



AGENDA

RETIREMENT BOARD MEETING

SECOND MONTHLY MEETING
August 22, 2018
9:00 a.m.

Retirement Board Conference Room
The Willows Office Park
1355 Willow Way, Suite 221
Concord, California

THE RETIREMENT BOARD MAY DISCUSS AND TAKE ACTION ON THE FOLLOWING:

1. Pledge of Allegiance.
2. Accept comments from the public.
3. Approve minutes from the July 25, 2018 and August 8, 2018 meetings.

CLOSED SESSION

4. The Board will go into closed session pursuant to Govt. Code Section 54957 to consider the disability application for Rebecca Halvorson.
5. The Board will continue in closed session pursuant to Govt. Code Section 54956.9(d)(1) to confer with legal counsel regarding pending litigation:
 - a. *Contra Costa County Deputy Sheriffs Association, et al., v. Board of Retirement of CCCERA, et al.*, Supreme Court of the State of California, Case No. S247095
 - b. *Wilmot v. CCCERA, et al*, Court of Appeal, Case No. A15200
 - c. *Nowicki v. CCCERA, et al.*, Contra Costa County Superior Court, Case No. C17-01266
 - d. *Batis v. CCCERA, et al.*, Contra Costa County Superior Court, Case No. N18-0553

OPEN SESSION

6. Consider and take possible action regarding non-service connected disability retirement allowance of deceased member James Ozment.
7. Review of total portfolio performance for period ending June 30, 2018.
 - a. Presentation from Verus
 - b. Presentation from staff
8. Review of portfolio rebalancing report.
9. Presentation from staff and Invesco regarding a potential commitment to Invesco Real Estate.

The Retirement Board will provide reasonable accommodations for persons with disabilities planning to attend Board meetings who contact the Retirement Office at least 24 hours before a meeting.

10. Consider and take possible action regarding a commitment to Invesco Real Estate.
11. Presentation from Segal regarding the December 31, 2017 Valuation Report.
12. Consider and take possible action to revise Attachment B of the Board of Retirement Resolution 2018-1 providing health plan monthly premium subsidies for unrepresented employees of CCCERA effective January 1, 2019.
13. Consider authorizing the attendance of Board:
 - a. SACRS Fall Conference, November 13-16, 2018, Indian Wells, CA.
14. Miscellaneous
 - a. Staff Report
 - b. Outside Professionals' Report
 - c. Trustees' comments

The Retirement Board will provide reasonable accommodations for persons with disabilities planning to attend Board meetings who contact the Retirement Office at least 24 hours before a meeting.



Meeting Date

08/22/18

Agenda Item

#3

MINUTES

RETIREMENT BOARD MEETING MINUTES

SECOND MONTHLY MEETING

July 25, 2018

9:00 a.m.

Retirement Board Conference Room

The Willows Office Park

1355 Willow Way, Suite 221

Concord, California

Present: Candace Andersen, Scott Gordon, Jerry Holcombe, Jay Kwon, David MacDonald, John Phillips, Gabe Rodrigues, Todd Smithey, Jerry Telles and Russell Watts

Absent: Louie Kroll and William Pigeon

Staff: Gail Strohl, Chief Executive Officer; Christina Dunn, Deputy Chief Executive Officer; Timothy Price, Chief Investment Officer; Karen Levy, General Counsel; Wrally Dutkiewicz, Compliance Officer; Anne Sommers, Administrative/HR Manager; Henry Gudino, Accounting Manager; and Tim Hoppe, Retirement Services Manager

Outside Professional Support:
Susan Hastings

Representing:
Laughlin, Falbo, Levy & Moresi

1. Pledge of Allegiance

The Board, staff and audience joined in the *Pledge of Allegiance*.

2. Accept comments from the public

No member of the public offered comment.

Telles was present for subsequent discussion and voting.

3. Approval of Minutes

It was **M/S/C** to approve the minutes from the June 27, 2018 meeting. (Yes: Andersen, Gordon, Holcombe, MacDonald, Phillips, Rodrigues, Smithey, Telles and Watts)

CLOSED SESSION

The Board moved into closed session pursuant to Govt. Code Section 54957.

The Board moved into open session.

4. It was **M/S/C** to deny Rebecca Halvorson's application for a Service Connected Disability and direct staff to prepare a proposed findings of fact and decision to deny a service-connected disability. (Yes: Andersen, Gordon, Holcombe, Phillips, Rodrigues, Smithey and Watts. No: MacDonald and Telles)

5. The Board did not accept the findings of the Hearing Officer related to Leslie Pounds application for a Service Connected Disability. It was **M/S/C** to require a transcript summary of all the testimony plus all other evidence received by the Hearing Officer, and after receipt thereof, the Board shall take such action as it determines is warranted by the evidence as provided under Govt. Code Section 31534. (Yes: Andersen, Gordon, Holcombe, MacDonald, Phillips, Rodrigues, Smithey, Telles and Watts)

6. **Appoint Audit Committee Members**

Smithey reported one of his duties as the Board Chairperson is to appoint the Audit Committee members. He reported the committee will remain the same with John Phillips as the Chairperson, Russell Watts as the Vice Chairperson, and Jerry Holcombe and Todd Smithey as Members-at-Large.

7. **Update from Chief Investment Officer on Asset Allocation Communications**

Price reported the Board has had several discussions about CCCERA's asset allocation including what it is, what it does, why it's different from our peers, and how to talk about it with others.

He reviewed a draft of a short form description of the asset allocation for use in conversations and a draft of a long form description of the asset allocation that will be posted on CCCERA's website for those who have more questions. He also reviewed the important aspects of each description and solicited feedback from the Board.

Price reviewed a chart that will be posted on the website that details CCCERA's Functionally Focused Portfolio (FFP) investment strategy.

8. **Consider and take possible action to:**

- a. Adopt Board of Retirement Resolution 2018-3 to adjust the salary of the Chief Executive Officer.
- b. Amend the Board of Retirement Resolution 2018-1 for Salary and Benefits for Unrepresented Employees to adjust the management administrative leave of the Chief Executive Officer.

It was **M/S/C** to adopt Board of Retirement Resolution No. 2018-3 to adjust the salary of the Chief Executive Officer and amend the Board of Retirement Resolution 2018-1 for Salary and Benefits for Unrepresented Employees to adjust the management administrative leave of the Chief Executive Officer. (Yes: Andersen, Gordon, Holcombe, MacDonald, Phillips, Rodrigues, Smithey, Telles and Watts)

9. **Consider and take possible action to adopt the CCCERA Position Pay Schedules effective July 1, 2018**

It was **M/S/C** to adopt the CCCERA Position Pay Schedules effective July 1, 2018. (Yes: Andersen, Gordon, Holcombe, MacDonald, Phillips, Rodrigues, Smithey, Telles and Watts)

10. **Consider authorizing the attendance of Board:**

- a. It was **M/S/C** to authorize the attendance of 2 Board members at the Board Audit Committee Compliance Conference, Society of Corporate Compliance and Ethics, September 24-25, 2018, Scottsdale, AZ. (Yes: Andersen, Gordon, Holcombe, MacDonald, Phillips, Rodrigues, Smithey, Telles and Watts)

- b. It was **M/S/C** to authorize the attendance of 2 Board members at the 2018 StepStone Investor Dinner & Conference, October 10-11, 2018, New York, NY. (Yes: Andersen, Gordon, Holcombe, MacDonald, Phillips, Rodrigues, Smithey, Telles and Watts)
- c. It was **M/S/C** to authorize the attendance of 3 Board members at the 2018 Torchlight Investment Summit, October 16-17, 2018, New York, NY. (Yes: Andersen, Gordon, Holcombe, MacDonald, Phillips, Rodrigues, Smithey, Telles and Watts)

11. Miscellaneous

(a) Staff Report –

Strohl reported the annual Staff Development Day was held on July 12, 2018. Topics discussed were embracing change and excellent customer service. She noted she received positive feedback from that day.

Price reported the global head of risk management at PIMCO resigned on Friday. He noted there is no impact to CCCERA's portfolio because our mandate with PIMCO is managed by Research Affiliates.

(b) Outside Professionals' Report -

None

(c) Trustees' comments –

Telles reported on the Invesco on-site visit he and MacDonald attended and noted he was very impressed with their teams.

MacDonald agreed and encouraged Trustees' to participate in on-site visits. He asked if there can be an educational session on a future agenda regarding disabilities and mental health.

Gordon reported that he, Price and Rodrigues attended the DLJ Annual Limited Partners Meeting and felt it was very interesting.

Rodrigues agreed and noted it was very educational.

It was **M/S/C** to adjourn the meeting. (Yes: Andersen, Gordon, Holcombe, MacDonald, Phillips, Rodrigues, Smithey, Telles and Watts)

Todd Smithey, Chairman

David MacDonald, Secretary



MINUTES

RETIREMENT BOARD MEETING MINUTES

REGULAR MEETING
August 8, 2018
9:00 a.m.

Retirement Board Conference Room
The Willows Office Park
1355 Willow Way, Suite 221
Concord, California

Present: Scott Gordon, Jerry Holcombe, Louie Kroll, Jay Kwon, David MacDonald, John Phillips, William Pigeon, Gabe Rodrigues, Todd Smithey, Jerry Telles and Russell Watts

Absent: Candace Andersen

Staff: Gail Strohl, Chief Executive Officer; Christina Dunn, Deputy Chief Executive Officer; Timothy Price, Chief Investment Officer; Karen Levy, General Counsel; Anne Sommers, Administrative/HR Manager; and Henry Gudino, Accounting Manager

Outside Professional Support:
Joe Wiley

Representing:
Wiley Price & Radulovich LLP

1. Pledge of Allegiance

The Board, staff and audience joined in the *Pledge of Allegiance*.

2. Recognition of Karen Levy for 10 years of service

Smithey recognized and congratulated Karen Levy for her 10 years of service.

3. Accept comments from the public

No member of the public offered comment.

4. Approval of Minutes

It was M/S/C to approve the minutes of the July 11, 2018 meeting. (Yes: Gordon, Holcombe, Kwon, MacDonald, Phillips, Rodrigues, Smithey, Telles and Watts)

5. Routine Items

It was M/S/C to approve the routine items of the August 8, 2018 meeting. (Yes: Gordon, Holcombe, Kwon, MacDonald, Phillips, Rodrigues, Smithey, Telles and Watts)

CLOSED SESSION

The Board moved into closed session pursuant to Govt. Code Section 54957, 54957.6 and 54956.9(d)(1).

The Board moved into open session.

6. It was **M/S/C** to accept the Medical Advisor's recommendation and grant the following disability benefits:

- a. Donald Bianucci – Non-Service Connected (Yes: Gordon, Holcombe, Kwon, MacDonald, Phillips, Rodrigues, Smithey, Telles and Watts)

Pigeon was present for subsequent discussion and voting.

- b. Charles McPherson – Non-Service Connected (Yes: Gordon, Holcombe, Kwon, MacDonald, Phillips, Pigeon, Smithey, Telles and Watts)
- c. David Atkin – Service Connected (Yes: Gordon, Holcombe, Kwon, MacDonald, Phillips, Pigeon, Smithey, Telles and Watts)
- d. Leslie Grundler – Service Connected (Yes: Gordon, Holcombe, Kwon, MacDonald, Phillips, Pigeon, Smithey, Telles and Watts)
- e. Natalie Probert-Kurtz – Service Connected (Yes: Gordon, Holcombe, Kwon, MacDonald, Phillips, Pigeon, Smithey, Telles and Watts)

7. There was no reportable action related to Govt. Code Section 54957.6.

8. There was no reportable action related to Govt. Code Section 54956.9(d)(1).

9. **Presentation of year to date 2018 CCCERA budget vs. actual expenses report**

Gudino presented the mid-year budget versus actual expenditures and noted we are trending at 56% of the remaining budget and most of the expenses are in line with the original budget projections.

10. **Consider authorizing the attendance of Board:**

- a. It was **M/S/C** to authorize the attendance of 1 Board member at the CRCEA 2018 Fall Conference, October 15-17, 2018, San Rafael, CA. (Yes: Gordon, Holcombe, Kwon, MacDonald, Phillips, Pigeon, Smithey, Telles and Watts)
- b. It was **M/S/C** to authorize the attendance of 1 Board member at the Connectivity 2018, William Blair, October 17-18, 2018, Chicago, IL. (Yes: Gordon, Holcombe, Kwon, MacDonald, Phillips, Pigeon, Smithey, Telles and Watts)
- c. It was **M/S/C** to authorize the attendance of 1 Board member at the CII 2018 Fall Conference, The Council of Institutional Investors, October 24-26, 2018, Boston, MA. (Yes: Gordon, Holcombe, Kwon, MacDonald, Phillips, Pigeon, Smithey, Telles and Watts)
- d. There was no action taken on this item. Trustees' Round Table, California Association of Public Retirement Systems, October 26, 2018, Glendale, CA.
- e. It was **M/S/C** to authorize the attendance of 4 Board members at the 2018 Public Safety Conference, National Conference on Public Employee Retirement Systems, October 28-31, 2018, Las Vegas, NV. (Yes: Gordon, Holcombe, Kwon, MacDonald, Phillips, Pigeon, Smithey, Telles and Watts)

11. **Miscellaneous**

- (a) Staff Report –

Strohl reported on the NASRA Conference she attended and noted it was very interesting; Segal will present the Valuation Report at the August 22, 2018 Board meeting; and the Benefits Statements will be sent out by end of the month.

- (b) Outside Professionals' Report -

None

(c) Trustees' comments –

None

It was **M/S/C** to adjourn the meeting. (Yes: Gordon, Holcombe, Kwon, MacDonald, Phillips, Pigeon, Smithey, Telles and Watts)

Todd Smithey, Chairman

David MacDonald, Secretary

MEMORANDUM

Date: August 22, 2018

To: CCCERA Board of Retirement

From: Tim Hoppe, Retirement Services Manager

Subject: James Ozment, Application for Non-Service Connected Disability, Tier 3

On February 16, 2018, James Ozment, a 54-year old Building Inspector with the Contra Costa County Department of Conservation & Development, and active CCCERA member, died as a result of metastatic rectal adenocarcinoma. Prior to his death, Mr. Ozment had on file a Member Election Form for Non-Service Connected Disability Retirement in the Event of Member's Death During Active Service (*Active Death Form*). Mr. Ozment had approximately 10.1668 years of service at the time of his death.

Shortly before his death, Mr. Ozment filed an application for a non-service connected disability retirement. Medical records were analyzed by the Board's medical advisor, who concluded that the evidence showed Mr. Ozment was totally disabled from any employment prior to his death. Therefore, he meets the medical requirements of permanent disability for a Tier 3 member on a non-service connected basis.

The Board is now called upon to make a determination as to whether the member became permanently unable to perform his job duties and if the Member Election Form for a Non-Service Connected Disability Retirement in the Event of Member's Death During Active Service (*Active Death Form*) should be granted.

Recommendation:

1. Find that the member was permanently unable to engage in any substantial gainful employment and grant a non-service connected disability retirement, effective February 16, 2018.
2. Grant the member's beneficiary (member's spouse) benefits pursuant to Government Code Section 31762 (Optional Settlement 2 allowance for the life of the named beneficiary).

Notes: Upon approval of the form, his beneficiary would receive a lifetime monthly allowance equal to 100% of the Optional Settlement 2 allowance (GC 31762).



**PERSPECTIVES
THAT DRIVE
ENTERPRISE
SUCCESS**



PERIOD ENDING: JUNE 30, 2018

Investment Performance Review for

Contra Costa County Employees' Retirement Association

Meeting Date

08/22/18

Agenda Item

#7a

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Verus⁷⁷⁷

[VERUSINVESTMENTS.COM](https://www.verusinvestments.com)

SEATTLE 206-622-3700

LOS ANGELES 300-297-1777

SAN FRANCISCO 415-362-3484

Investment Landscape

TAB I

Investment Performance
Review

TAB II



**PERSPECTIVES
THAT DRIVE
ENTERPRISE
SUCCESS**

3RD QUARTER 2018
Investment Landscape

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VERUSINVESTMENTS.COM

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2nd quarter summary

THE ECONOMIC CLIMATE

- U.S. economic data generally surprised to the upside in Q2, leading to a strong quarterly GDP growth estimate of 3.4%. Economic growth in the second and third quarters will likely see the biggest boost from fiscal stimulus. The U.S. is currently outshining other developed economies. [p. 7, 18](#)
- The synchronized global growth story of the past year has shifted somewhat as economies have displayed more disparate performance. The change has not been too dramatic – growth continues to be positive, but at a more moderate pace. [p. 17](#)

PORTFOLIO IMPACTS

- Emerging market equity and local debt delivered losses of 8.0% and 10.4% in Q2 (MSCI Emerging Markets Index, JPM GBI-EM Global Diversified). Much of the losses were due to currency movement. We believe emerging market assets offer attractive value – recent movements appear to have been driven by a shift in short-term sentiment and currency depreciation. [p. 27, 34](#)
- The U.S. implemented a first round of tariffs on Chinese imports on July 6th, which impacted \$34 billion worth of goods. So far, only a small portion of the discussed tariffs have been enacted. [p. 8, 9](#)

THE INVESTMENT CLIMATE

- Strong corporate earnings growth is expected again in the second quarter. According to FactSet, the bottom-up analyst forecast for the S&P 500 is 20.0% YoY. [p. 31](#)
- Short-term U.S. Treasury yields rose, resulting in a flatter yield curve. The spread between the 10- and 2-year yield was 27 bps, a new cycle low. [p. 23](#)
- Fears were raised over Italy's role in the European Union after a coalition of the anti-establishment Five Star Movement and League Party formed a new government. Italian sovereign bond yields spiked severely during the move, but have since moderated somewhat. [p. 19](#)

ASSET ALLOCATION ISSUES

- Following the February selloff equity markets have been range bound. As corporate earnings rise further equity valuations have been pushed down to more attractive levels closer to the long-term historical average. [p. 31, 37](#)
- While we believe trade negotiations and geopolitical uncertainty are potential causes for concern, the backdrop of positive global growth and strong corporate earnings may allow for healthy risk-asset performance. [p. 18, 31](#)

A neutral to mild risk overweight may be warranted in today's environment

What drove the market in Q2?

“Trade tariff worries keep stocks under pressure”

TOTAL PROPOSED GOODS SUBJECT TO U.S. TARIFFS (\$BILLIONS)

Jan	Feb	Mar	Apr	May	Jun
10	10	106	206	481	881

Article Source: Financial Times, June 21st, 2018

“Economic growth in U.S. leaves world behind”

U.S. Q2 GDP CONSENSUS EXPECTATION (%)

Jan	Feb	Mar	Apr	May	Jun
2.6	2.7	3.0	3.1	3.1	3.4

Article Source: WSJ, June 14th, 2018

“Rising dollar sparks tumult in emerging markets”

MSCI EMERGING MARKETS MONTHLY CURRENCY IMPACT

Jan	Feb	Mar	Apr	May	Jun
1.6%	-0.7%	0.0%	-1.6%	-1.3%	-1.7%

Article Source: WSJ, May 21st, 2018

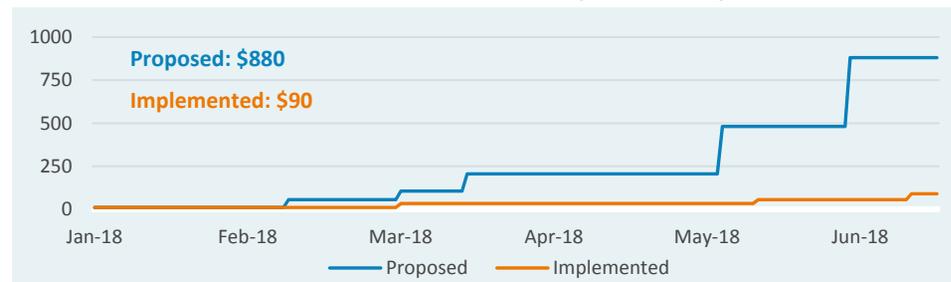
“Investors are getting worried about an inverted yield curve”

U.S. 10- MINUS 2-YEAR YIELD SPREAD (BPS)

Jan	Feb	Mar	Apr	May	Jun
56	61	47	46	42	33

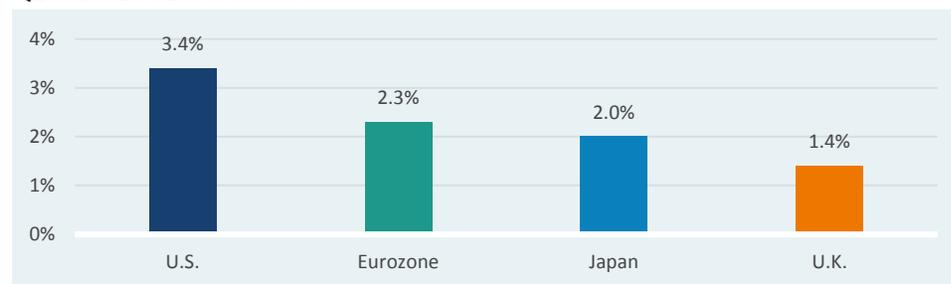
Article Source: Bloomberg, April 18th, 2018

PROPOSED VS. IMPLEMENTED U.S. TARIFFS (\$BILLIONS)



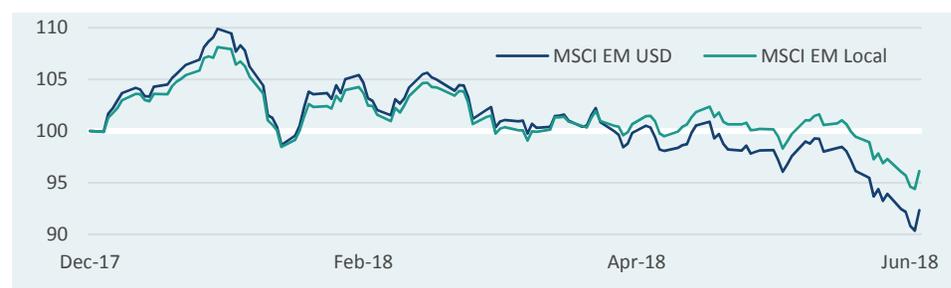
Source: Verus, as of 7/6/18

Q2 GDP EXPECTATIONS



Source: Bloomberg, as of 7/11/18

MSCI EMERGING MARKETS USD VS. LOCAL



Source: Bloomberg, as of 6/30/18

Economic environment

U.S. economics summary

- GDP growth was 2.8% year-over-year in the first quarter (2.0% quarterly annualized rate). The slightly slower pace of expansion was influenced by more conservative consumer spending than in previous quarters.
- The rate of inflation picked up moderately throughout the quarter. Core CPI rose 2.3% over the past year, reaching the upper end of its range during the current cycle. The year-over-year rate was impacted by a low base effect – the 3-month annualized core inflation rate was only 1.7%.
- Job gains during the quarter were strong, despite traditional employment measures indicating a tight labor market. Additions to nonfarm payrolls averaged 211,000 per month and the U-3 unemployment rate fell slightly from 4.1% to 4.0%.
- The broadest measure of labor market health, the ratio of employed individuals to the total population, indicates there may still be room for further improvement. More narrow indicators, such as the U-3 unemployment rate, may be overstating labor market tightness.
- The back and forth on trade between the U.S. and much of the rest of the world intensified. The White House has threatened to enact tariffs on up to \$550 billion of Chinese goods over unfair trade practices and intellectual property theft. To this point, tariffs have only been implemented on around \$40 billion of Chinese goods.
- The Fed raised interest rates for a second time this year in June to a target rate of 1.8% to 2.0%. Two more rate hikes are expected by the end of the year based on the Fed dot plot.

	Most Recent	12 Months Prior
GDP (YoY)	2.8% 3/31/18	2.0% 3/31/17
Inflation (CPI YoY, Core)	2.3% 6/30/18	1.7% 6/30/17
Expected Inflation (5yr-5yr forward)	2.2% 6/30/18	1.8% 6/30/17
Fed Funds Target Range	1.75 – 2.00% 6/30/18	1.00 – 1.25% 6/30/17
10 Year Rate	2.9% 6/30/18	2.3% 6/30/17
U-3 Unemployment	4.0% 6/30/18	4.3% 6/30/17
U-6 Unemployment	7.8% 6/30/18	8.5% 6/30/17

GDP growth

Real GDP growth rose 2.8% from the previous year in the first quarter (2.0% quarterly annualized rate). After a strong fourth quarter, consumers were more conservative with their purchases. Consumer spending contributed only 0.6% to the first quarter growth rate, compared to a 2.8% contribution in the previous quarter. Corporate capital investment was the biggest contributor to growth at 1.2%.

Strong growth is expected throughout the rest of the year as the benefits of fiscal stimulus begin to flow through to the economy. According to the Bloomberg consensus estimate,

real GDP growth is expected to be 3.4% in the second quarter. The big question is whether the economic benefits from fiscal stimulus are a one-off or whether they will have a more lasting impact on the economy that will help counter the headwind from monetary tightening.

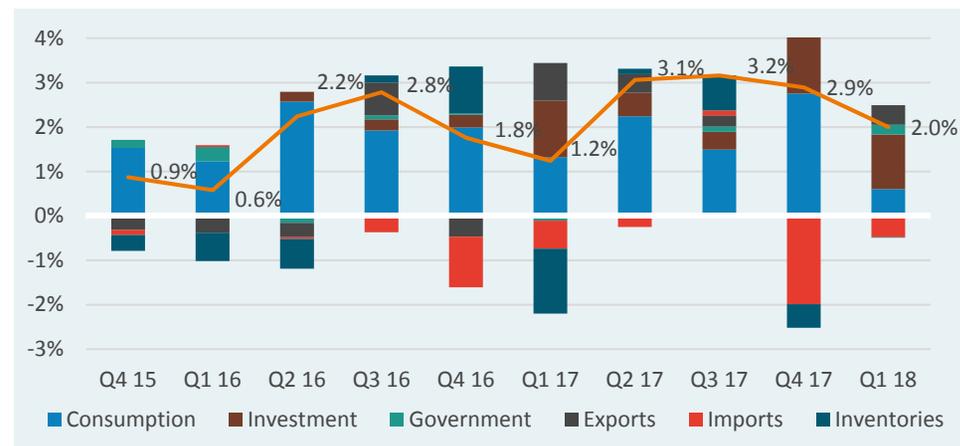
While much of the tax cut windfall has been returned to shareholders via share buybacks there has been a meaningful pick up in corporate fixed investment to more normal levels, which may help sustain growth in the coming quarters.

U.S. REAL GDP GROWTH (YOY)



Source: Bloomberg, as of 3/31/18

U.S. GDP COMPONENTS



Source: Bloomberg, annualized quarterly rate, as of 3/31/18

Global trade

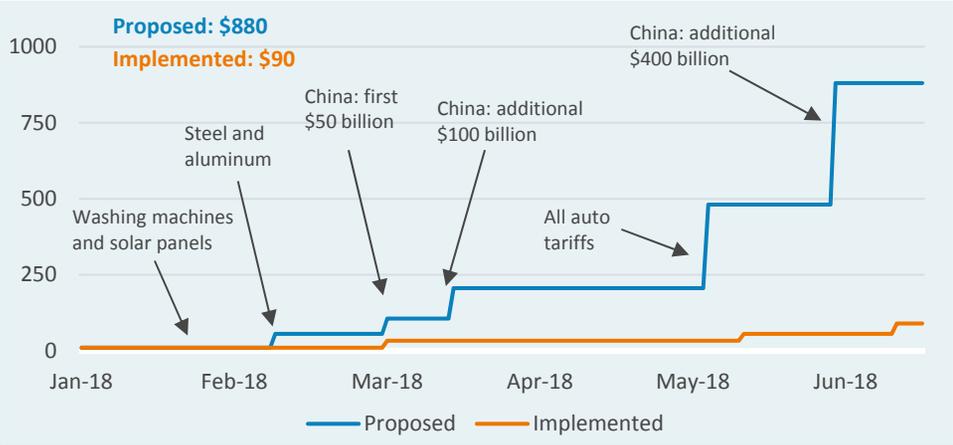
The war of words over trade between the U.S. and much of the rest of the world intensified in recent months, particularly with China. A first round of 10% tariffs on \$34 billion of Chinese goods was implemented on July 6th.

Thus far, there has been a large discrepancy between tariffs that have been proposed and tariffs that have been implemented. The U.S. has only enacted tariffs on \$90 billion of global imports. In comparison, the White House has proposed placing tariffs on a total of \$880 billion of imported goods. It is important to remember that tariffs are an avoidable tax on corporations conducting business in the U.S. Assuming a 10%

tariff rate on all proposed goods would result in a maximum tax of \$88 billion, a relatively small amount when thinking about the U.S. economy as a whole.

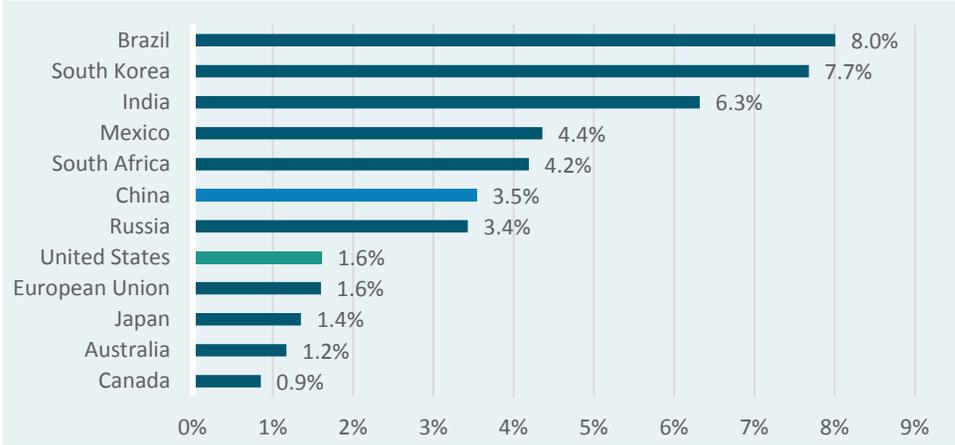
Tariffs in place so far are likely to have a minimal impact on the global economy. We believe that financial markets may be more sensitive to an escalation in the trade conflict than the actual economic impact. Much of the discussion on trade has ignored the fact that the U.S. has upheld less protectionist trade policies than many of its trading partners. While the trade conflict creates potential market downside risks, it also creates potential benefits if the end result is freer trade.

PROPOSED VS. IMPLEMENTED U.S. TARIFFS (\$BILLIONS)



Source: Verus, as of 7/6/18

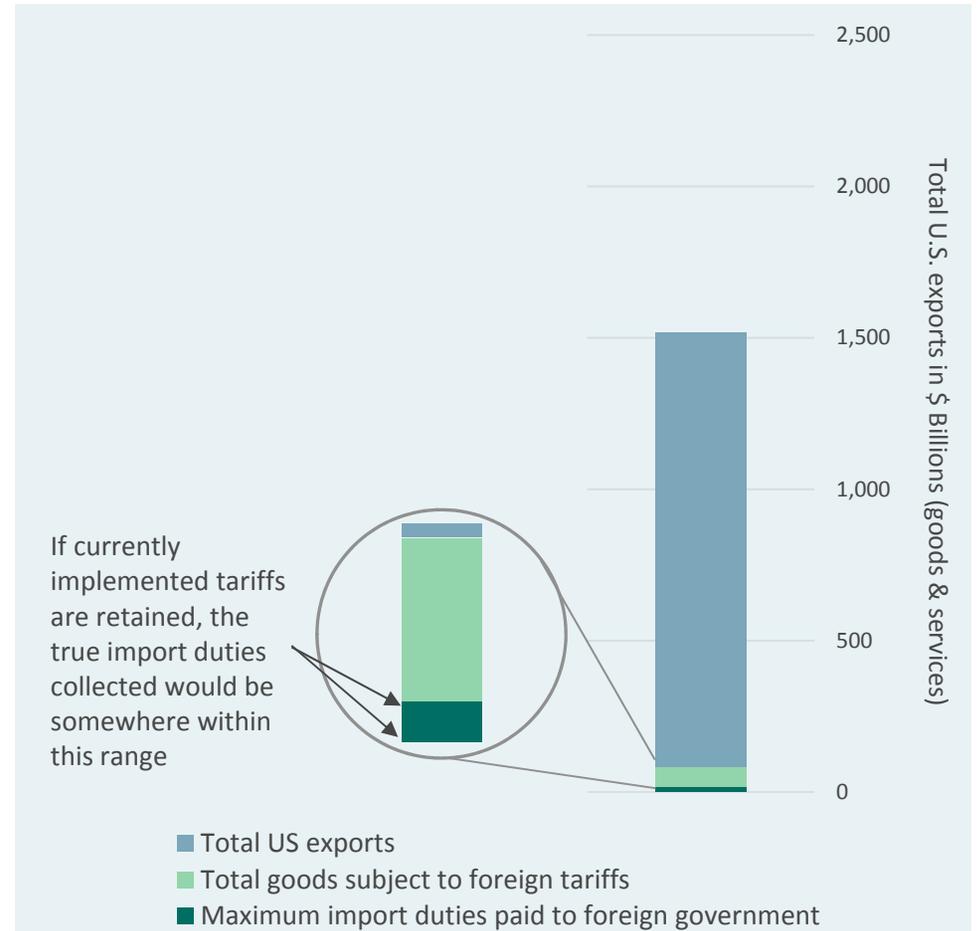
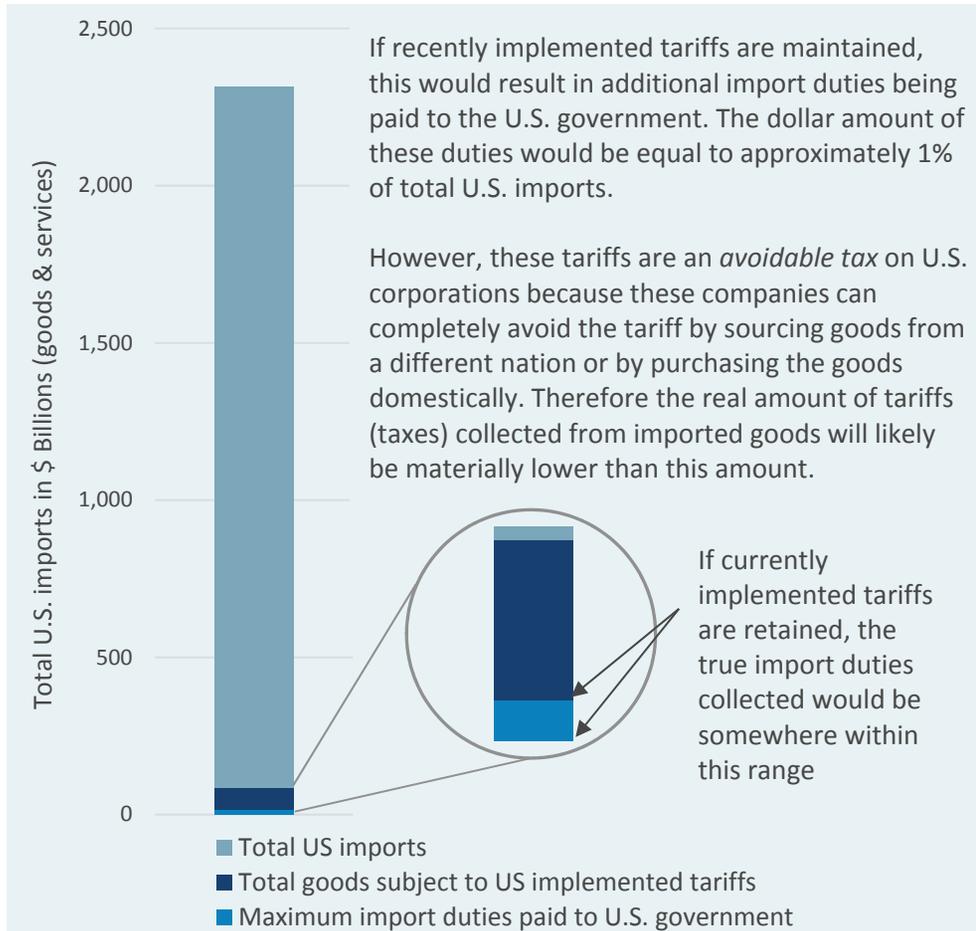
AVERAGE TARIFF RATE



Source: WTO, 2016

Putting tariffs into perspective

Tariff duties are better thought of as an avoidable tax. The impact of recently enacted tariffs is small, especially once substitution effects are accounted for.



Source: U.S. Census Bureau, Verus

Analysis conservatively assumes a 25% tariff rate for an estimated \$90 billion of tariffs on both imports and exports, both goods and services are included

Inflation

The year-over-year core CPI inflation rate was 2.3% in June, up from 2.1% three months prior. The increase in the yearly rate slightly overstates the size of the move because it was impacted by a low base effect – the annualized 3-month core inflation rate was only 1.7%.

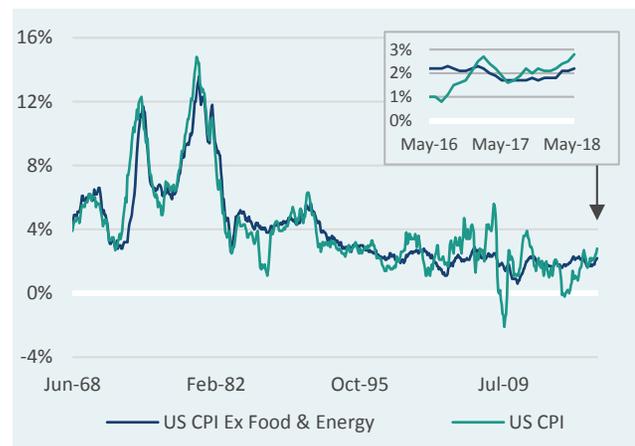
While investors' concerns over inflation have bubbled up occasionally throughout the year, we have yet to see a material increase in price levels. Consumer price inflation

has been held back by a lack of wage growth as well as structural factors such as globalization and automation which have weighed down the prices of goods.

The Fed's response to inflation data is potentially more important to investors than actual changes in inflation, barring an unforeseen shock to the upside. To this point, the central bank appears to be tolerant of inflation slightly higher than the stated 2% target.

Core inflation remained modest

U.S. CPI (YOY)



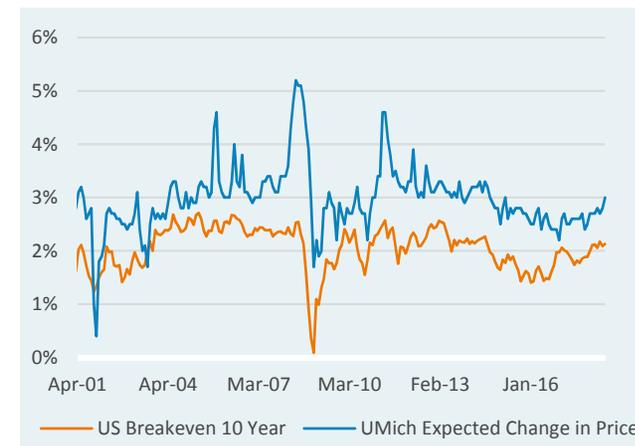
Source: FRED, as of 5/31/18

INFLATION BY PRODUCT TYPE (YOY)



Source: Bloomberg, as of 5/31/18

INFLATION EXPECTATIONS



Source: Bloomberg, as of 6/30/18

Labor market

Conditions in the U.S. labor market tightened further in Q2 as unemployment moved from 4.1% to 4.0%. The unemployment rate that includes discouraged and part time workers fell from 8.0% to 7.8%. Despite these headline readings, we believe there may be considerable slack in the U.S. labor force which is not captured in traditional unemployment measures. This suggests further labor market gains in the U.S. expansion may be reflected in higher participation rates rather than solely through a decline in the unemployment rate.

Perhaps the greatest question mark in today's labor market is the degree to which long-term unemployed workers decide to resume their job search. This decision to return to work may be influenced by greater job prospects that come hand-in-hand with a strong economy, or may be influenced purely by necessity (many Americans are not adequately prepared for retirement).

Traditional unemployment metrics may understate labor market slack

Average hourly earnings growth ticked up to 2.7%, continuing a mild positive trend since the bottom of the U.S. recession.

UNEMPLOYMENT RATE



Source: FRED, as of 6/30/18

AVERAGE HOURLY EARNINGS (YOY)



Source: Bloomberg, as 5/31/18

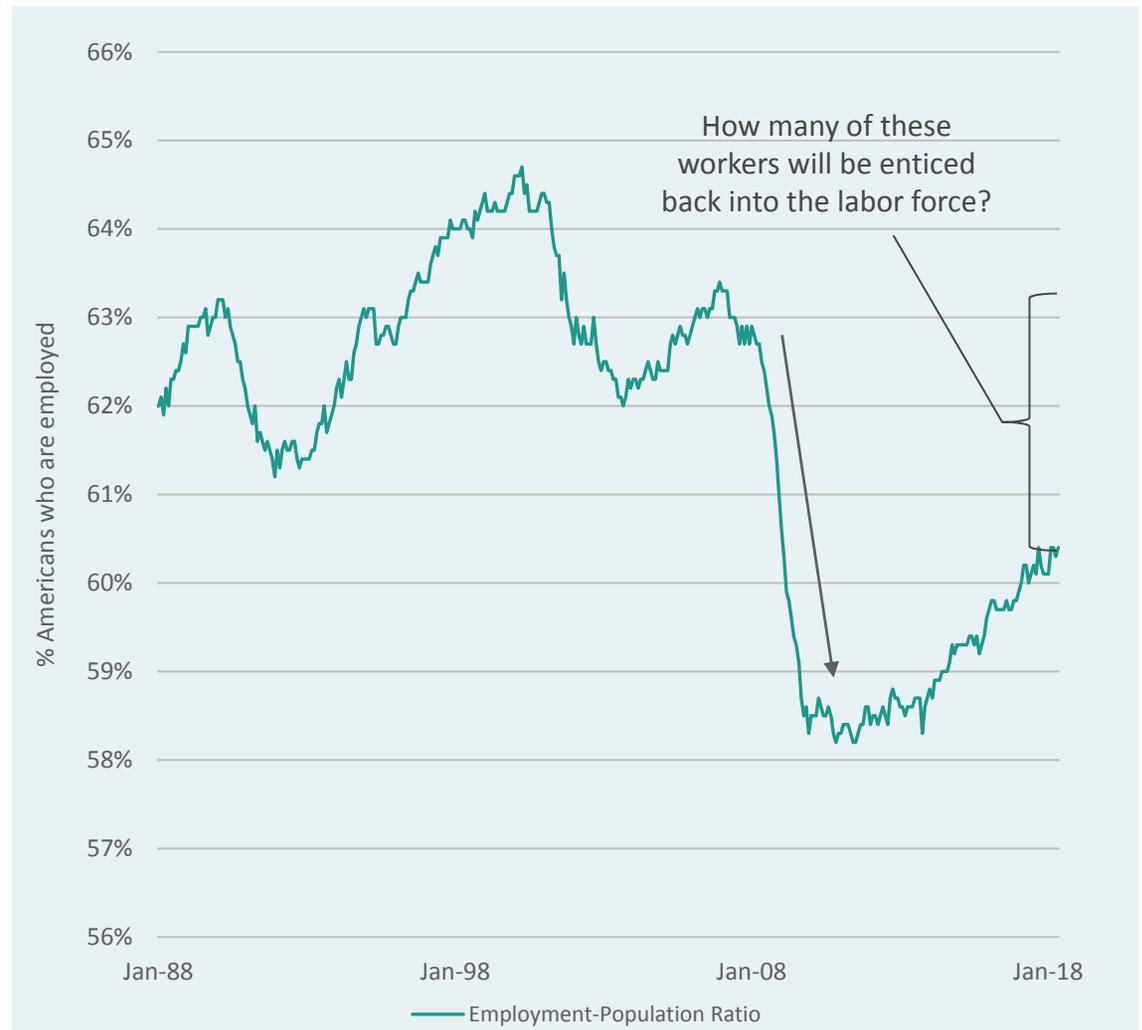
UNEMPLOYMENT DURATION



Source: FRED, as of 6/30/18

How tight is the job market?

- According to the most frequently touted measures of unemployment, the U.S. job market is at the strongest level seen in nearly 50 years. But looking at unemployment through a different lens – the number of Americans employed – paints a very different picture. A significant portion of America remains unemployed relative to 10 years ago.
- During past U.S. economic downturns, between 2% and 3% of Americans lost their jobs, though most or all of those jobs were recovered throughout the subsequent economic recovery. In comparison, 5% of Americans exited the workforce during the latest recession, and less than half of these lost jobs have been regained.
- Some of this shortfall has been fueled by demographic shifts, and some by workers giving up and permanently leaving the workforce. But the remainder of the shortfall is comprised of very discouraged workers who will eventually seek employment. If it turns out that this third category is large, the current U.S. job market may not be as tight as commonly believed, which implies more potential upside to the U.S. economic expansion.



Source: FRED, Verus, as of 6/30/18

The consumer

Economic conditions such as low unemployment, moderate wage gains, and restrained inflation remain broadly supportive of the U.S. consumer. Personal spending growth was 4.6% year-over-year in May, in line with the conservative spending habits seen throughout this expansion.

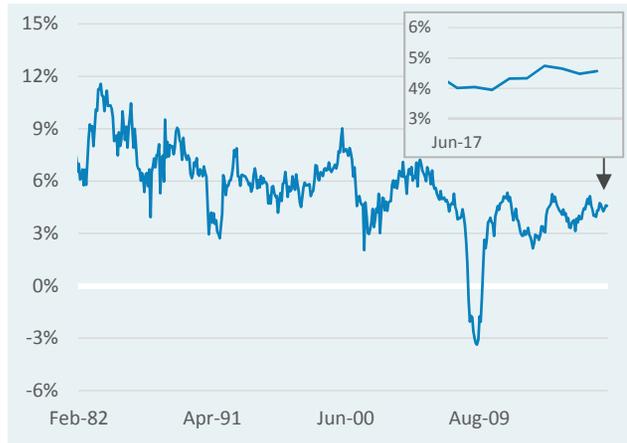
Consumers have also been timid with credit use during the current cycle. Households deleveraged following the financial crisis primarily through less mortgage debt, although this trend has flattened out more recently. Despite this

deleveraging, household debt levels are still high relative to history at 91.5% of disposable income.

Given the more conservative use of credit, dissaving has been an important driver of consumer spending. The personal savings rate was only 3.2% in May, near historical lows. Low interest rates and high asset prices likely helped push down the savings rate. If these conditions were to moderate, it would lead to a more normal balance between spending and savings.

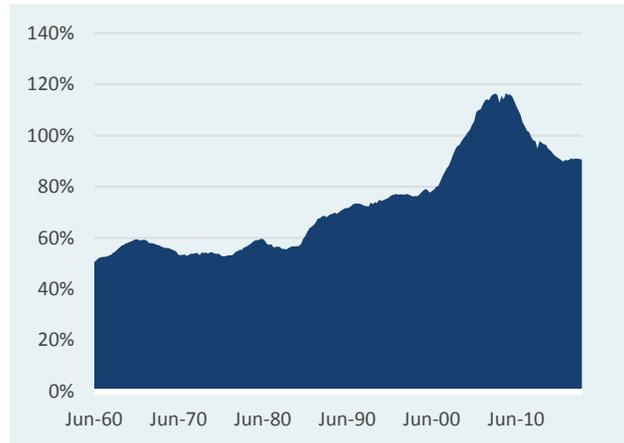
Economic conditions are still supportive of consumer spending

CONSUMER SPENDING GROWTH (YOY)



Source: Bloomberg, as of 5/31/18

HOUSEHOLD DEBT (% OF DISPOSABLE INCOME)



Source: Bloomberg, as of 3/31/18

PERSONAL SAVINGS RATE



Source: FRED, as of 5/31/18

Sentiment

Consumer and business sentiment readings are impressively high. The Bloomberg U.S. Weekly Consumer Confidence Index is in the 90th percentile, since 1985. The University of Michigan Consumer Sentiment Survey is in the 87th percentile, since 1978. Survey respondents provided favorable views on jobs and wages, and broadly expect modest gains in U.S. employment. Cited concerns included rising inflation, higher energy prices, and the economic risks posed by tariffs.

The NFIB Small Business Optimism Index was 107.2 at the end of the quarter – its 6th highest reading in survey history. NFIB noted that “small business owners continue to report astounding optimism as they celebrate strong sales, the creation of jobs, and more profits.” Business owners are concerned about the inability to find qualified employees for open positions, consistent with the historically high number of unfilled job openings reported by the Bureau of Labor Services.

CONSUMER COMFORT INDEX



Source: Bloomberg, as of 6/30/18 (see Appendix)

CONSUMER SENTIMENT



Source: University of Michigan, as of 6/30/18 (see Appendix)

NFIB SMALL BUSINESS OPTIMISM INDEX



Source: NFIB, as of 6/30/18 (see Appendix)

Housing

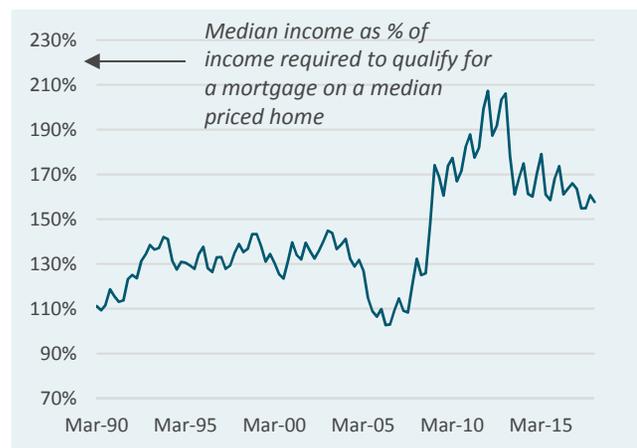
Single-family home prices have risen steadily thus far this year. As of April, the Case-Shiller National Home Price Index was up 6.4% from the previous year, and was 8.8% above the pre-crisis peak. Since the housing market bottomed in February of 2012, home prices have jumped by nearly 50% while personal incomes were up only 24% during the same period. Despite the outsized gain in home prices, demand for single-family housing has been strong, aided by low mortgage interest rates. Rising mortgage rates may make it difficult for many potential home buyers to enter the market at current prices. However, mortgage rates are still low and home affordability is high

relative to history – the median income is over 1.5 times the amount required to qualify for a mortgage on a median priced home.

The homeownership rate rose in 2017 for the first time in 13 years. This rate bottomed at 62.9% in the middle of 2016 and sits at 64.2% as of the end of the March. The rise in homeownership has been driven by younger, first time owners (i.e. Millennials). Mortgage lending standards have moderated after years of very tight standards following the financial crisis, which has helped younger buyers enter the market.

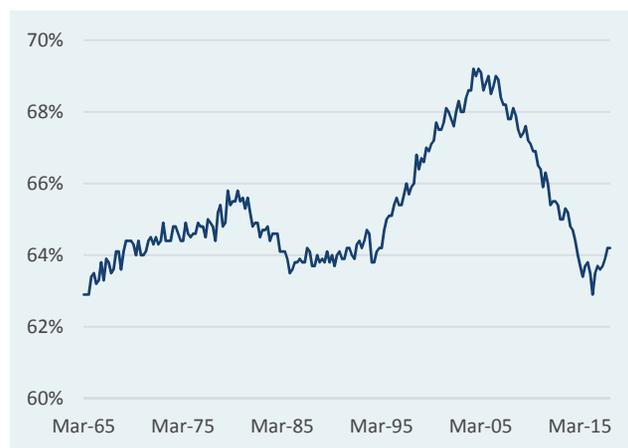
Home ownership rose for the first time in 13 years

HOUSING AFFORDABILITY INDEX



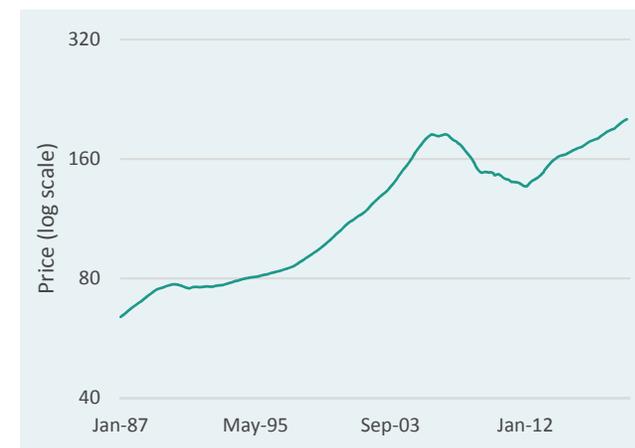
Source: Bloomberg, as of 3/31/18

HOME OWNERSHIP RATE



Source: FRED, as of 3/31/18

U.S. HOME PRICE INDEX



Source: Case-Shiller National Home Price Index, as of 4/30/18

International economics summary

- The synchronized global growth story of the past year has shifted somewhat as greater performance disparity is visible across global economies. Growth continues to be positive but is more moderate in places.
- Developed market economies are expected to grow less quickly in the coming years while emerging economy growth rates are expected to rise.
- The U.S. implemented a first round of tariffs on Chinese imports on July 6th, which impacted \$34 billion of goods. So far, only a small portion of the discussed tariffs have been enacted.
- In June, Mario Draghi officially announced the end of Europe's bond buying program. Asset purchases are scheduled to end in December, and it was promised that interest rates will remain unchanged through the summer of 2019. This message was seen by markets as more dovish than expected.
- Fears were raised over Italy's uncertain role in the EU, following a new coalition of the anti-establishment Five Star Movement and League Party taking over the government. Italian bond yields spiked severely during the move, but have since moderated.
- The Eurozone Composite PMI rose for the first time in five months to 54.8 in June. PMIs in most developed and emerging markets remain above 50, indicating expansion.
- The U.S. dollar appreciated 5% during the quarter. Certain emerging market currencies have devalued sharply, such as the Argentine peso, which is down more than 35% against the USD on the year.

Area	GDP (Real, YoY)	Inflation (CPI, YoY)	Unemployment
United States	2.8% <i>3/31/18</i>	2.8% <i>5/31/18</i>	4.0% <i>6/30/18</i>
Eurozone	2.5% <i>3/31/18</i>	2.0% <i>6/30/18</i>	8.6% <i>3/31/18</i>
Japan	1.1% <i>3/31/18</i>	0.7% <i>5/31/18</i>	2.2% <i>5/31/18</i>
BRICS Nations	5.8% <i>3/31/18</i>	2.5% <i>6/30/18</i>	5.6% <i>3/31/18</i>
Brazil	1.2% <i>3/31/18</i>	4.4% <i>6/30/18</i>	12.8% <i>6/30/18</i>
Russia	1.3% <i>3/31/18</i>	2.3% <i>6/30/18</i>	4.7% <i>5/31/18</i>
India	7.7% <i>3/31/18</i>	5.0% <i>6/30/18</i>	8.8% <i>12/31/17</i>
China	6.8% <i>3/31/18</i>	1.9% <i>6/30/18</i>	3.9% <i>3/31/18</i>

International economics

The synchronized global growth story of the past year has shifted as economies display more disparate economic performance. The change has not been too dramatic - growth continues to be positive but more moderate in places. Since 2016 we have been discussing political and economic risks which exist in Europe. These fears were confirmed in recent quarters as Eurozone economies missed expectations in a variety of areas including GDP growth, retail sales, and industrial production – casting some doubt over the European recovery story.

The Eurozone and Japan exhibited inflation well below central bank targets in the second quarter, while the U.S. delivered a moderate rise. Overall, inflation conditions remain benign which has allowed (or necessitated) easier central bank policy.

Labor markets tightened broadly, in line with an environment of positive economic expansion. However, joblessness remains stubbornly high in some Eurozone countries such as Italy, Spain, and Greece.

Synchronized global growth has moderated

REAL GDP GROWTH (YOY)



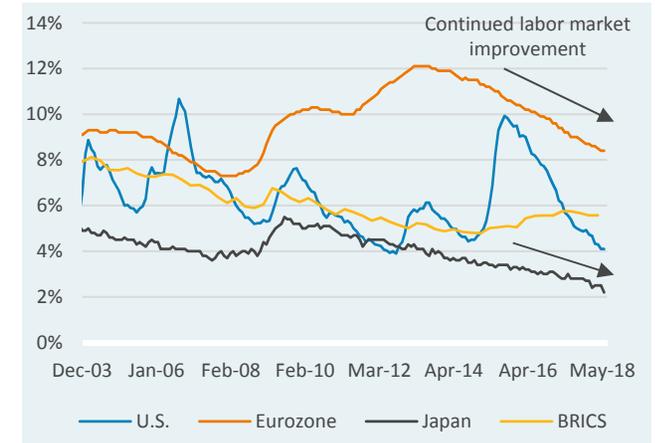
Source: Bloomberg, as of 3/31/18

INFLATION (CPI YOY)



Source: Bloomberg, as of 5/31/18

UNEMPLOYMENT RATE



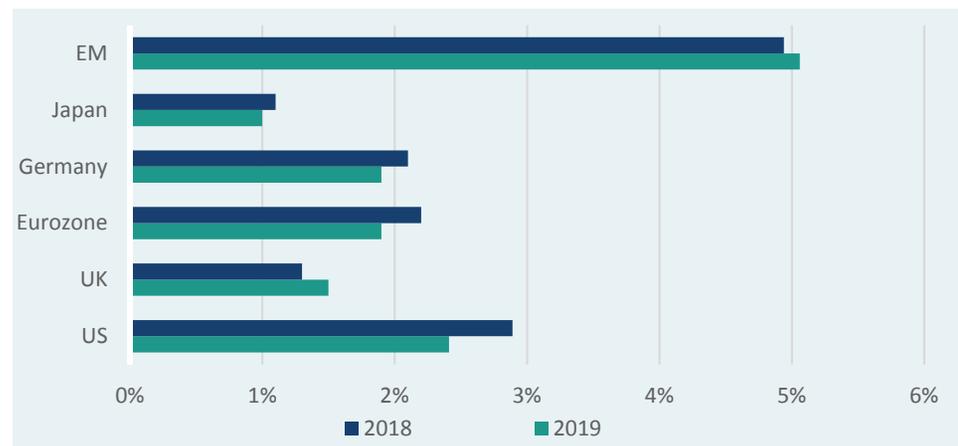
Source: Bloomberg, as of 5/31/18 or most recent release

GDP growth expectations

Economic growth expectations for the rest of 2018 and 2019 have begun to show widening differentials between the U.S. and the rest of the developed world. GDP expectations for the U.S. have been revised upward over the past six months partly due to an expected boost from fiscal stimulus, while growth expectations for other developed countries have been revised slightly lower. This disparity has led to skepticism regarding the story of accelerating synchronized global growth which economies experienced towards the second half of 2017.

In 2019, growth is expected to moderate in every major developed country as risks develop further, such as tighter monetary conditions. Achieving the right balance of monetary tightening at this stage of the economic cycle becomes increasingly difficult, and the risk of a policy mistake is greater. However, cyclical conditions in most economies (i.e. moderate inflation, wage gains) may allow central banks to be patient, extending the cycle even further. Emerging market economy growth premiums are expected to increase – these markets are earlier in their economic and monetary policy cycles than developed markets.

GDP GROWTH EXPECTATIONS (%)



Source: Bloomberg, as of 7/5/18

YTD NET CHANGES IN GDP EXPECTATIONS



Source: Bloomberg, as of 7/5/18

Political shakeup in Italy

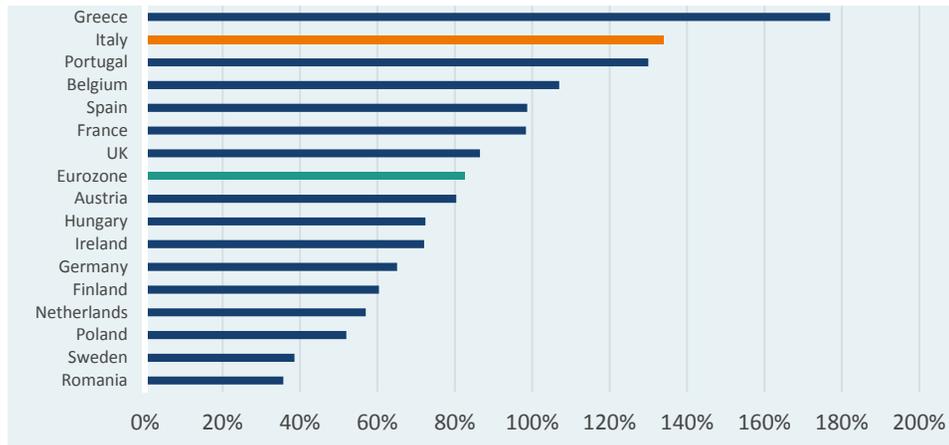
Fears were raised over Italy's possible exit from the Eurozone following a coalition of the anti-establishment Five Star Movement and League Party. Italian bond yields spiked severely during the move, but have since moderated.

The greatest immediate risk seems to be coalition talks of significant spending increases. Per the Maastricht Treaty – the founding document of the European Union (EU) – member nation fiscal budgets are limited to a debt-to-GDP level of 60% and a budget deficit of 3% of GDP. Italy's debt-to-GDP is over 130%, while for now the country is running a more reasonable budget deficit of 1.6%. If Italy forges ahead

with fiscal stimulus, this may result in further conflict with Maastricht Treaty guidelines and may place the new emboldened leaders head-to-head with the EU.

The political events in Italy tie into a broader European trend – the growing power and influence of populism. Populist movements have been fueled by severe economic disparity between some Eurozone economies as well as controversial EU policies relating open borders and immigration. This populist trend will likely pose an ongoing threat to the stability of European economies and the EU as a whole.

DEBT-TO-GDP



Source: ec.europa.eu, as of 2017 Q3

EUROZONE VS. ITALY REAL GDP



Source: Bloomberg, as of 3/31/18

Fixed income rates & credit

Interest rate environment

- The Fed raised interest rates in June for the second time this year to a target range of 1.8-2.0%. The balance sheet unwind continued as planned with approximately \$18 billion in Treasuries and \$12 billion in MBS coming off each month during the quarter.
- According to the Fed dot plot, officials are expecting two additional rate hikes this year, while market pricing suggests only one more hike. Quicker than expected Fed tightening would represent a key risk to the economy and asset prices.
- The 10-year U.S. Treasury yield ticked up modestly during the quarter to 2.9% while the short-end of the curve rose further. The spread between the 2- and 10-year yields fell to a cycle low of 33 bps at quarter end. By another measure of curve shape, the 10-year yield minus 3-month yield, the curve remains at a level of steepness closer to the longer-term average (92 bps vs. 184 bps average).
- Historically, an inverted yield curve has preceded recessions, but the timing between inversion and recession has been anywhere from one to three years.
- In June, Mario Draghi officially announced the end of the Eurozone's bond buying program. The ECB stated that purchases will end in December, and interest rates will remain unchanged through summer of 2019. The markets interpreted this as dovish and yields fell on the news.
- Italian sovereign yields spiked after it appeared the country was headed for new elections later in the year. The 2-year yield jumped 186 bps in one day to 2.8% as risk premiums rose. In the end, a coalition government was formed between the Five Star and League parties and the country avoided going back to the polls.
- Emerging market local and hard yields moved higher, influenced by a general risk-off sentiment towards EM as well as idiosyncratic risks in several vulnerable countries, such as Turkey and Argentina.

Area	Short Term (3M)	10 Year
United States	1.91%	2.86%
Germany	(0.59%)	0.30%
France	(0.63%)	0.67%
Spain	(0.42%)	1.32%
Italy	(0.12%)	2.68%
Greece	1.04%	3.96%
U.K.	0.61%	1.28%
Japan	(0.14%)	0.04%
Australia	1.92%	2.63%
China	3.01%	3.48%
Brazil	6.45%	11.68%
Russia	6.62%	7.81%

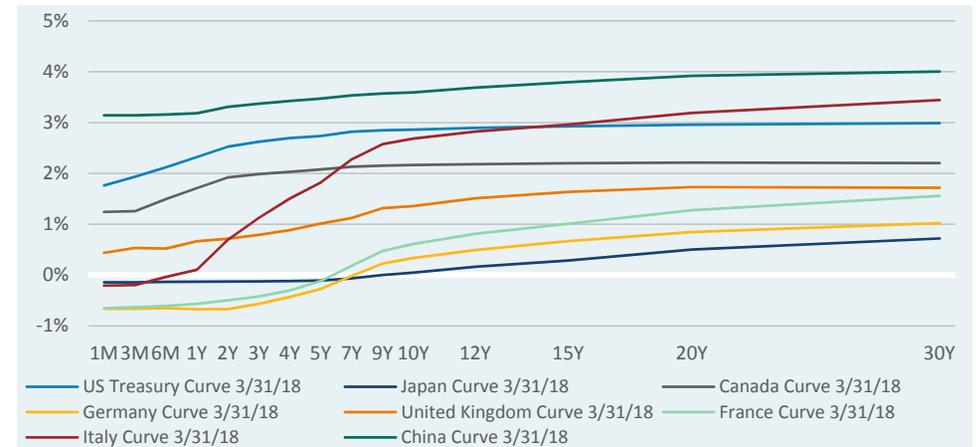
Source: Bloomberg, as of 6/30/18

Yield environment

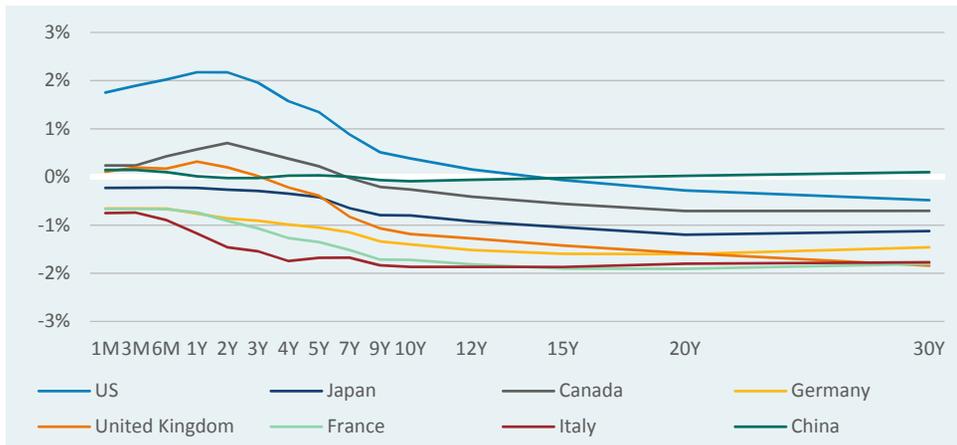
U.S. YIELD CURVE



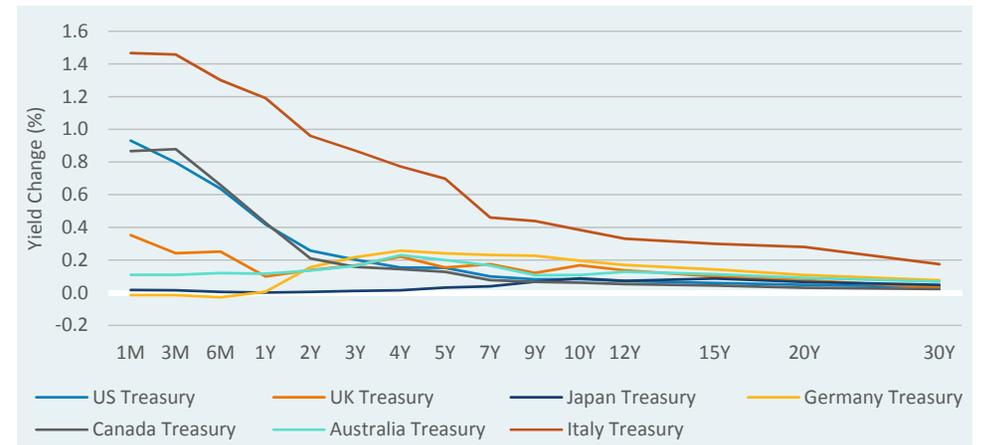
GLOBAL GOVERNMENT YIELD CURVES



YIELD CURVE CHANGES OVER LAST FIVE YEARS

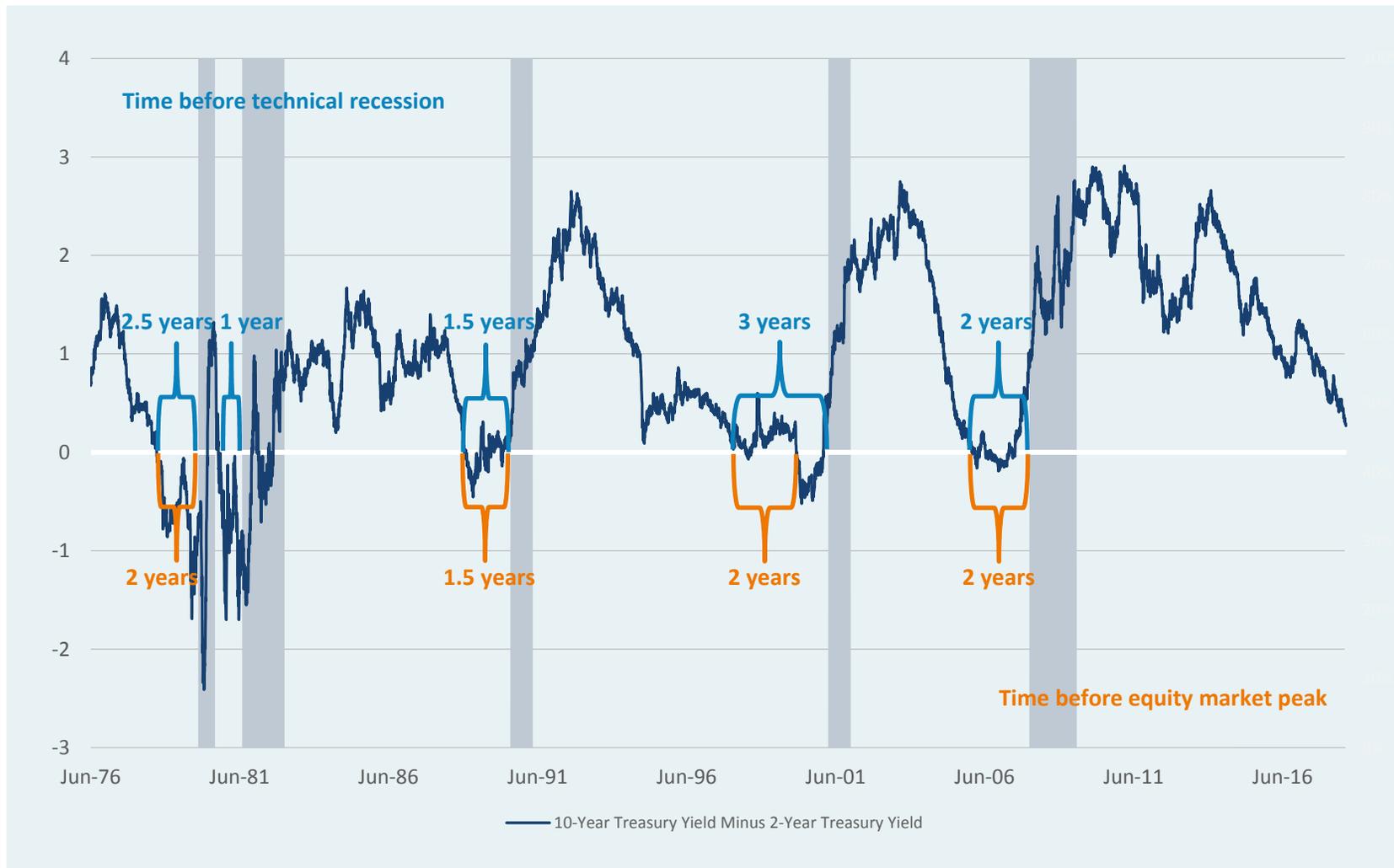


IMPLIED CHANGES OVER NEXT YEAR



Source: Bloomberg, as of 6/30/18

What does an inverted curve indicate?



Yield curve inversions often occur during the late-cycle

Recession and equity market peaks typically do not occur immediately after an inversion

Source: FRED, Verus – time that passed between initial yield curve inversion and the next technical recession, and time that passed between initial yield curve inversion and next equity market peak

Note: There was not a clear equity market peak during the early 1980's expansion. A "time before equity market peak" was therefore not calculated.

ECB bond buying program

MONTHLY ASSET PURCHASES (EUROS BILLIONS)



European Central Bank bond purchases are expected to end in December

These purchases have acted as a major support to bond prices in recent years

Country	Debt Purchased by ECB	% of Total Sovereign Purchases	% of Total Country Debt
Germany	€ 485.6	26.6%	23.2%
France	€ 396.7	21.8%	17.9%
Italy	€ 344.8	18.9%	15.0%
Spain	€ 244.4	13.4%	21.4%
Netherlands	€ 108.5	5.9%	26.1%
Belgium	€ 69.2	3.8%	15.3%
Austria	€ 54.9	3.0%	18.9%
Portugal	€ 33.7	1.8%	13.9%

Credit environment

Credit spreads in both leveraged loans and high yield have widened slightly since the beginning of the year, but are still sitting well below their historical averages. Loans outperformed high yield bonds during eight of the past nine months. LIBOR has steadily risen since 2016, surpassing the LIBOR floors which exist in senior loans, causing them to be fully floating-rate instruments.

U.S. high yield option-adjusted spreads widened slightly in the second quarter to 3.6% – the asset class generated a

1.0% total return. Tight credit spreads in both high yield bonds and loans have been driven by strong corporate fundamentals, manageable debt maturities and general macroeconomic improvement. Credit spreads have historically been a good indicator of future performance relative to Treasuries.

Based on low interest rates and tight spreads, we recommend an underweight to U.S. investment and high yield credit.

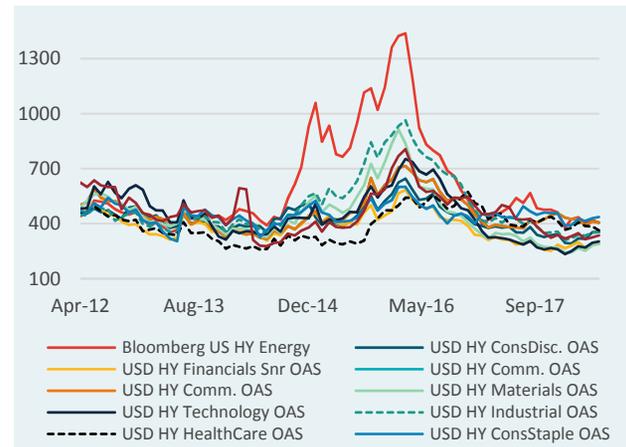
Credit spreads are tight across the capital structure

SPREADS



Source: Barclays, Bloomberg, as of 6/30/18

HIGH YIELD SECTOR SPREADS (BPS)



Source: Bloomberg, as of 6/30/18

Market	Credit Spread (6/30/18)	Credit Spread (1 Year Ago)
Long US Corporate	1.8%	1.6%
US Aggregate	1.2%	1.0%
US High Yield	3.6%	3.6%
US Bank Loans	3.5%	3.7%

Source: Barclays, Credit Suisse, Bloomberg, as of 6/30/18

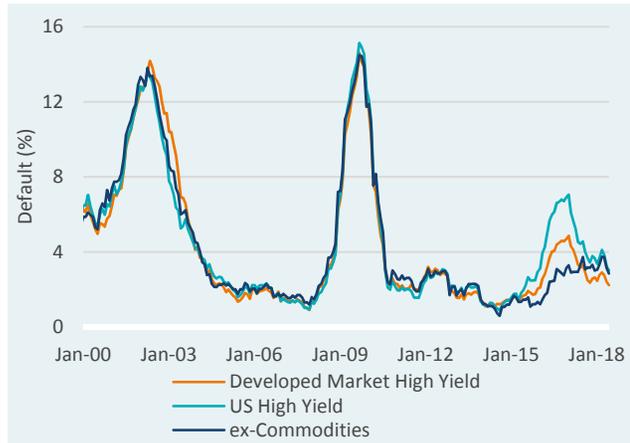
Issuance and default

Default activity has been low and stable in the U.S. and international credit markets. The par-weighted U.S. default rate remains below its long-term average of 3.0-3.5% and is currently at 2.0%. In the second quarter, \$1.5 billion of defaults occurred - the lowest quarterly total since Q4 2013.

Senior loan and high yield markets are recovering from a wave of defaults seen in 2015-2016, generated from energy and metals/mining sectors. Recovery rates for high yield bonds have vastly improved since that time.

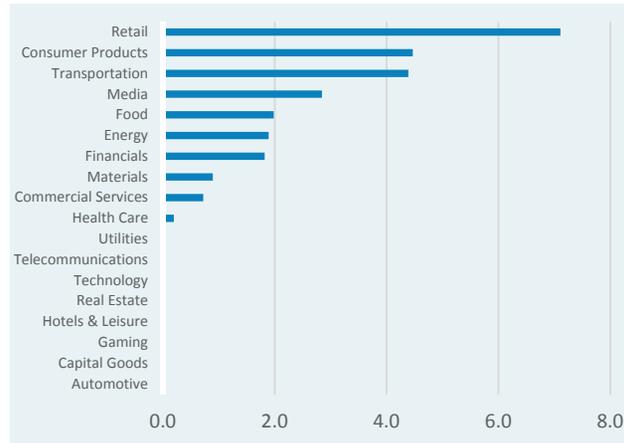
Issuance in high yield bonds totaled \$126 billion compared with \$176 billion across the first half of 2017. Similarly, issuance in leveraged loans totaled \$501 billion, compared with over \$577 billion in the first half of 2017. New issue spreads continue to compress with strong demand supported by significant retail and institutional inflows into both high yield and senior loan asset classes, as well as CLO formation.

HY DEFAULT TRENDS (ROLLING 1 YEAR)



Source: BofA Merrill Lynch, as of 6/30/18

HY SECTOR DEFAULTS (LAST 12 MONTHS)



Source: BofA Merrill Lynch, as of 6/30/18 – par weighted

GLOBAL ISSUANCE (BILLIONS)



Source: Bloomberg, BofA Merrill Lynch, as of 6/30/18

Emerging market debt

Emerging market debt experienced a difficult quarter, particularly in local currency bonds. The JPM EMBI Index (hard) and JPM GBI-EM Index (local) returned -3.5% and -10.4%, respectively. Much of the negative performance in local debt was driven by currency depreciation and rising risk premiums in several vulnerable countries. Excluding Venezuela, there has not yet been any defaults, delayed payments or credit downgrades in this space – Argentina narrowly avoided defaulting after securing a \$50 billion bailout from the IMF.

Currency movement in local debt accounted for approximately 80% of the losses in the second quarter. While many currencies

moved due to broad strengthening of the U.S. dollar, several countries with high external debt loads and current account deficits, including Brazil, Argentina, and Turkey, saw their currencies depreciate sharply.

Outside of a few countries, we believe the economic backdrop remains positive for emerging market debt. Most markets have come a considerable way in trimming external debt over the past few years which has made them less reliant on dollar funding. The recent sell-off has created value opportunities that might be taken advantage of – active management is preferred in this asset class.

We maintain a positive outlook on emerging market debt

EMD HARD YIELDS



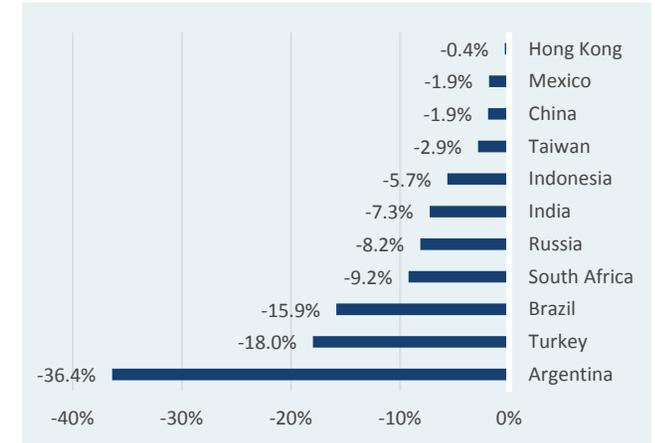
Source: Bloomberg, as of 6/30/18

EMD LOCAL YIELDS



Source: Bloomberg, as of 6/30/18

YTD CURRENCY LOSSES VS USD



Source: Bloomberg, as of 6/30/18

Equity

Equity environment

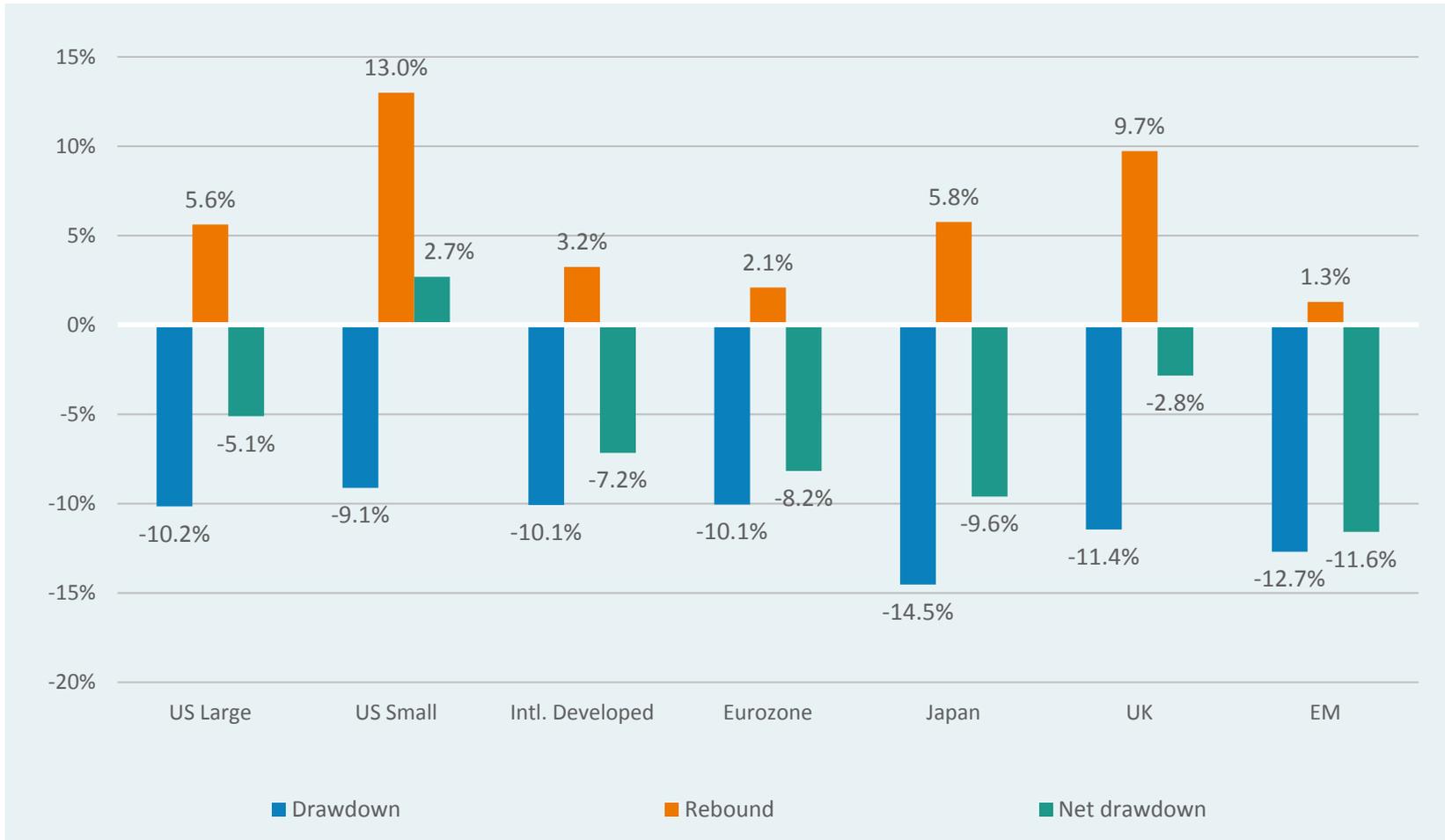
- We maintain an overweight position to equities through a positive tilt to emerging markets. We do not believe recent price swings reflect any major fundamental change to the trajectory of emerging markets. Equity bull runs in these markets have typically incurred a 10% or larger drawdown sometime during the rally.
- Outside of emerging markets, equities have remained fairly range bound following the February selloff. As corporate earnings rise and prices stay flat, equity valuations have been pushed down to more attractive levels closer in line with the historical average.
- Concerns over global trade contributed to a choppy month for equities, although no major breakthroughs or setbacks occurred. Global equities were up +2.9% on a hedged basis but currency depreciation acted as a drag (+0.5% unhedged).
- The value premium has delivered anomalously poor performance – the worst 10-year return on record (since 1926). However, because performance differences were due to earnings growth disparity rather than moves in valuation, the price difference between value and growth stocks has remained fairly normal. A tactical opportunity to overweight value is not yet apparent - we believe investors should stay the course.
- Equity volatility moved to below-average levels once again, following February's spike. The VIX averaged 15.3 during Q2.
- Currency volatility has frequently been greater than equity market volatility in recent years, causing return disparity for investors with unhedged international assets. A hedging program could allow investors to significantly reduce or eliminate this uncompensated risk.

	QTD TOTAL RETURN		YTD TOTAL RETURN		1 YEAR TOTAL RETURN	
	(unhedged)	(hedged)	(unhedged)	(hedged)	(unhedged)	(hedged)
US Large Cap (Russell 1000)	3.6%		2.9%		14.5%	
US Small Cap (Russell 2000)	7.8%		7.7%		17.6%	
US Large Value (Russell 1000 Value)	1.0%		-2.0%		6.0%	
US Large Growth (Russell 1000 Growth)	5.8%		7.3%		22.5%	
International Large (MSCI EAFE)	(1.2%)	3.9%	(2.7%)	0.0%	6.8%	7.9%
Eurozone (Euro Stoxx 50)	(2.3%)	3.6%	(3.7%)	0.5%	3.7%	3.7%
U.K. (FTSE 100)	(3.1%)	9.8%	(0.9%)	2.2%	10.2%	9.9%
Japan (NIKKEI 225)	0.2%	4.4%	0.5%	(1.1%)	15.1%	13.2%
Emerging Markets (MSCI Emerging Markets)	(8.0%)	(3.6%)	(6.7%)	(3.0%)	8.2%	9.5%

Source: Russell Investments, MSCI, STOXX, FTSE, Nikkei, as of 6/30/18

2018 peak to trough

PEAK TO TROUGH



Most equity markets remain range bound since the February selloff

U.S. small caps have fully recovered while E.M. has stayed depressed

2018 peak to trough, local returns, as of 7/2/18 – the trough (market bottom) date for each market is as follows: US Large (2/8), US Small (2/8), Intl. Dev. (3/26), Eurozone (3/23), Japan (3/23), UK (3/26), EM (6/28)

Domestic equity

U.S. equities were range bound over the quarter – the S&P 500 Index posted a positive return of 3.4% and traded within a tight range between 2600 and 2800. The ups and downs of trade negotiations, particularly those between the U.S. and China, impacted equity markets during the quarter. However, considerable uncertainty surrounding the outcome of these negotiations likely helped keep equities from breaking out of their range in either direction.

Strong year-over-year earnings growth is expected to continue for the second quarter. According to FactSet, the bottom-up analyst earnings growth forecast for the S&P 500 is 19.9%. Forward 12-month earnings growth expectations were revised higher throughout the quarter while equity prices leveled out. Given that prices tend to follow earnings, there may be potential upside to prices if the expected high growth is realized. Alternatively, higher discount rates from Fed tightening may offset the impact of strong earnings growth.

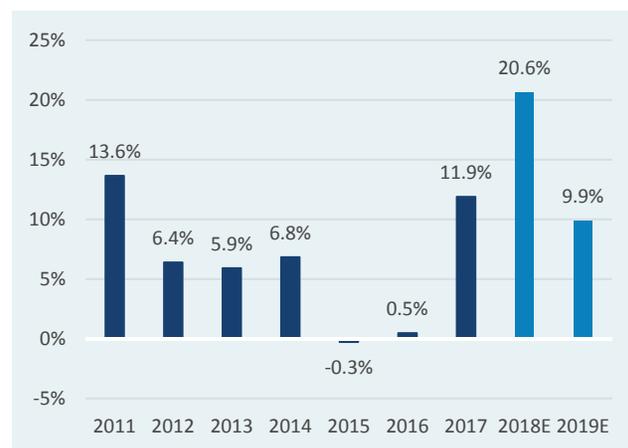
Fundamentals appear unchanged despite falling prices

U.S. EQUITIES



Source: Russell Investments, as of 6/30/18

CALENDAR YEAR EARNINGS GROWTH



Source: FactSet, as of 7/6/18

S&P 500 PRICE & EARNINGS



Source: Bloomberg, as of 6/30/18

Domestic equity size & style

Large cap equities (Russell 1000 3.6%) underperformed small cap (Russell 2000 7.8%) during the quarter. Value stocks continued to lag growth (Russell 1000 Value 1.2% vs. Russell 1000 Growth 5.8%).

Value has delivered anomalously negative returns – the worst 10-year run on record (since 1926). Because performance differences were due to earnings growth disparity rather than moves in valuation, the price difference between value and growth stocks has remained normal. Earnings trends can be somewhat attributed to the global financial crisis where financials lagged considerably, followed by a bull market for

technology stocks (value is concentrated in financials while growth is concentrated in tech). In other words, much of value's underperformance was macroeconomic in nature.

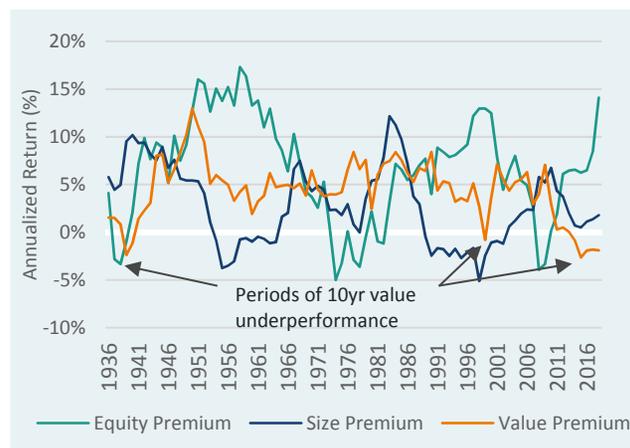
We do not yet see a catalyst for a value comeback, and it is possible that when value bounces back there will not be obvious signals beforehand. Poor recent performance is not always a solid standalone indicator of future reversal. Relative valuations are fairly in line with history, and the economic environment is positive (growth often performs well during later stages of economic cycles). We recommend that value investors stay the course.

SMALL CAP VS LARGE CAP (YOY)



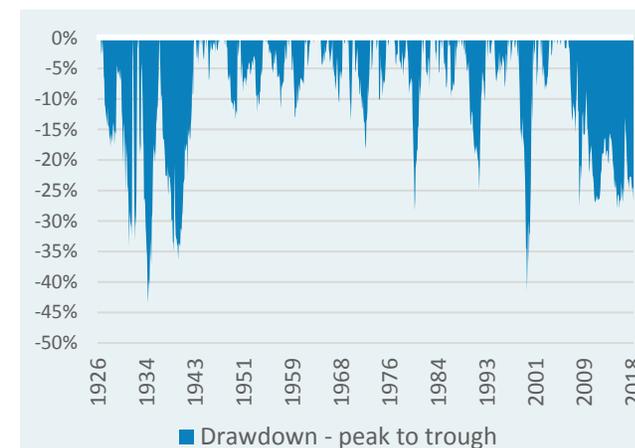
Source: FTSE, as of 6/30/18

FACTOR PERFORMANCE (10YR ROLLING)



Source: Kenneth French Library, as of 5/30/18

VALUE - PEAK TO TROUGH



Source: Kenneth French Library, as of 5/30/18

International developed equity

Unhedged international equities underperformed U.S. equities during Q1 (MSCI EAFE -1.2% vs. S&P 500 +3.4%). On a hedged basis, international equities delivered returns of 3.9%, outpacing the U.S. market. Currency volatility has frequently been greater than equity market volatility in recent years, causing considerable return disparity for investors with unhedged investments in international assets. Equity returns in most markets have been positive year-to-date on an ex-currency basis.

Earnings growth remains strong and will likely be supportive of equity prices going forward. The U.S. has taken back the lead in year-over-year earnings growth, alongside a large boost from U.S. tax reform and a relatively strong economy.

P/E multiples have moved lower as equity prices remain range bound and earnings grow at a brisk pace. Equity valuations are now closer to the longer-term average – a notable change from recent years.

EFFECT OF CURRENCY (1-YEAR ROLLING)



Source: MSCI, as of 6/30/18

EARNINGS GROWTH (YOY)



Source: MSCI, as of 6/30/18 – YoY growth in forward earnings

FORWARD P/E



Source: MSCI, as of 6/30/18

Emerging market equity

Emerging market equities delivered losses of -8.0% in Q2, but remain up +8.2% on a year-over-year basis. Currency movement caused -4.4% of losses during the quarter.

We maintain an overweight position to equities through a positive tilt to emerging markets. Equity bull runs in these markets through history typically incur at least a 10% drawdown sometime during the rally (see next page). Recent price swings were driven by valuation changes rather than by a fundamental change in earnings.

Developed markets are expected to grow less quickly in the coming years while emerging economic growth is expected to rise. A positive growth premium of emerging economies relative to developed economies has historically acted as a tailwind for EM outperformance.

We believe positive emerging economy growth trends, attractive valuations, a strong earnings environment, and depressed currencies should provide an environment of strong equity performance across these markets.

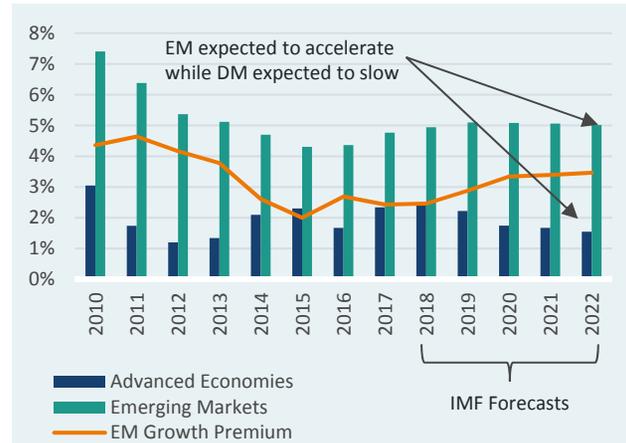
Conditions remain positive for EM equity

EQUITY PERFORMANCE (3YR ROLLING)



Source: Standard & Poor's, MSCI, as of 6/30/18

EM GROWTH PREMIUM



Source: IMF

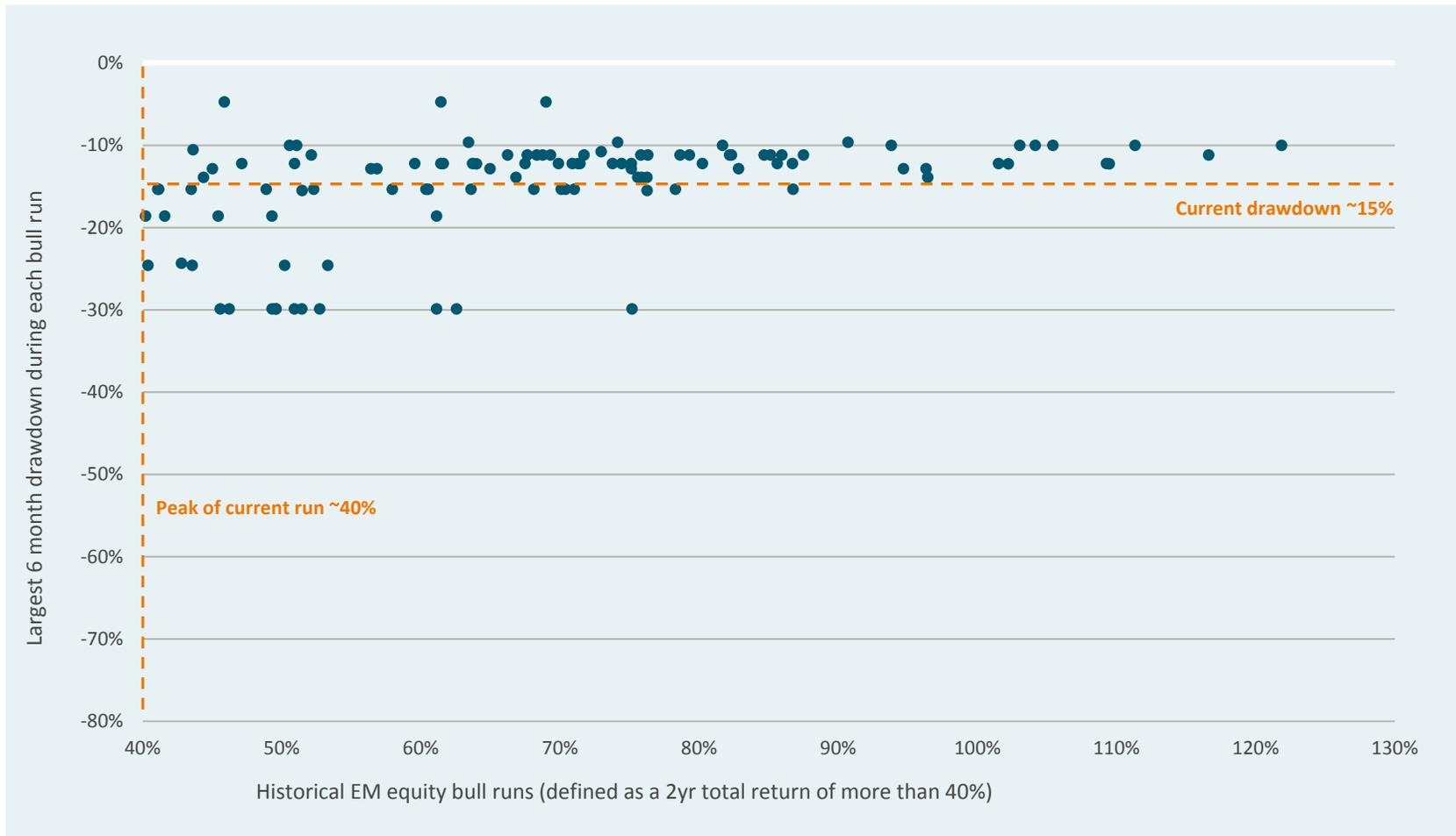
EARNINGS GROWTH (YOY)



Source: MSCI, as of 6/30/18

Emerging market volatility

Drawdowns of 10% or more are typical during EM bull runs



The average drawdown experienced during all 2 year periods of 40%+ returns was -14.8%

Equity valuations

Equity valuations have moved lower year-to-date as prices fell and earnings increased at a strong pace. U.S. equity valuations have fallen the most as domestic earnings growth recently took the lead year-over-year against other markets.

The trailing P/E ratio of the S&P 500 is notably high, but as we have seen throughout the expansion more expensive markets may deliver consistent outperformance if fundamentally driven by robust earnings. On a forward P/E basis, the U.S. is now only slightly rich relative to valuations of the past 15 years (16.5 today vs. an average of 15.1). Price is an important component of equity investing, but higher prices may be indicative of

greater future earnings, which suggests investors cannot rely on price alone when forming expectations.

When examining equity markets through our *carry, value, trend,* and *macro* lens, *carry* has improved through lower prices (higher dividend and earnings yields), *value* has improved through lower equity multiples (range bound prices with rising earnings has pushed multiples downward), *trend* has flattened on a short-term basis but remains positive on a 12-month basis, and the *macro* environment has moderated a bit (notable weakness in Europe but strength in the U.S.)

FORWARD P/E RATIOS



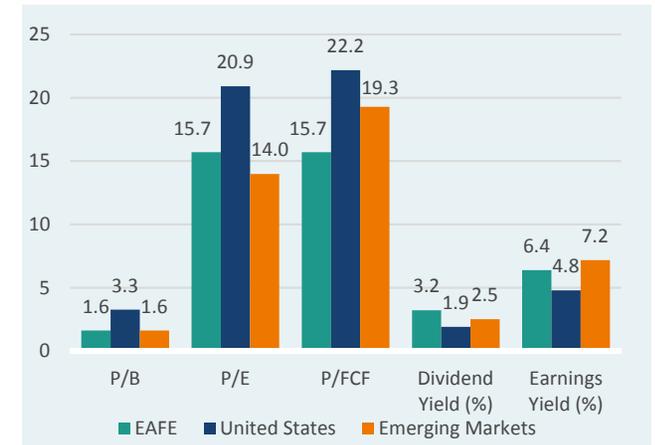
Source: MSCI, as of 6/30/18

MOMENTUM (1YR)



Source: Standard & Poor's, MSCI, as of 6/30/18

VALUATION METRICS (3-MONTH AVERAGE)



Source: Bloomberg, as of 6/30/18 - trailing P/E

Equity volatility

U.S. equity volatility retreated in the second quarter after a period of elevated risk following the February volatility spike. The VIX Index of implied volatility declined steadily throughout the quarter and averaged 15.3, compared to an average of 17.4 in the first quarter.

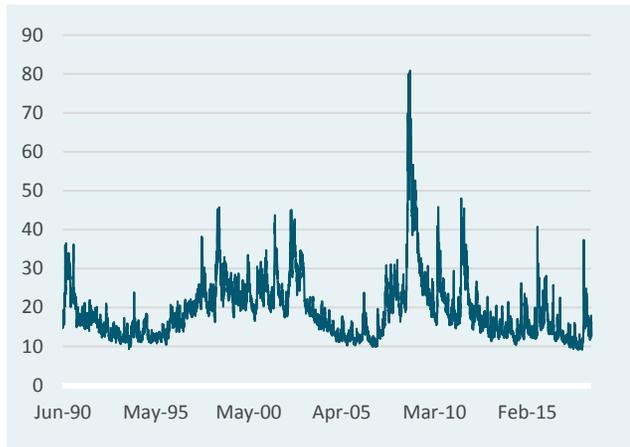
Realized volatility was below average in domestic and international equity markets in the second quarter, despite the concerns over a global trade war. Emerging markets experienced the greatest volatility, although the annualized standard deviation of daily returns in Q2 were

only 13.4% (MSCI Emerging Markets). International developed markets (MSCI EAFE) had a standard deviation of only 9.0%.

The implied volatility curve (i.e. skew), which looks at the differences in implied volatility at various option strike prices, has recently steepened. A steeper volatility curve means that investors are paying a higher premium for equity downside protection.

Equity volatility subsided back to below average levels

U.S. IMPLIED VOLATILITY (VIX)



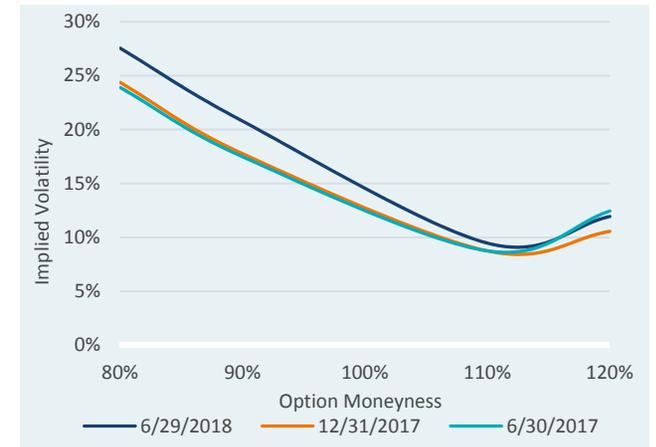
Source: CBOE, as of 6/30/18

REALIZED 1-YEAR ROLLING VOLATILITY



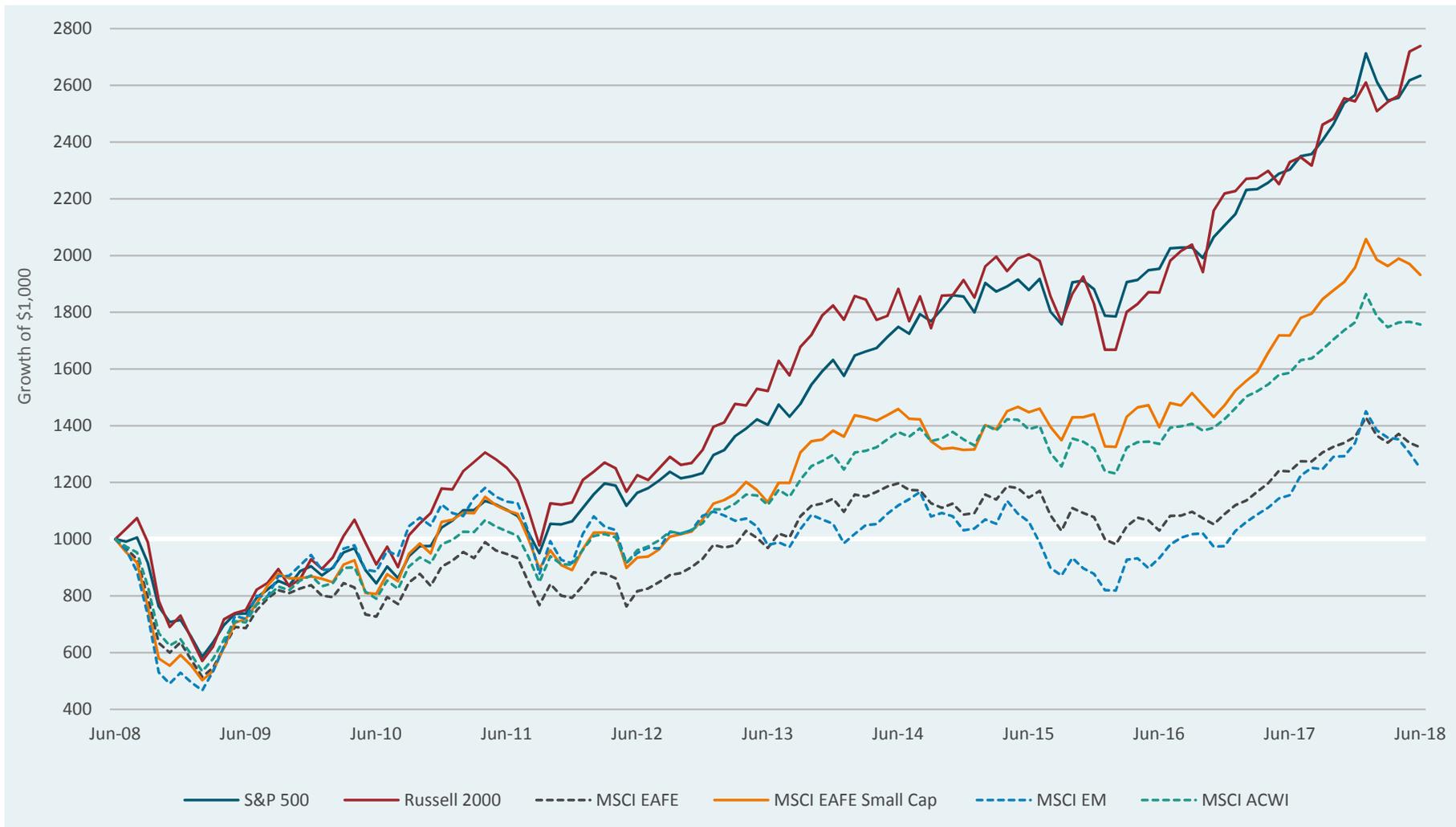
Source: Bloomberg, as of 6/30/18

U.S. IMPLIED VOLATILITY CURVE



Source: Bloomberg, as of 6/30/18

Long-term equity performance



Source: Morningstar, as of 6/30/18

Other assets

Currency

The U.S. dollar appreciated 5% during the quarter, which erased the positive equity returns of many international markets. Relative strength of the U.S. economy, paired with Federal Reserve tightening, likely helped lead the U.S. dollar higher.

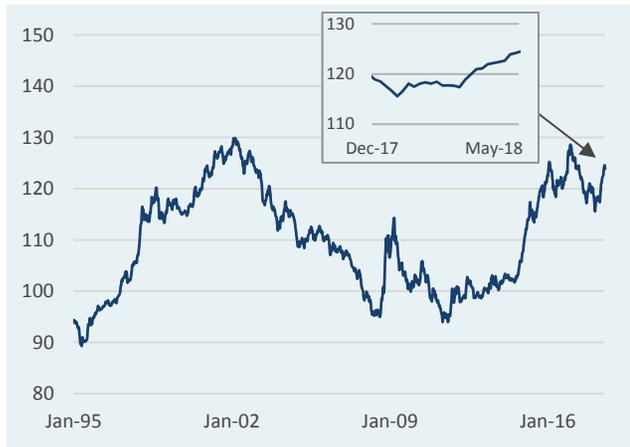
Interest rate differentials between the U.S. and the rest of the developed world have been steadily widening over the past 10 months. The spread between the U.S. 10-year Treasury yield and the yield on a basket of developed sovereign debt rose approximately 80 bps to 2.3% during this

time. Higher relative interest rates has historically been a short-term driver of currencies.

Emerging market currencies fell 9.1% in Q2, based on the JPM EM Currency Index. The performance of most currencies were in line with expectations based on U.S. dollar appreciation against developed market currencies. Several countries with large current account deficits that are heavily reliant on dollar funding, such as Argentina and Turkey, saw their currencies fall sharply. As a whole, emerging market currencies are significantly undervalued based on purchasing power parity.

The U.S. dollar materially appreciated, reversing a multi-year downtrend

U.S. DOLLAR TRADE WEIGHTED INDEX



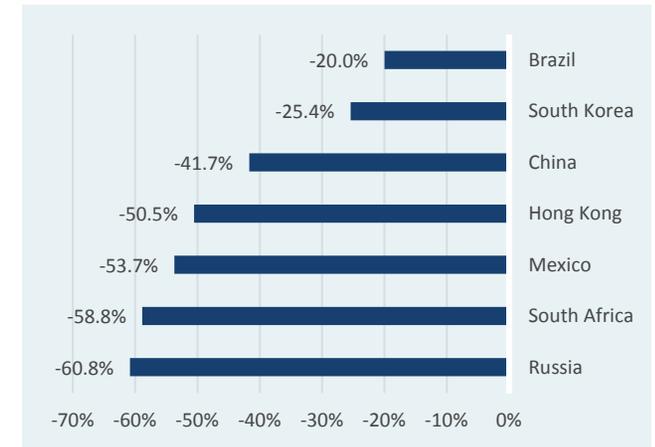
Source: Federal Reserve, as of 6/30/18

U.S. VS. DEVELOPED INTEREST RATE SPREAD



Source: Verus, Bloomberg, as of 6/30/18

PURCHASING POWER PARITY VALUATIONS VS. U.S. DOLLAR (BIG MAC INDEX)



Source: Bloomberg, as of 6/30/18

Alternative beta

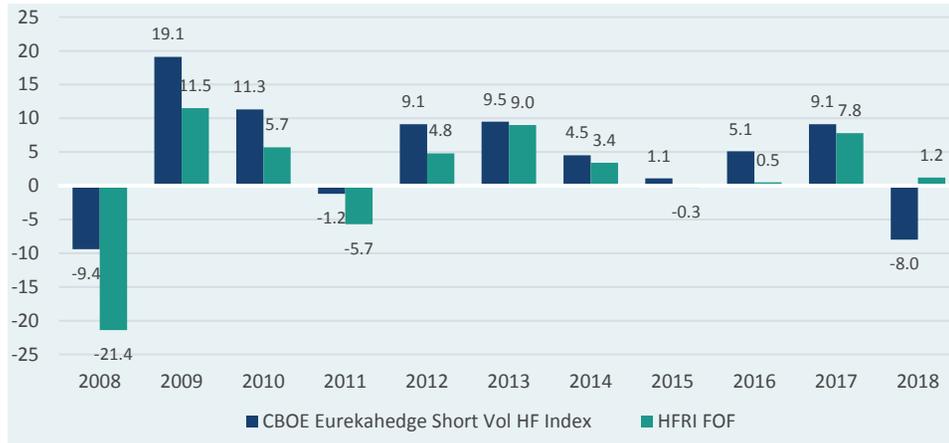
Alternative beta strategies have posted losses in Q2 and year-to-date. Equity value exposures accounted for the largest component of strategy losses in Q2 and year-to-date. Short volatility, a strong performing strategy over the past 10 years, also suffered a severe drawdown in Q1 and affected returns.

Correlation characteristics often benefit strategies with diversified factor exposure (some factors provide losses while others provide gains), but several factors including momentum and carry have not counterbalanced losses in value as they have often done historically.

We do not believe that alternative beta strategies are “broken” per se, but instead have reflected coinciding factor drawdowns as well as muted equity market returns more broadly.

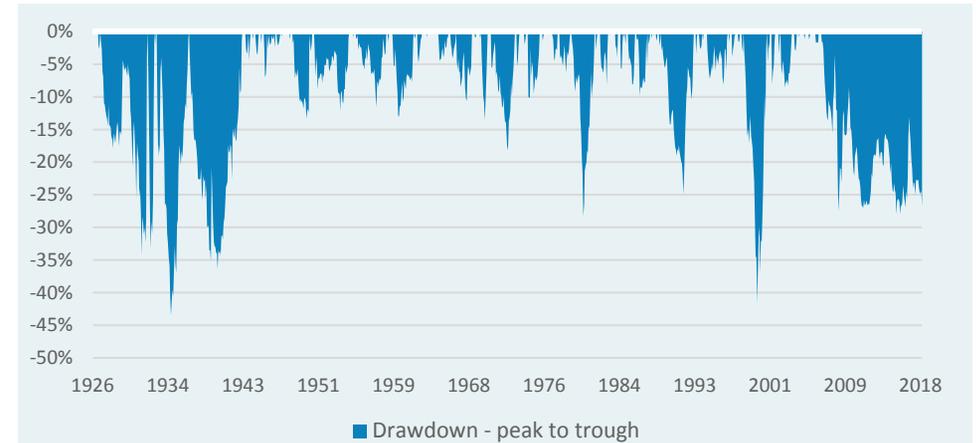
Attribution analyses on the Alt Beta strategies we follow confirm that recent performance is in line with 8-12% target volatility levels of each strategy. We are closely monitoring these funds through an environment of heightened volatility and are continuing discussions with managers. These losses are significant but are within the range we would expect, given the underlying factor exposure.

SHORT VOLATILITY PERFORMANCE



Source: CBOE, HFRI, as of 6/30/18

VALUE – PEAK TO TROUGH



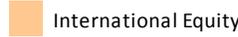
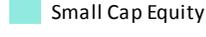
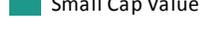
Source: Kenneth French Library, Verus, as of May 2018 – shows value factor peak to trough drawdowns through time

Appendix

Periodic table of returns

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	YTD	5-Year	10-Year
Small Cap Growth	38.7	66.4	31.8	14.0	25.9	56.3	26.0	34.5	32.6	39.8	5.2	79.0	29.1	14.3	18.6	43.3	13.5	13.3	31.7	37.3	9.7	16.4	11.8
Small Cap Equity	27.0	43.1	22.8	8.4	10.3	48.5	22.2	21.4	26.9	16.2	1.4	37.2	26.9	7.8	18.1	38.8	13.2	5.7	21.3	30.2	7.7	13.6	11.2
Large Cap Growth	20.3	33.2	12.2	7.3	6.7	47.3	20.7	20.1	23.5	15.8	-6.5	34.5	24.5	2.6	17.9	34.5	13.0	0.9	17.3	25.0	7.3	13.4	10.6
Small Cap Value	19.3	27.3	11.6	3.3	1.6	46.0	18.3	14.0	22.2	11.8	-21.4	32.5	19.2	1.5	17.5	33.5	11.8	0.6	12.1	22.2	5.4	12.5	10.2
Large Cap Equity	16.2	26.5	7.0	2.8	1.0	39.2	16.5	7.5	18.4	11.6	-25.9	28.4	16.8	0.4	16.4	33.1	6.0	0.0	11.8	21.7	2.9	11.2	9.9
Real Estate	15.6	24.3	6.0	2.5	-5.9	30.0	14.5	7.1	16.6	10.9	-28.9	27.2	16.7	0.1	16.3	32.5	5.6	-0.4	11.3	17.1	1.7	10.3	8.5
Hedge Funds of Funds	8.7	21.3	4.1	-2.4	-6.0	29.9	14.3	6.3	15.5	10.3	-33.8	23.3	16.1	-2.1	15.3	23.3	4.9	-0.8	11.2	14.6	1.2	10.0	6.1
Cash	4.9	20.9	-3.0	-5.6	-11.4	29.7	12.9	5.3	15.1	7.0	-35.6	20.6	15.5	-2.9	14.6	12.1	4.2	-1.4	8.0	13.7	0.8	6.4	4.8
Commodities	1.2	13.2	-7.3	-9.1	-15.5	25.2	11.4	4.7	13.3	7.0	-36.8	19.7	13.1	-4.2	11.5	11.0	3.4	-2.5	7.1	7.8	0.0	6.3	3.7
60/40 Global Portfolio	-2.5	11.4	-7.8	-9.2	-15.7	23.9	9.1	4.6	10.4	5.8	-37.6	18.9	10.2	-5.5	10.5	9.0	2.8	-3.8	5.7	7.7	-0.8	5.0	2.8
US Bonds	-5.1	7.3	-14.0	-12.4	-20.5	11.6	6.9	4.6	9.1	4.4	-38.4	11.5	8.2	-5.7	4.8	0.1	0.0	-4.4	2.6	5.1	-1.6	3.6	2.3
Large Cap Value	-6.5	4.8	-22.4	-19.5	-21.7	9.0	6.3	4.2	4.8	-0.2	-38.5	5.9	6.5	-11.7	4.2	-2.0	-1.8	-7.5	1.0	3.5	-1.7	2.3	1.5
International Equity	-25.3	-0.8	-22.4	-20.4	-27.9	4.1	4.3	3.2	4.3	-1.6	-43.1	0.2	5.7	-13.3	0.1	-2.3	-4.5	-14.9	0.5	1.7	-2.7	0.4	0.4
Emerging Markets Equity	-27.0	-1.5	-30.6	-21.2	-30.3	1.0	1.4	2.4	2.1	-9.8	-53.2	-16.9	0.1	-18.2	-1.1	-9.5	-17.0	-24.7	0.3	0.9	-6.7	-6.4	-9.0

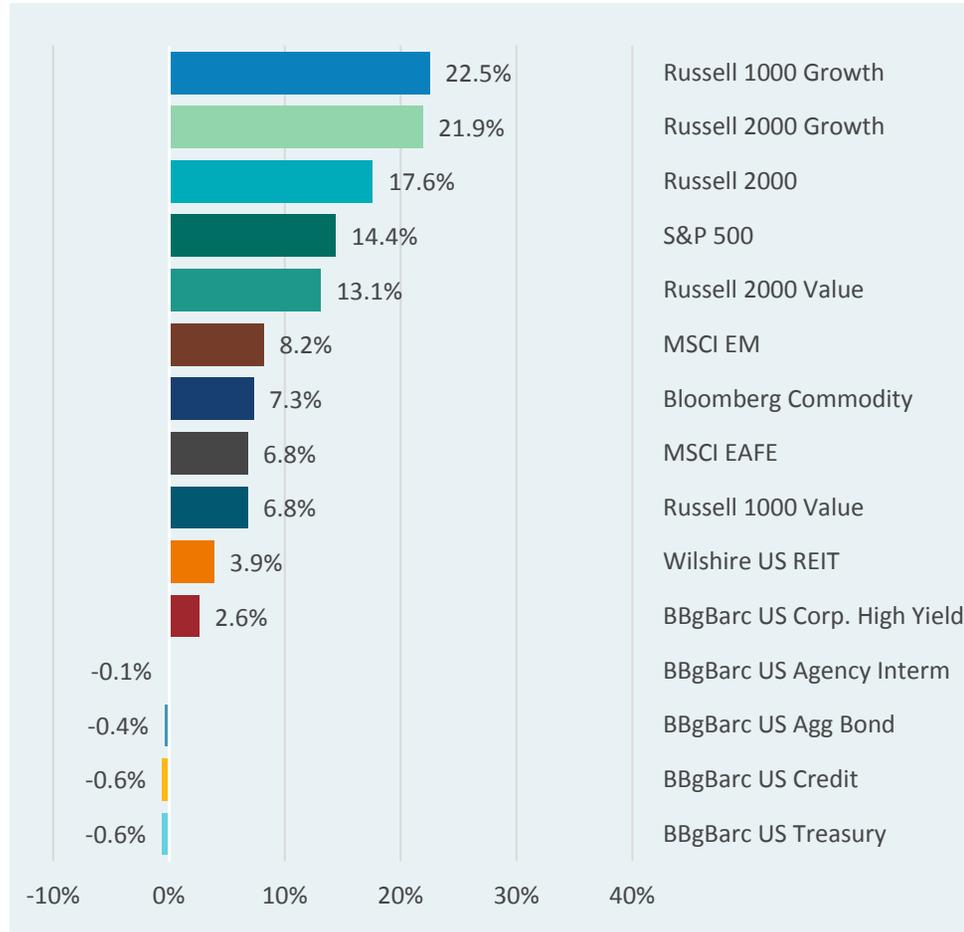
↑ BEST
↓ WORST

 Large Cap Equity	 Small Cap Growth	 Commodities
 Large Cap Value	 International Equity	 Real Estate
 Large Cap Growth	 Emerging Markets Equity	 Hedge Funds of Funds
 Small Cap Equity	 US Bonds	 60% MSCI ACWI/40% BBgBarc Global Bond
 Small Cap Value	 Cash	

Source Data: Morningstar, Inc., Hedge Fund Research, Inc. (HFR), National Council of Real Estate Investment Fiduciaries (NCREIF). Indices used: Russell 1000, Russell 1000 Value, Russell 1000 Growth, Russell 2000, Russell 2000 Value, Russell 2000 Growth, MSCI EAFE, MSCI EM, BBgBarc US Aggregate, T-Bill 90 Day, Bloomberg Commodity, NCREIF Property, HFRI FOF, MSCI ACWI, BBgBarc Global Bond. NCREIF Property Index performance data as of 3/31/18.

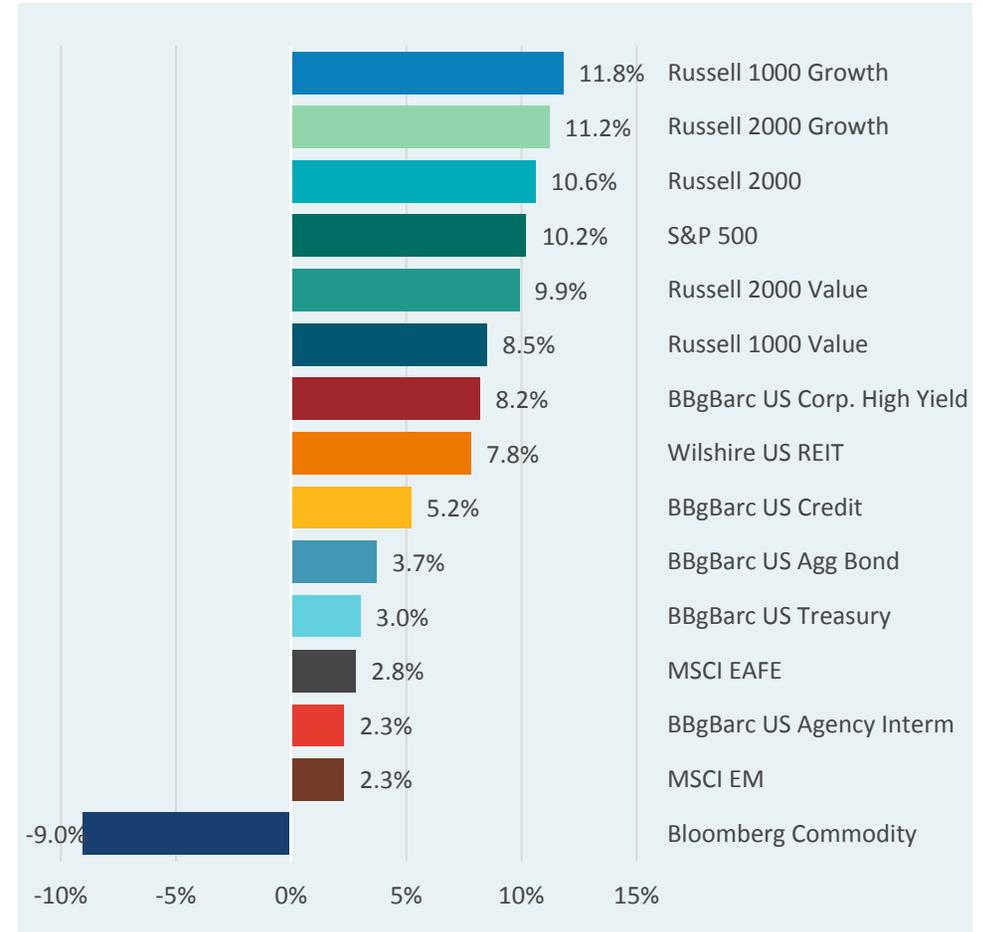
Major asset class returns

ONE YEAR ENDING JUNE



Source: Morningstar, as of 6/30/18

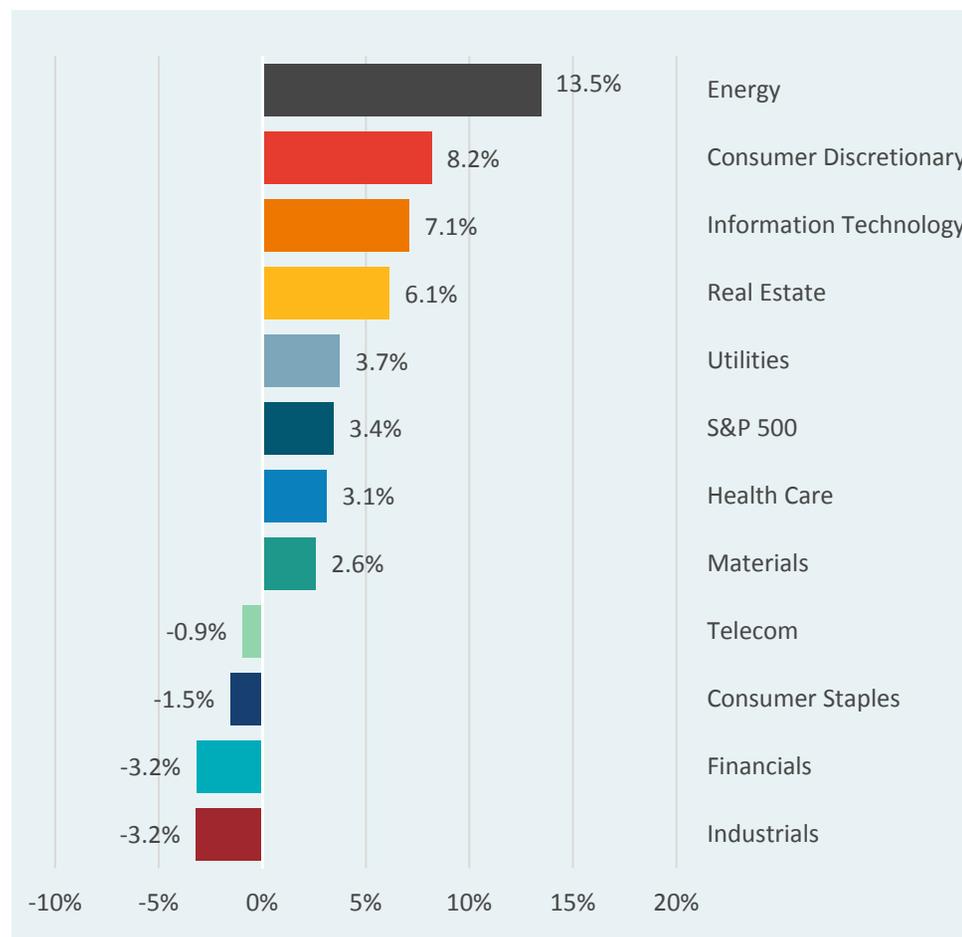
TEN YEARS ENDING JUNE



Source: Morningstar, as of 6/30/18

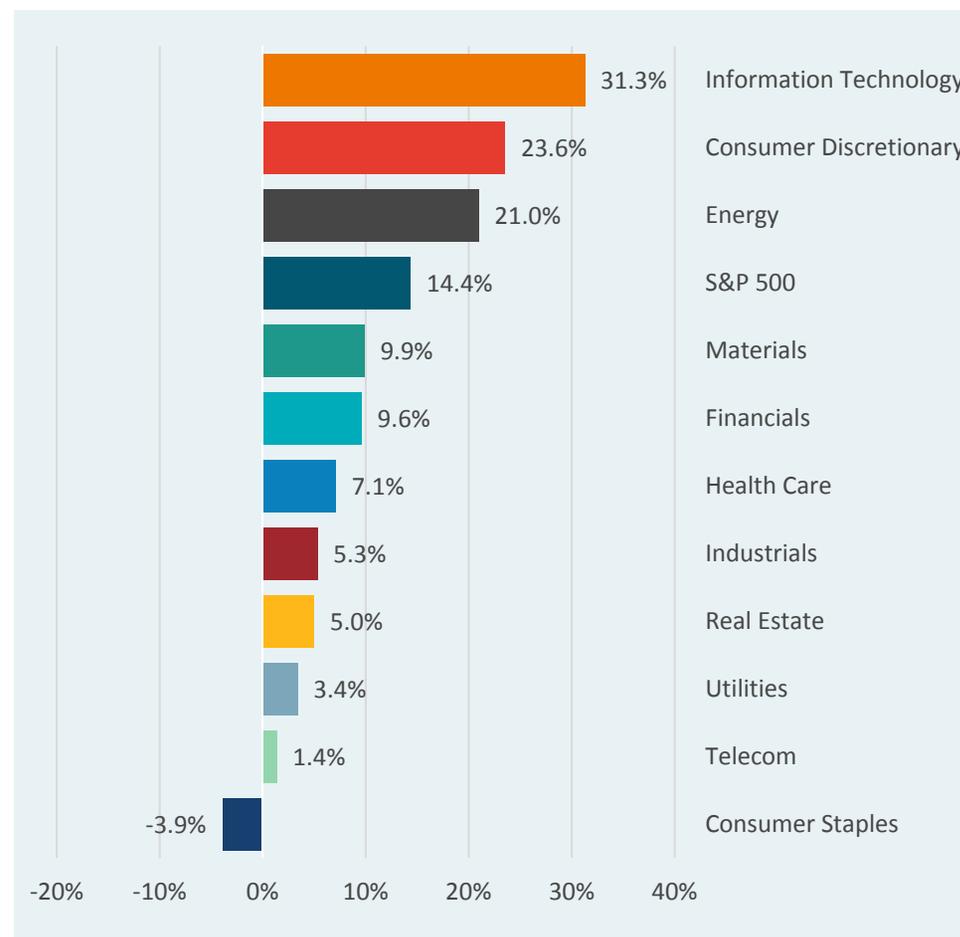
S&P 500 sector returns

2ND QUARTER



Source: Morningstar, as of 6/30/18

ONE YEAR ENDING JUNE



Source: Morningstar, as of 6/30/18

Detailed index returns

DOMESTIC EQUITY

	June	Q2	YTD	1 Year	3 Year	5 Year	10 Year
Core Index							
S&P 500	0.6	3.4	2.6	14.4	11.9	13.4	10.2
S&P 500 Equal Weighted	0.9	2.8	1.8	12.0	10.5	12.8	11.6
DJ Industrial Average	(0.5)	1.3	(0.7)	16.3	14.1	13.0	10.8
Russell Top 200	0.6	3.9	3.1	15.4	12.5	13.8	10.2
Russell 1000	0.6	3.6	2.9	14.5	11.6	13.4	10.2
Russell 2000	0.7	7.8	7.7	17.6	11.0	12.5	10.6
Russell 3000	0.7	3.9	3.2	14.8	11.6	13.3	10.2
Russell Mid Cap	0.7	2.8	2.3	12.3	9.6	12.2	10.2
Style Index							
Russell 1000 Growth	1.0	5.8	7.3	22.5	15.0	16.4	11.8
Russell 1000 Value	0.2	1.2	(1.7)	6.8	8.3	10.3	8.5
Russell 2000 Growth	0.8	7.2	9.7	21.9	10.6	13.6	11.2
Russell 2000 Value	0.6	8.3	5.4	13.1	11.2	11.2	9.9

INTERNATIONAL EQUITY

Broad Index							
MSCI ACWI	(0.5)	0.5	(0.4)	10.7	8.2	9.4	5.8
MSCI ACWI ex US	(1.9)	(2.6)	(3.8)	7.3	5.1	6.0	2.5
MSCI EAFE	(1.2)	(1.2)	(2.7)	6.8	4.9	6.4	2.8
MSCI EM	(4.2)	(8.0)	(6.7)	8.2	5.6	5.0	2.3
MSCI EAFE Small Cap	(1.9)	(1.6)	(1.3)	12.4	10.1	11.3	6.8
Style Index							
MSCI EAFE Growth	(1.2)	0.1	(0.9)	9.4	6.4	7.4	3.5
MSCI EAFE Value	(1.3)	(2.6)	(4.6)	4.3	3.3	5.4	2.2
Regional Index							
MSCI UK	(1.0)	2.9	(1.0)	10.0	3.1	4.9	2.7
MSCI Japan	(2.5)	(2.8)	(2.0)	10.5	6.2	7.4	3.5
MSCI Euro	(0.7)	(2.8)	(3.2)	5.0	5.3	7.1	1.1
MSCI EM Asia	(4.7)	(5.8)	(5.1)	10.1	7.3	8.3	5.6
MSCI EM Latin American	(3.1)	(17.8)	(11.2)	(0.2)	2.0	(2.4)	(3.7)

FIXED INCOME

	June	Q2	YTD	1 Year	3 Year	5 Year	10 Year
Broad Index							
BBgBarc US TIPS	0.4	0.8	(0.0)	2.1	1.9	1.7	3.0
BBgBarc US Treasury Bills	0.2	0.5	0.8	1.3	0.7	0.4	0.4
BBgBarc US Agg Bond	(0.1)	(0.2)	(1.6)	(0.4)	1.7	2.3	3.7
Duration							
BBgBarc US Treasury 1-3 Yr	0.0	0.2	0.1	0.0	0.4	0.6	1.3
BBgBarc US Treasury Long	0.2	0.3	(3.0)	(0.1)	3.4	4.5	6.1
BBgBarc US Treasury	0.0	0.1	(1.1)	(0.6)	1.0	1.5	3.0
Issuer							
BBgBarc US MBS	0.0	0.2	(1.0)	0.1	1.5	2.3	3.5
BBgBarc US Corp. High Yield	0.4	1.0	0.2	2.6	5.5	5.5	8.2
BBgBarc US Agency Interm	0.0	0.2	(0.2)	(0.1)	0.8	1.1	2.3
BBgBarc US Credit	(0.5)	(0.9)	(3.0)	(0.6)	2.9	3.4	5.2

OTHER

Index							
Bloomberg Commodity	(3.5)	0.4	(0.0)	7.3	(4.5)	(6.4)	(9.0)
Wilshire US REIT	4.5	9.7	1.5	3.9	7.8	8.4	7.8
CS Leveraged Loans	0.2	1.0	2.3	4.5	4.2	4.1	5.0
Alerian MLP	(1.5)	11.8	(0.6)	(4.6)	(5.9)	(4.1)	6.5
Regional Index							
JPM EMBI Global Div	(1.2)	(3.5)	(5.2)	(1.6)	4.6	5.1	6.7
JPM GBI-EM Global Div	(2.9)	(10.4)	(6.4)	(2.3)	2.0	(1.4)	2.6
Hedge Funds							
HFRI Composite	(0.1)	0.8	1.2	5.2	2.6	4.2	3.5
HFRI FOF Composite	(0.2)	0.9	1.2	5.6	2.1	3.6	1.5
Currency (Spot)							
Euro	0.0	(5.1)	(2.8)	2.4	1.6	(2.1)	(3.0)
Pound	(0.8)	(5.9)	(2.4)	1.6	(5.7)	(2.7)	(4.0)
Yen	(1.9)	(4.0)	1.7	1.4	(3.4)	(2.2)	(0.3)

Source: Morningstar, as of 6/30/18

Definitions

Bloomberg US Weekly Consumer Comfort Index - tracks the public's economic attitudes each week, providing a high-frequency read on consumer sentiment. The index, based on cell and landline telephone interviews with a random, representative national sample of U.S. adults, tracks Americans' ratings of the national economy, their personal finances and the buying climate on a weekly basis, with views of the economy's direction measured separately each month. (www.lanqerresearch.com)

University of Michigan Consumer Sentiment Index - A survey of consumer attitudes concerning both the present situation as well as expectations regarding economic conditions conducted by the University of Michigan. For the preliminary release approximately three hundred consumers are surveyed while five hundred are interviewed for the final figure. The level of consumer sentiment is related to the strength of consumer spending. (www.Bloomberg.com)

NFIB Small Business Outlook - Small Business Economic Trends (SBET) is a monthly assessment of the U.S. small-business economy and its near-term prospects. Its data are collected through mail surveys to random samples of the National Federal of Independent Business (NFIB) membership. The survey contains three broad question types: recent performance, near-term forecasts, and demographics. The topics addressed include: outlook, sales, earnings, employment, employee compensation, investment, inventories, credit conditions, and single most important problem. (<http://www.nfib-sbet.org/about/>)

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Contra Costa County Employees' Retirement Association

Investment Performance Review

Period Ending: June 30, 2018



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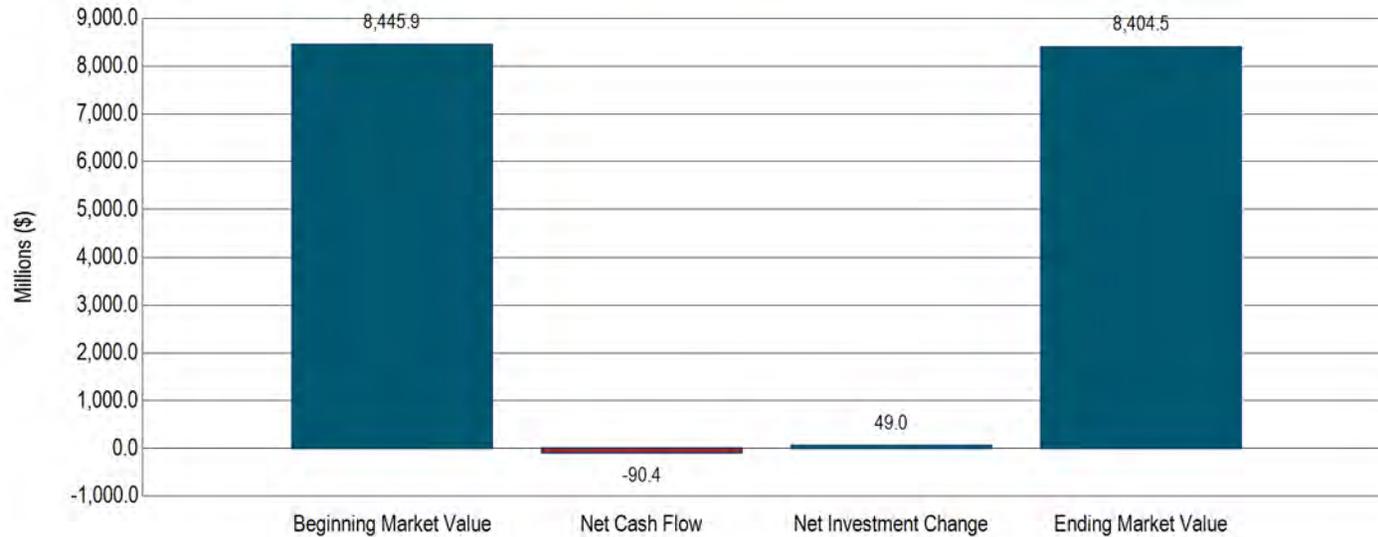
LOS ANGELES 310-297-1777

SAN FRANCISCO 415-362-3484

Portfolio Reconciliation

	Last Three Months	Year-To-Date
Beginning Market Value	\$8,445,903,088	\$8,532,697,023
Net Cash Flow	-\$90,372,175	-\$181,749,349
Net Investment Change	\$48,995,438	\$53,578,678
Ending Market Value	\$8,404,526,351	\$8,404,526,351

**Change in Market Value
Last Three Months**

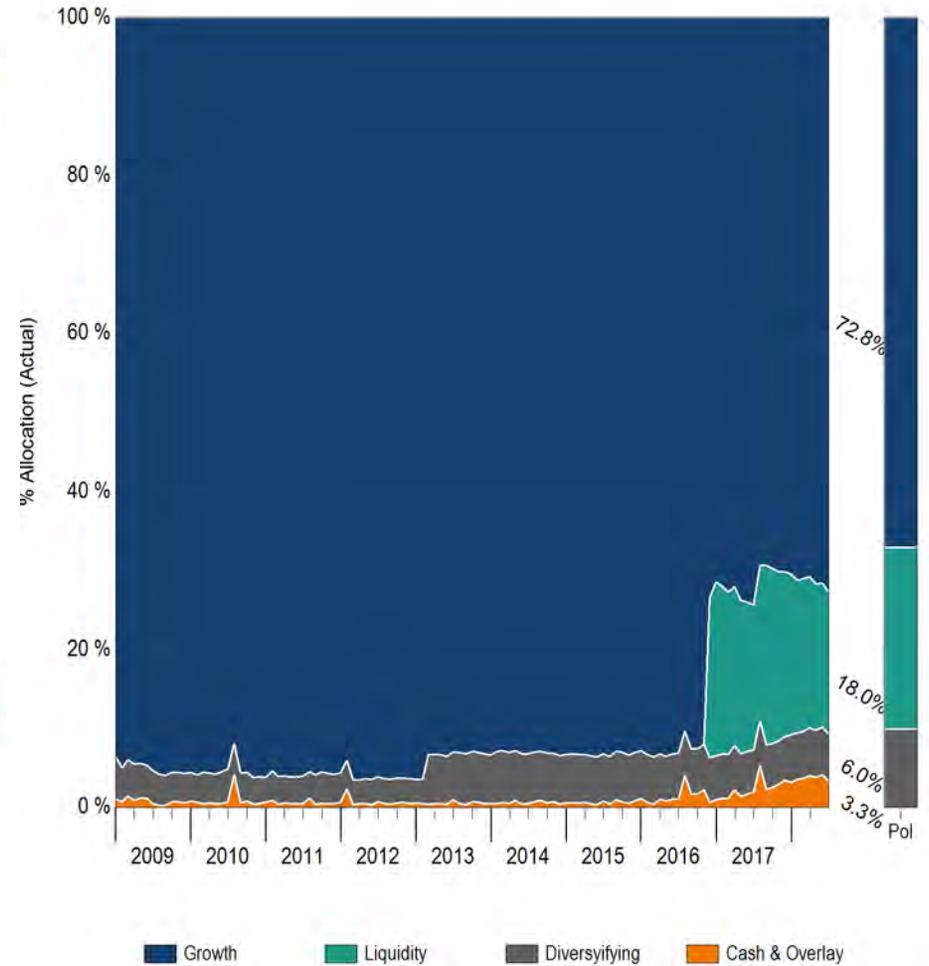


Contributions and withdrawals may include intra-account transfers between managers/funds.

Market Value History
Cumulative Cash Flows



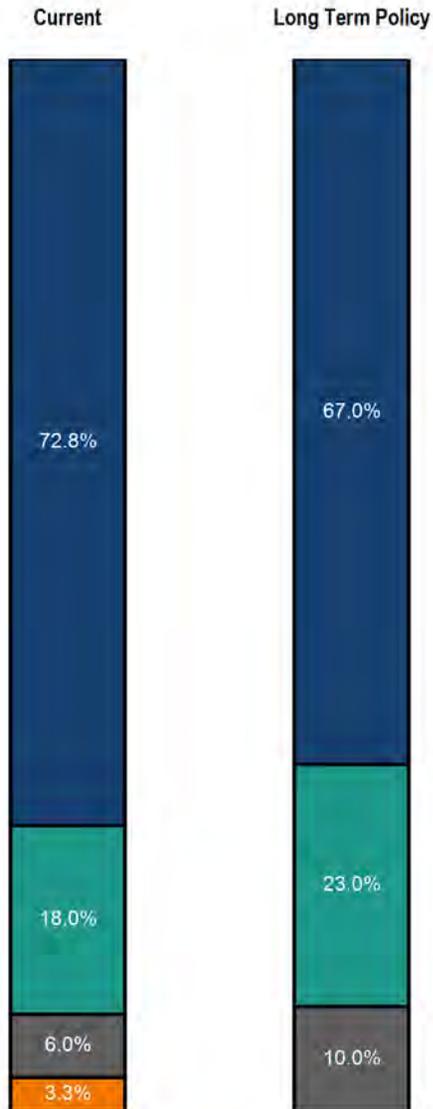
Asset Allocation History



Policy reflects FFP 4-Yr allocations approved in March 2018.

Total Fund
Asset Allocation vs. Long Term Target Policy

Period Ending: June 30, 2018



Allocation vs. Long Term Target

	Current Balance	Current Allocation	Long Term Target	Difference
Growth	\$6,115,900,948	72.8%	67.0%	\$484,868,293
Liquidity	\$1,509,653,066	18.0%	23.0%	-\$423,387,995
Diversifying	\$504,588,296	6.0%	10.0%	-\$335,864,339
Cash & Overlay	\$274,384,042	3.3%	--	\$274,384,042
Total	\$8,404,526,351	100.0%	100.0%	

Allocation vs. Current Targets

	Current Balance	Current Allocation	Current Target	Difference
Growth	\$6,115,900,948	72.8%	71.1%	\$140,282,712
Liquidity	\$1,509,653,066	18.0%	23.4%	-\$457,006,100
Diversifying	\$504,588,296	6.0%	5.5%	\$42,339,347
Cash & Overlay	\$274,384,042	3.3%	--	\$274,384,042
Total	\$8,404,526,351	100.0%	100.0%	

Long Term Targets reflect FFP 4-Yr allocations approved in March 2018.
Current Targets reflect Phase 2a Targets approved in March 2017.

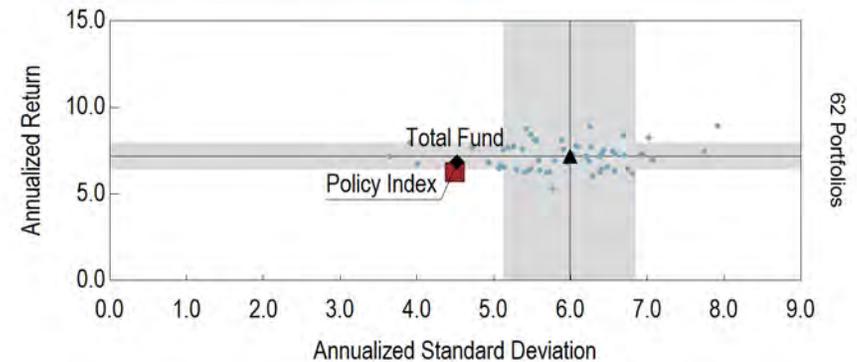
Total Fund Executive Summary (Net of Fees)

Period Ending: June 30, 2018

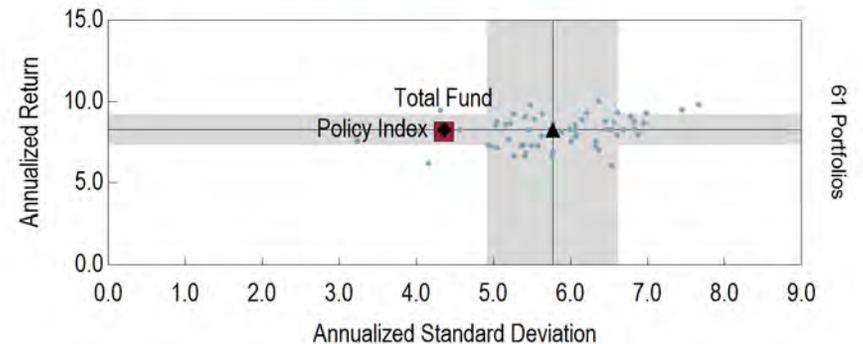
	% of Portfolio	QTD	YTD	1 Yr	3 Yrs	5 Yrs	10 Yrs
Total Fund	100.0	0.5	0.5	7.2	6.3	8.1	6.8
Policy Index		-0.3	0.0	6.5	6.8	8.3	--
Growth	72.8	0.8	1.0	10.0	8.2	9.6	--
Custom Growth Benchmark		-0.6	-0.2	8.9	9.1	9.8	--
Diversifying	6.0	-0.5	-1.3	0.1	-0.4	0.6	2.8
Custom Diversifying Benchmark		0.2	0.1	1.9	3.2	3.5	4.4
Liquidity	18.0	0.3	0.0	0.4	--	--	--
BBgBarc US Govt/Credit 1-3 Yr. TR		0.3	0.1	0.2	--	--	--

*Correlation between the Growth and Diversifying composites is -.08, .20 and .34 over the previous 1, 3 and 5 year periods respectively.

Risk vs. Return
3 Years Ending June 30, 2018



Risk vs. Return
5 Years Ending June 30, 2018



- Total Fund
- ◆ Policy Index
- ▲ Universe Median
- 68% Confidence Interval
- InvestorForce Public DB > \$1B Gross

Policy Index (4/1/2018 - Present): 5% S&P 500, 13% MSCI EAFE, 11% MSCI Emerging Markets, 11% Cambridge US Private Equity, 12% S&P Leverage Loan Index +2%, 5% NCREIF Property Index +2%, 4% NCREIF Property Index +4%, 1% Wilshire REIT, 3% MSCI ACWI, 2% BBgBarc US Aggregate, 23% BBgBarc 1-3 Yr Gov/Credit, 3% BBgBarc Treasury 7-10 Yr, 7% HFRI Fund of Funds.
 Policy Index (12/1/2016 -3/31/2018): 22.9% Russell 3000, 11% MSCI ACWI ex-US (Gross), 10.9% MSCI ACWI (Net), 22.4% BBgBarc 1-3 Yr Gov/Credit, 3.2% BBgBarc US Aggregate, 1.7% ICE BofAML High Yield Master II +2%, 5.1% ICE BofAML High Yield Master II, 1% Wilshire REIT, 1.7% NCREIF Property Index, 6.8% NCREIF ODCE Index, 3.6% CPI +4%, 8.1% S&P 500 +4%, 1.6% 90-day T-Bills.
 Policy Index (4/1/2012-11/30/16): 27.7% Russell 3000, 10.6% MSCI ACWI ex-US (Gross), 12.3% MSCI ACWI (Net), 19.6% BBgBarc U.S. Aggregate, 5% ICE BofAML High Yield Master II, 4% BBgBarc Global Aggregate, 5.4% Wilshire REIT, 6.75% NCREIF Property Index, 1.35% FTSE/EPRA NAREIT Developed exUS, 6.8% S&P 500 +4% (Lagged), 0.5% 91-Day T-Bills.

Total Fund Performance Summary (Gross of Fees)

Period Ending: June 30, 2018

	Market Value	% of Portfolio	3 Mo	YTD	1 Yr	3 Yrs	5 Yrs	10 Yrs	2017	2016	2015	2014	2013
Total Fund	8,404,526,351	100.0	0.6	0.7	7.5	6.7	8.7	7.4	14.2	7.4	2.7	8.4	16.4
Policy Index			-0.3	0.0	6.5	6.8	8.3	--	13.8	8.8	0.6	9.0	15.6
InvestorForce Public DB > \$1B Gross Rank			65	59	89	69	30	13	83	74	5	6	33
Total Fund ex Overlay & Cash	8,130,142,310	96.7	0.7	0.8	7.5	6.7	8.7	7.4	14.1	7.4	2.7	8.4	16.4
Policy Index			-0.3	0.0	6.5	6.8	8.3	--	13.8	8.8	0.6	9.0	15.6
InvestorForce Public DB > \$1B Gross Rank			60	56	88	68	29	13	84	74	5	6	33
Growth	6,115,900,948	72.8	0.9	1.2	10.3	8.6	10.1	--	19.1	8.1	3.0	8.8	17.5
Custom Growth Benchmark			-0.6	-0.2	8.9	9.1	9.8	--	19.5	12.2	-0.2	8.1	17.7
Total Domestic Equity	1,526,372,748	18.2	4.8	3.7	17.3	11.4	14.0	11.1	23.9	11.5	1.1	11.4	36.2
Russell 3000			3.9	3.2	14.8	11.6	13.3	10.2	21.1	12.7	0.5	12.6	33.6
InvestorForce Public DB US Eq Gross Rank			11	39	15	46	7	5	6	77	21	50	19
BlackRock Russell 1000 Index	123,396,474	1.5	3.6	2.8	14.5	--	--	--	--	--	--	--	--
Russell 1000			3.6	2.9	14.5	--	--	--	--	--	--	--	--
eV US Large Cap Equity Gross Rank			36	39	43	--	--	--	--	--	--	--	--
Jackson Square Partners	423,687,946	5.0	4.2	5.9	19.2	9.8	14.1	11.7	29.3	-4.4	6.1	13.9	35.4
Russell 1000 Growth			5.8	7.3	22.5	15.0	16.4	11.8	30.2	7.1	5.7	13.0	33.5
eV US Large Cap Growth Equity Gross Rank			69	67	67	91	77	44	47	98	37	31	40
Robeco Boston Partners	395,079,843	4.7	-0.1	-1.6	10.5	9.1	11.3	10.7	20.1	15.1	-3.9	12.0	37.4
Russell 1000 Value			1.2	-1.7	6.8	8.3	10.3	8.5	13.7	17.3	-3.8	13.5	32.5
eV US Large Cap Value Equity Gross Rank			91	70	46	56	51	18	23	50	65	55	24
Emerald Advisers	310,233,552	3.7	9.4	7.7	24.0	10.7	16.3	14.0	28.8	10.1	4.1	7.3	50.3
Russell 2000 Growth			7.2	9.7	21.9	10.6	13.6	11.2	22.2	11.3	-1.4	5.6	43.3
eV US Small Cap Growth Equity Gross Rank			42	87	56	71	22	26	26	54	19	21	27
Ceredex	273,911,563	3.3	8.6	4.7	17.1	11.6	12.6	--	11.4	29.8	-4.4	3.3	36.5
Russell 2000 Value			8.3	5.4	13.1	11.2	11.2	--	7.8	31.7	-7.5	4.2	34.5
eV US Small Cap Value Equity Gross Rank			16	37	19	36	35	--	48	32	52	74	66

Individual closed end funds are not shown in performance summary table. BlackRock Russell 1000 funded 4/20/2017. Goldman Sachs has \$17,111 of residual cash. JPM Global has \$161,227 of residual cash. Lazard has \$30,537 of residual cash. TT Emerging Markets funded 7/27/2017. PIMCO Stock Plus, Intech Large Cap and Global Low Vol liquidated 7/27/2017. Intech Large Cap has \$4,588 of residual cash. Intech Global Low Vol has \$24,623 of residual cash. PIMCO Stock Plus has \$58,782 of residual cash. Effective 1/01/2017, only traditional asset class (public equity, public fixed income, REITs) investment management fees will be included in the gross of fee return calculation.

Total Fund
Performance Summary (Gross of Fees)

Period Ending: June 30, 2018

	Market Value	% of Portfolio	3 Mo	YTD	1 Yr	3 Yrs	5 Yrs	10 Yrs	2017	2016	2015	2014	2013
Total International Equity	1,602,187,825	19.1	-5.5	-5.0	7.1	4.6	7.1	1.9	25.5	1.2	-1.2	0.3	17.8
MSCI ACWI ex USA Gross			-2.4	-3.4	7.8	5.6	6.5	3.0	27.8	5.0	-5.3	-3.4	15.8
MSCI EAFE Gross			-1.0	-2.4	7.4	5.4	6.9	3.3	25.6	1.5	-0.4	-4.5	23.3
InvestorForce Public DB ex-US Eq Gross Rank			97	89	63	86	49	85	90	89	28	5	50
International Equity	933,867,808	11.1	-1.8	-2.5	7.6	5.4	7.6	2.2	25.3	1.2	-1.2	0.3	17.8
MSCI ACWI ex USA Gross			-2.4	-3.4	7.8	5.6	6.5	3.0	27.8	5.0	-5.3	-3.4	15.8
InvestorForce Public DB ex-US Eq Gross Rank			17	31	49	63	31	83	93	89	28	5	50
Pyrford	443,155,210	5.3	-2.2	-4.2	2.4	3.9	--	--	19.8	3.4	-2.9	--	--
MSCI ACWI ex USA Value			-3.8	-5.3	4.6	3.5	--	--	22.7	8.9	-10.1	--	--
eV ACWI ex-US Value Equity Gross Rank			29	44	82	75	--	--	84	74	59	--	--
William Blair	490,712,598	5.8	-1.3	-0.9	12.7	6.7	8.2	--	30.9	-1.4	0.5	-1.2	20.9
MSCI ACWI ex USA Growth			-1.4	-2.3	9.9	6.6	7.2	--	32.0	0.1	-1.3	-2.6	15.5
eV ACWI ex-US Growth Equity Gross Rank			66	71	64	80	82	--	81	55	69	37	44
Emerging Markets Equity	668,320,017	8.0	-10.1	-8.2	7.8	--	--	--	--	--	--	--	--
MSCI Emerging Markets			-8.0	-6.7	8.2	--	--	--	--	--	--	--	--
InvestorForce Public DB Emg Mkt Eq Gross Rank			90	74	23	--	--	--	--	--	--	--	--
PIMCO RAE Emerging Markets	344,791,961	4.1	-9.8	-6.9	7.9	--	--	--	--	--	--	--	--
MSCI Emerging Markets			-8.0	-6.7	8.2	--	--	--	--	--	--	--	--
eV Emg Mkts Equity Gross Rank			84	55	51	--	--	--	--	--	--	--	--
TT Emerging Markets	323,528,055	3.8	-10.5	-9.6	--	--	--	--	--	--	--	--	--
MSCI Emerging Markets			-8.0	-6.7	--	--	--	--	--	--	--	--	--
eV Emg Mkts Equity Gross Rank			92	91	--	--	--	--	--	--	--	--	--
Total Global Equity	757,663,928	9.0	0.9	1.9	11.0	9.7	11.0	5.4	23.7	7.6	2.2	5.2	23.7
MSCI ACWI			0.5	-0.4	10.7	8.2	9.4	5.8	24.0	7.9	-2.4	4.2	22.8
InvestorForce Public DB Gbl Eq Gross Rank			36	3	32	3	40	10	79	40	16	41	64
Artisan Partners	397,147,350	4.7	1.4	4.7	15.8	13.3	14.4	--	32.9	5.6	9.2	3.9	26.1
MSCI ACWI			0.5	-0.4	10.7	8.2	9.4	--	24.0	7.9	-2.4	4.2	22.8
eV All Global Equity Gross Rank			47	13	20	8	7	--	11	61	4	56	51
First Eagle	360,330,728	4.3	0.3	-1.0	6.1	7.6	8.3	--	15.1	11.7	0.2	4.5	17.9
MSCI ACWI			0.5	-0.4	10.7	8.2	9.4	--	24.0	7.9	-2.4	4.2	22.8
eV All Global Equity Gross Rank			69	71	87	66	77	--	89	19	49	51	80

Individual closed end funds are not shown in performance summary table. BlackRock Russell 1000 funded 4/20/2017. Goldman Sachs has \$17,111 of residual cash. JPM Global has \$161,227 of residual cash. Lazard has \$30,537 of residual cash. TT Emerging Markets funded 7/27/2017. PIMCO Stock Plus, Intech Large Cap and Global Low Vol liquidated 7/27/2017. Intech Large Cap has \$4,588 of residual cash. Intech Global Low Vol has \$24,623 of residual cash. PIMCO Stock Plus has \$58,782 of residual cash. Effective 1/01/2017, only traditional asset class (public equity, public fixed income, REITs) investment management fees will be included in the gross of fee return calculation.

Total Fund
Performance Summary (Gross of Fees)

Period Ending: June 30, 2018

	Market Value	% of Portfolio	3 Mo	YTD	1 Yr	3 Yrs	5 Yrs	10 Yrs	2017	2016	2015	2014	2013
Private Credit	236,145,437	2.8	-0.7	2.4	4.8	4.8	5.1	6.7	9.0	2.8	1.7	7.4	2.0
ICE BofAML High Yield Master II +2%			1.5	1.1	4.6	7.6	7.6	10.2	9.6	19.8	-2.7	4.5	9.6
Total High Yield	346,773,913	4.1	0.7	-0.5	1.4	4.3	4.6	7.8	6.5	14.3	-3.5	1.2	8.8
ICE BofAML High Yield Master II			1.0	0.1	2.5	5.5	5.5	8.0	7.5	17.5	-4.6	2.5	7.4
eV US High Yield Fixed Inc Gross Rank			58	78	90	83	84	52	74	47	68	83	28
Allianz Global Investors	346,773,913	4.1	0.7	-0.5	1.4	4.3	4.6	7.8	6.5	14.3	-3.5	1.2	8.8
ICE BofAML High Yield Master II			1.0	0.1	2.5	5.5	5.5	8.0	7.5	17.5	-4.6	2.5	7.4
eV US High Yield Fixed Inc Gross Rank			58	78	90	83	84	52	74	47	68	83	28
Total Real Estate	725,544,787	8.6	3.1	5.2	11.4	8.9	11.8	6.8	11.1	5.5	13.5	20.6	10.5
Real Estate Benchmark			2.8	3.9	7.8	8.3	9.2	7.3	7.1	6.7	8.3	18.8	7.1
NCREIF-ODCE			2.1	4.3	8.4	9.4	11.0	5.3	7.6	8.8	15.0	12.5	13.9
NCREIF Property Index			1.8	3.5	7.2	8.3	9.8	6.2	7.0	8.0	13.3	11.8	11.0
Adelante	67,542,607	0.8	7.6	0.6	4.5	7.2	9.2	7.4	7.8	4.1	5.1	33.4	3.6
Wilshire REIT			9.7	1.5	3.9	7.8	8.4	7.8	4.2	7.2	4.2	31.8	1.9
Private Equity	921,181,773	11.0	5.5	5.7	9.9	9.0	12.9	10.1	11.9	9.4	11.6	17.3	15.0
S&P 500 Index +4% (Lagged)			0.2	7.9	18.5	15.2	17.8	13.8	23.3	20.0	3.4	24.5	24.0
Diversifying	504,588,296	6.0	-0.4	-1.2	0.4	0.0	1.0	3.2	2.8	1.3	-1.4	2.2	-1.5
Custom Diversifying Benchmark			0.2	0.1	1.9	3.2	3.5	4.4	4.7	4.1	2.5	5.4	-1.6
Diversifying Fixed Income	504,588,296	6.0	-0.4	-1.2	0.4	1.8	2.6	4.0	2.8	2.8	1.6	6.6	-1.9
eV US Core Fixed Inc Gross Rank			94	25	21	83	61	78	96	72	15	25	78
AFL-CIO	317,519,384	3.8	-0.2	-1.4	-0.2	1.8	2.6	4.1	3.6	2.4	1.6	6.6	-1.9
BBgBarc US Aggregate TR			-0.2	-1.6	-0.4	1.7	2.3	3.7	3.5	2.6	0.6	6.0	-2.0
eV US Core Fixed Inc Gross Rank			73	38	57	79	56	72	76	87	15	25	78
Wellington Real Total Return	187,068,912	2.2	-0.9	-0.9	1.2	-2.2	-0.9	--	1.9	-0.1	-4.9	-2.5	--
CPI + 4%			2.0	4.2	7.0	5.9	5.6	--	6.2	6.2	4.8	4.8	--

Individual closed end funds are not shown in performance summary table. BlackRock Russell 1000 funded 4/20/2017. Goldman Sachs has \$17,111 of residual cash. JPM Global has \$161,227 of residual cash. Lazard has \$30,537 of residual cash. TT Emerging Markets funded 7/27/2017. PIMCO Stock Plus, Intech Large Cap and Global Low Vol liquidated 7/27/2017. Intech Large Cap has \$4,588 of residual cash. Intech Global Low Vol has \$24,623 of residual cash. PIMCO Stock Plus has \$58,782 of residual cash. Effective 1/01/2017, only traditional asset class (public equity, public fixed income, REITs) investment management fees will be included in the gross of fee return calculation.

Total Fund
Performance Summary (Gross of Fees)

Period Ending: June 30, 2018

	Market Value	% of Portfolio	3 Mo	YTD	1 Yr	3 Yrs	5 Yrs	10 Yrs	2017	2016	2015	2014	2013
Liquidity	1,509,653,066	18.0	0.3	0.1	0.5	--	--	--	1.5	--	--	--	--
BBgBarc US Govt/Credit 1-3 Yr. TR			0.3	0.1	0.2	--	--	--	0.8	--	--	--	--
eV US Short Duration Fixed Inc Gross Rank			75	68	57	--	--	--	50	--	--	--	--
DFA Short Credit	329,410,558	3.9	0.3	-0.5	-0.1	--	--	--	1.9	--	--	--	--
ICE BofAML 1-5 Yrs US Corp & Govt TR			0.2	-0.3	-0.2	--	--	--	1.3	--	--	--	--
eV US Short Duration Fixed Inc Gross Rank			83	99	99	--	--	--	26	--	--	--	--
Insight Short Duration	697,455,828	8.3	0.5	0.4	0.9	--	--	--	1.5	--	--	--	--
BBgBarc US Govt/Credit 1-3 Yr. TR			0.3	0.1	0.2	--	--	--	0.8	--	--	--	--
eV US Short Duration Fixed Inc Gross Rank			8	18	28	--	--	--	50	--	--	--	--
Sit Short Duration	482,786,680	5.7	0.0	0.0	0.5	--	--	--	1.3	--	--	--	--
BBgBarc US Govt 1-3 Yr TR			0.2	0.1	0.0	--	--	--	0.4	--	--	--	--
eV US Short Duration Fixed Inc Gross Rank			99	77	60	--	--	--	68	--	--	--	--
Total Cash	229,416,930	2.7	0.5	0.7	1.2	0.9	0.4	--	0.9	0.9	0.1	-3.0	8.8
91 Day T-Bills			0.5	0.8	1.4	0.7	0.4	--	0.9	0.3	0.0	0.0	0.0
Cash	229,416,930	2.7	0.5	0.7	1.2	0.9	1.2	3.2	0.9	0.9	0.1	1.4	4.5

Individual closed end funds are not shown in performance summary table. BlackRock Russell 1000 funded 4/20/2017. Goldman Sachs has \$17,111 of residual cash. JPM Global has \$161,227 of residual cash. Lazard has \$30,537 of residual cash. TT Emerging Markets funded 7/27/2017. PIMCO Stock Plus, Intech Large Cap and Global Low Vol liquidated 7/27/2017. Intech Large Cap has \$4,588 of residual cash. Intech Global Low Vol has \$24,623 of residual cash. PIMCO Stock Plus has \$58,782 of residual cash. Effective 1/01/2017, only traditional asset class (public equity, public fixed income, REITs) investment management fees will be included in the gross of fee return calculation.

Total Fund Performance Summary (Net of Fees)

Period Ending: June 30, 2018

	Market Value	% of Portfolio	3 Mo	YTD	1 Yr	3 Yrs	5 Yrs	10 Yrs	2017	2016	2015	2014	2013
Total Fund	8,404,526,351	100.0	0.5	0.5	7.2	6.3	8.1	6.8	13.9	6.9	2.1	7.7	15.6
<i>Policy Index</i>			-0.3	0.0	6.5	6.8	8.3	--	13.8	8.8	0.6	9.0	15.6
Total Fund ex Overlay & Cash	8,130,142,310	96.7	0.6	0.7	7.2	6.3	8.2	6.8	13.8	6.9	2.1	7.7	15.6
<i>Policy Index</i>			-0.3	0.0	6.5	6.8	8.3	--	13.8	8.8	0.6	9.0	15.6
Growth	6,115,900,948	72.8	0.8	1.0	10.0	8.2	9.6	--	18.7	7.6	2.3	8.1	16.7
<i>Custom Growth Benchmark</i>			-0.6	-0.2	8.9	9.1	9.8	--	19.5	12.2	-0.2	8.1	17.7
Total Domestic Equity	1,526,372,748	18.2	4.7	3.5	16.8	11.0	13.6	10.7	23.5	11.1	0.6	11.0	35.7
<i>Russell 3000</i>			3.9	3.2	14.8	11.6	13.3	10.2	21.1	12.7	0.5	12.6	33.6
BlackRock Russell 1000 Index	123,396,474	1.5	3.6	2.8	14.5	--	--	--	--	--	--	--	--
<i>Russell 1000</i>			3.6	2.9	14.5	--	--	--	--	--	--	--	--
Jackson Square Partners	423,687,946	5.0	4.1	5.6	18.8	9.3	13.6	11.2	28.7	-4.8	5.6	13.4	35.0
<i>Russell 1000 Growth</i>			5.8	7.3	22.5	15.0	16.4	11.8	30.2	7.1	5.7	13.0	33.5
Robeco Boston Partners	395,079,843	4.7	-0.1	-1.7	10.2	8.7	10.9	10.4	19.7	14.7	-4.2	11.6	37.0
<i>Russell 1000 Value</i>			1.2	-1.7	6.8	8.3	10.3	8.5	13.7	17.3	-3.8	13.5	32.5
Emerald Advisers	310,233,552	3.7	9.3	7.4	23.2	10.0	15.6	13.3	28.0	9.4	3.5	6.6	49.4
<i>Russell 2000 Growth</i>			7.2	9.7	21.9	10.6	13.6	11.2	22.2	11.3	-1.4	5.6	43.3
Ceredex	273,911,563	3.3	8.5	4.4	16.5	11.0	12.0	--	10.7	29.1	-5.0	2.7	35.8
<i>Russell 2000 Value</i>			8.3	5.4	13.1	11.2	11.2	--	7.8	31.7	-7.5	4.2	34.5
Total International Equity	1,602,187,825	19.1	-5.6	-5.1	6.7	4.1	6.7	1.5	25.0	0.8	-1.6	0.0	17.4
<i>MSCI ACWI ex USA Gross</i>			-2.4	-3.4	7.8	5.6	6.5	3.0	27.8	5.0	-5.3	-3.4	15.8
<i>MSCI EAFE Gross</i>			-1.0	-2.4	7.4	5.4	6.9	3.3	25.6	1.5	-0.4	-4.5	23.3
International Equity	933,867,808	11.1	-1.9	-2.7	7.1	5.0	7.2	1.8	24.8	0.8	-1.6	0.0	17.4
<i>MSCI ACWI ex USA Gross</i>			-2.4	-3.4	7.8	5.6	6.5	3.0	27.8	5.0	-5.3	-3.4	15.8
Pyrford	443,155,210	5.3	-2.3	-4.4	2.0	3.5	--	--	19.3	3.0	-3.3	--	--
<i>MSCI ACWI ex USA Value</i>			-3.8	-5.3	4.6	3.5	--	--	22.7	8.9	-10.1	--	--
William Blair	490,712,598	5.8	-1.4	-1.1	12.2	6.3	7.8	--	30.4	-1.8	0.0	-1.7	20.4
<i>MSCI ACWI ex USA Growth</i>			-1.4	-2.3	9.9	6.6	7.2	--	32.0	0.1	-1.3	-2.6	15.5
Emerging Markets Equity	668,320,017	8.0	-10.3	-8.4	7.3	--							
<i>MSCI Emerging Markets</i>			-8.0	-6.7	8.2	--	--	--	--	--	--	--	--
PIMCO RAE Emerging Markets	344,791,961	4.1	-9.9	-6.9	7.5	--	--	--	--	--	--	--	--
<i>MSCI Emerging Markets</i>			-8.0	-6.7	8.2	--	--	--	--	--	--	--	--
TT Emerging Markets	323,528,055	3.8	-10.7	-9.9	--	--	--	--	--	--	--	--	--
<i>MSCI Emerging Markets</i>			-8.0	-6.7	--	--	--	--	--	--	--	--	--

Individual closed end funds are not shown in performance summary table. BlackRock Russell 1000 funded 4/20/2017. Goldman Sachs has \$17,111 of residual cash. JPM Global has \$161,227 of residual cash. Lazard has \$30,537 of residual cash. TT Emerging Markets funded 7/27/2017. PIMCO Stock Plus, Intech Large Cap and Global Low Vol liquidated 7/27/2017. Intech Large Cap has \$4,588 of residual cash. Intech Global Low Vol has \$24,623 of residual cash. PIMCO Stock Plus has \$58,782 of residual cash.

Total Fund
Performance Summary (Net of Fees)

Period Ending: June 30, 2018

	Market Value	% of Portfolio	3 Mo	YTD	1 Yr	3 Yrs	5 Yrs	10 Yrs	2017	2016	2015	2014	2013
Total Global Equity	757,663,928	9.0	0.7	1.5	10.1	8.9	10.3	4.9	22.8	6.9	1.6	4.5	22.9
MSCI ACWI			0.5	-0.4	10.7	8.2	9.4	5.8	24.0	7.9	-2.4	4.2	22.8
Artisan Partners	397,147,350	4.7	1.2	4.3	14.9	12.4	13.5	--	31.9	4.8	8.4	3.1	25.2
MSCI ACWI			0.5	-0.4	10.7	8.2	9.4	--	24.0	7.9	-2.4	4.2	22.8
First Eagle	360,330,728	4.3	0.1	-1.4	5.3	6.8	7.5	--	14.3	10.9	-0.6	3.7	17.1
MSCI ACWI			0.5	-0.4	10.7	8.2	9.4	--	24.0	7.9	-2.4	4.2	22.8
Private Credit	236,145,437	2.8	-0.7	2.4	4.8	4.6	4.8	6.4	9.0	2.4	1.4	6.9	1.6
ICE BofAML High Yield Master II +2%			1.5	1.1	4.6	7.6	7.6	10.2	9.6	19.8	-2.7	4.5	9.6
Total High Yield	346,773,913	4.1	0.6	-0.7	1.0	3.9	4.2	7.5	6.1	13.9	-3.9	0.8	8.4
ICE BofAML High Yield Master II			1.0	0.1	2.5	5.5	5.5	8.0	7.5	17.5	-4.6	2.5	7.4
Allianz Global Investors	346,773,913	4.1	0.6	-0.7	1.0	3.9	4.2	7.4	6.1	13.9	-3.9	0.8	8.4
ICE BofAML High Yield Master II			1.0	0.1	2.5	5.5	5.5	8.0	7.5	17.5	-4.6	2.5	7.4
Total Real Estate	725,544,787	8.6	3.1	5.2	11.3	8.5	10.9	5.8	11.0	4.8	12.4	19.1	8.9
Real Estate Benchmark			2.8	3.9	7.8	8.3	9.2	7.3	7.1	6.7	8.3	18.8	7.1
NCREIF-ODCE			2.1	4.3	8.4	9.4	11.0	5.3	7.6	8.8	15.0	12.5	13.9
NCREIF Property Index			1.8	3.5	7.2	8.3	9.8	6.2	7.0	8.0	13.3	11.8	11.0
Adelante	67,542,607	0.8	7.4	0.3	4.0	6.7	8.7	6.9	7.2	3.6	4.6	32.7	3.0
Wilshire REIT			9.7	1.5	3.9	7.8	8.4	7.8	4.2	7.2	4.2	31.8	1.9
Private Equity	921,181,773	11.0	5.5	5.7	9.9	8.6	11.9	8.2	11.9	8.9	9.9	15.2	12.7
S&P 500 Index +4% (Lagged)			0.2	7.9	18.5	15.2	17.8	13.8	23.3	20.0	3.4	24.5	24.0
Diversifying	504,588,296	6.0	-0.5	-1.3	0.1	-0.4	0.6	2.8	2.6	0.8	-1.8	1.7	-1.9
Custom Diversifying Benchmark			0.2	0.1	1.9	3.2	3.5	4.4	4.7	4.1	2.5	5.4	-1.6
Diversifying Fixed Income	504,588,296	6.0	-0.5	-1.3	0.1	1.4	2.2	3.7	2.6	2.3	1.1	6.1	-2.4
AFL-CIO	317,519,384	3.8	-0.3	-1.6	-0.6	1.4	2.2	3.7	3.2	1.9	1.1	6.1	-2.4
BBgBarc US Aggregate TR			-0.2	-1.6	-0.4	1.7	2.3	3.7	3.5	2.6	0.6	6.0	-2.0
Wellington Real Total Return	187,068,912	2.2	-0.9	-0.9	1.2	-2.5	-1.3	--	1.9	-0.6	-5.4	-3.1	--
CPI + 4%			2.0	4.2	7.0	5.9	5.6	--	6.2	6.2	4.8	4.8	--

Individual closed end funds are not shown in performance summary table. BlackRock Russell 1000 funded 4/20/2017. Goldman Sachs has \$17,111 of residual cash. JPM Global has \$161,227 of residual cash. Lazard has \$30,537 of residual cash. TT Emerging Markets funded 7/27/2017. PIMCO Stock Plus, Intech Large Cap and Global Low Vol liquidated 7/27/2017. Intech Large Cap has \$4,588 of residual cash. Intech Global Low Vol has \$24,623 of residual cash. PIMCO Stock Plus has \$58,782 of residual cash.

Total Fund
Performance Summary (Net of Fees)

Period Ending: June 30, 2018

	Market Value	% of Portfolio	3 Mo	YTD	1 Yr	3 Yrs	5 Yrs	10 Yrs	2017	2016	2015	2014	2013
Liquidity	1,509,653,066	18.0	0.3	0.0	0.4	--	--	--	1.4	--	--	--	--
<i>BBgBarc US Govt/Credit 1-3 Yr. TR</i>			<i>0.3</i>	<i>0.1</i>	<i>0.2</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>0.8</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>--</i>
DFA Short Credit	329,410,558	3.9	0.2	-0.5	-0.2	--	--	--	1.8	--	--	--	--
<i>ICE BofAML 1-5 Yrs US Corp & Govt TR</i>			<i>0.2</i>	<i>-0.3</i>	<i>-0.2</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>1.3</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>--</i>
Insight Short Duration	697,455,828	8.3	0.5	0.4	0.8	--	--	--	1.5	--	--	--	--
<i>BBgBarc US Govt/Credit 1-3 Yr. TR</i>			<i>0.3</i>	<i>0.1</i>	<i>0.2</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>0.8</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>--</i>
Sit Short Duration	482,786,680	5.7	-0.1	-0.1	0.3	--	--	--	1.1	--	--	--	--
<i>BBgBarc US Govt 1-3 Yr TR</i>			<i>0.2</i>	<i>0.1</i>	<i>0.0</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>0.4</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>--</i>
Total Cash	229,416,930	2.7	0.5	0.7	1.2	0.9	0.4	--	0.9	0.9	0.1	-3.0	8.8
<i>91 Day T-Bills</i>			<i>0.5</i>	<i>0.8</i>	<i>1.4</i>	<i>0.7</i>	<i>0.4</i>	<i>--</i>	<i>0.9</i>	<i>0.3</i>	<i>0.0</i>	<i>0.0</i>	<i>0.0</i>
Cash	229,416,930	2.7	0.5	0.7	1.2	0.9	1.2	2.8	0.9	0.9	0.1	1.4	4.5

Individual closed end funds are not shown in performance summary table. BlackRock Russell 1000 funded 4/20/2017. Goldman Sachs has \$17,111 of residual cash. JPM Global has \$161,227 of residual cash. Lazard has \$30,537 of residual cash. TT Emerging Markets funded 7/27/2017. PIMCO Stock Plus, Intech Large Cap and Global Low Vol liquidated 7/27/2017. Intech Large Cap has \$4,588 of residual cash. Intech Global Low Vol has \$24,623 of residual cash. PIMCO Stock Plus has \$58,782 of residual cash.

Total Fund
Closed End Funds - Investment Summary

Period Ending: June 30, 2018

Verus Internal Analysis												
Inception Date	Manager Name/Fund Name	Estimated Market Value as of 6/30/18 ³	Total Commitment	% Called	Capital Called	Current Qtr. Capital Called	Current Qtr. Distributions	Total Distributions ⁴	Remaining Commitment	Distrib./ Paid-In (DPI) ¹	Tot. Value/ Paid-In (TVPI) ²	Latest Valuation
Private Credit												
9/24/2015	Angelo Gordon Energy Credit Opp.	\$10,345,109	\$28,125,000	67%	\$18,750,000	\$0	\$0	\$14,250,816	\$9,375,000	0.76	1.31	3/31/2018
2/2/2018	Stepstone CC Opportunities Fund	\$122,126,052	\$450,000,000	28%	\$124,468,391	\$108,811,250	\$924,640	\$924,640	\$325,531,609	0.01	0.99	3/31/2018
7/1/2006	Torchlight II	\$14,307,459	\$128,000,000	100%	\$128,000,000	\$0	\$24,588,889	\$186,605,841	\$0	1.46	1.57	6/30/2018
12/12/2008	Torchlight III	\$500,175	\$75,000,000	100%	\$75,000,000	\$0	\$1,786,661	\$110,946,880	\$0	1.48	1.49	6/30/2018
8/1/2012	Torchlight IV	\$38,039,670	\$60,000,000	100%	\$60,000,000	\$0	\$6,319,546	\$73,121,353	\$0	1.22	1.85	6/30/2018
3/12/2015	Torchlight V	\$50,802,107	\$75,000,000	60%	\$44,999,912	\$0	\$737,462	\$2,547,310	\$30,000,088	0.06	1.19	3/31/2018
Total Fixed Income		\$236,120,572										
% of Portfolio (Market Value)		2.8%										

¹(DPI) is equal to (capital returned / capital called)

²(TVPI) is equal to (market value + capital returned) / capital called

³Latest valuation + capital calls - distributions

⁴Total distributions may contain recallable capital

Total Fund
Closed End Funds - Investment Summary

Period Ending: June 30, 2018

Verus Internal Analysis												
Inception Date	Manager Name/Fund Name	Estimated Market Value as of 6/30/18 ³	Total Commitment	Total % Called	Capital Called	Current Qtr. Capital Called	Current Qtr. Distributions	Total Distributions ⁵	Remaining Commitment	Distrib./Paid-In (DPI) ¹	Tot. Value/Paid-In (TVPI) ²	Latest Valuation
Real Estate												
1/23/2012	Angelo Gordon Realty Fund VIII	\$31,212,326	\$80,000,000	94%	\$75,401,855	\$0	\$9,626,104	\$87,778,501	\$12,334,302	1.16	1.58	3/31/2018
12/8/2014	Angelo Gordon Realty Fund IX	\$48,968,437	\$65,000,000	66%	\$43,062,500	\$3,737,500	\$0	\$5,200,000	\$20,897,500	0.12	1.26	3/31/2018
6/23/2005	DLJ RECP III	\$23,207,326	\$75,000,000	95%	\$70,968,662	\$0	\$0	\$72,565,242	\$4,031,338	1.02	1.35	3/31/2018
2/11/2008	DLJ RECP IV	\$95,707,781	\$100,000,000	94%	\$94,092,198	\$0	\$328,490	\$63,309,188	\$5,907,802	0.67	1.69	3/31/2018
7/1/2014	DLJ RECP V	\$42,483,499	\$75,000,000	96%	\$72,221,782	\$18,683,244	\$10,788,053	\$50,780,984	\$22,108,631	0.70	1.29	3/31/2018
6/17/1998	Hearthstone II ⁴	-\$2,482	\$25,000,000	80%	\$19,932,386	\$0	\$0	\$19,952,734	\$2,520,348	1.00	1.00	3/31/2018
11/26/2007	Invesco Real Estate II	\$436,952	\$85,000,000	92%	\$78,202,813	\$0	\$0	\$100,620,489	\$6,797,187	1.29	1.29	6/30/2018
6/30/2013	Invesco Real Estate III	\$13,351,533	\$35,000,000	93%	\$32,386,423	\$0	\$0	\$32,987,218	\$2,613,577	1.02	1.43	6/30/2018
6/30/2014	Invesco Real Estate IV	\$22,538,950	\$35,000,000	72%	\$25,373,544	\$852,922	\$0	\$7,578,475	\$9,626,456	0.30	1.19	6/30/2018
7/16/2013	LaSalle Income & Growth VI	\$35,047,502	\$75,000,000	95%	\$71,428,571	\$0	\$0	\$70,239,356	\$3,571,429	0.98	1.47	3/31/2018
2/28/2017	LaSalle Income & Growth VII	\$54,415,778	\$75,000,000	62%	\$46,589,379	\$0	\$0	\$0	\$28,410,621	0.00	1.17	3/31/2018
7/3/2013	Long Wharf Fund IV	\$14,313,214	\$25,000,000	100%	\$25,000,000	\$0	\$887,749	\$20,921,286	\$0	0.84	1.41	6/30/2018
9/30/2016	Long Wharf Fund V	\$39,455,358	\$50,000,000	78%	\$38,758,140	\$6,397,806	\$1,713,698	\$2,741,917	\$11,241,860	0.07	1.09	6/30/2018
12/31/2011	Oaktree REOF V	\$6,866,599	\$50,000,000	100%	\$50,000,000	\$0	\$920,000	\$78,676,587	\$25,750,000	1.57	1.71	6/30/2018
9/30/2013	Oaktree REOF VI	\$48,561,690	\$80,000,000	100%	\$80,000,000	\$0	\$3,646,725	\$63,193,907	\$18,400,000	0.79	1.40	6/30/2018
4/1/2015	Oaktree REOF VII	\$24,397,440	\$65,000,000	37%	\$24,245,000	\$11,245,000	\$0	\$4,615,000	\$45,370,000	0.19	1.20	6/30/2018
11/10/2013	Paulson Real Estate Fund II	\$24,833,212	\$20,000,000	97%	\$19,345,623	\$0	\$0	\$4,594,996	\$654,377	0.24	1.52	3/31/2018
1/25/2012	Siguler Guff DREOF	\$51,623,911	\$75,000,000	93%	\$69,375,000	\$0	\$2,054,600	\$67,719,903	\$5,625,000	0.98	1.72	3/31/2018
8/31/2013	Siguler Guff DREOF II	\$57,362,695	\$70,000,000	80%	\$55,720,000	\$0	\$5,607,821	\$18,948,632	\$14,280,000	0.34	1.37	3/31/2018
1/27/2016	Siguler Guff DREOF II Co-Inv	\$23,220,459	\$25,000,000	79%	\$19,850,362	\$0	\$0	\$0	\$5,149,638	0.00	1.17	3/31/2018
Total Closed End Real Estate		\$658,002,180	\$1,185,000,000	85%	\$1,011,954,239	\$40,916,472	\$35,573,240	\$772,424,416	\$245,290,065	0.24	0.89	
% of Portfolio (Market Value)		7.8%										

¹(DPI) is equal to (capital returned / capital called)

²(TVPI) is equal to (market value + capital returned) / capital called

³Latest valuation + capital calls - distributions

⁴No further capital to be called

⁵Total distributions may include recallable distributions

Total Fund
Closed End Funds - Investment Summary

Period Ending: June 30, 2018

Verus Internal Analysis												
Inception Date	Manager Name/Fund Name	Estimated Market Value as of 6/30/18 ³	Total Commitment	Total % Called	Capital Called	Current Qtr. Capital Called	Current Qtr. Current Qtr. Distributions	Total Distributions	Remaining Commitment	Distrib./Paid-In (DPI) ¹	Tot. Value/Paid-In (TVPI) ²	Latest Valuation
Private Equity & Venture Capital												
3/18/1996	Adams Street Partners	\$142,827,449	\$210,000,000	84%	\$176,202,618	\$2,435,000	\$3,716,158	\$117,739,587	\$33,797,382	0.67	1.48	3/31/2018
1/16/2009	Adams Street Partners II	\$11,254,921	\$30,000,000	95%	\$28,365,000	\$0	\$874,023	\$36,592,267	\$1,635,000	1.29	1.69	3/31/2018
9/21/2012	Adams Street Partners - Fund 5	\$25,384,419	\$40,000,000	77%	\$30,611,900	\$0	\$0	\$10,613,177	\$9,388,100	0.35	1.18	3/31/2018
1/18/1996	Adams Street Partners - BPF	\$2,577,373	\$59,565,614	97%	\$57,517,409	\$0	\$214,487	\$101,862,594	\$2,048,205	1.77	1.82	3/31/2018
4/28/2017	Adams Street Venture Innovation	\$10,014,702	\$75,000,000	15%	\$10,912,500	\$3,750,000	\$0	\$0	\$64,087,500	0.00	0.92	3/31/2018
11/27/2013	Aether Real Assets III	\$23,989,122	\$25,000,000	0%	\$19,135,133	\$0	\$0	\$940,554	\$6,671,958	0.05	1.30	3/31/2018
11/27/2013	Aether Real Assets III Surplus	\$60,271,462	\$50,000,000	0%	\$45,266,353	\$827,695	\$2,070,821	\$2,860,635	\$6,671,958	0.06	1.39	3/31/2018
3/16/2016	Aether Real Assets IV	\$24,515,245	\$50,000,000	0%	\$26,264,063	\$6,810,112	\$121,783	\$4,114,797	\$6,671,958	0.16	1.09	3/31/2018
6/14/2004	Bay Area Equity Fund	\$2,895,558	\$10,000,000	100%	\$10,000,000	\$0	\$0	\$36,331,243	\$0	3.63	3.92	3/31/2018
12/7/2009	Bay Area Equity Fund II	\$11,210,350	\$10,000,000	100%	\$10,000,000	\$0	\$0	\$2,026,313	\$0	0.20	1.32	3/31/2018
1/31/2008	Carpenter Bancfund	\$6,398,969	\$30,000,000	97%	\$29,239,890	\$0	\$0	\$43,976,891	\$904,309	1.50	1.72	3/31/2018
6/28/2013	Commonfund	\$45,533,533	\$50,000,000	81%	\$40,524,998	\$1,524,998	\$400,000	\$4,277,497	\$6,671,958	0.11	1.23	3/31/2018
11/26/2003	EIF US Power Fund I	\$55,837	\$30,000,000	100%	\$30,000,000	\$0	\$0	\$64,404,030	\$0	2.15	2.15	3/31/2018
8/16/2005	EIF US Power Fund II ⁵	\$20,593,951	\$50,000,000	100%	\$50,000,000	\$0	\$7,832,472	\$58,996,571	\$0	1.18	1.59	3/31/2018
5/30/2007	EIF US Power Fund III ⁶	\$22,520,325	\$65,000,000	100%	\$65,000,000	\$0	\$12,149,340	\$71,231,764	\$0	1.10	1.44	3/31/2018
11/28/2011	EIF US Power Fund IV ⁴	\$44,164,295	\$50,000,000	113%	\$56,555,731	\$0	\$2,667,868	\$21,818,650	\$6,308,439	0.39	1.17	3/31/2018
11/28/2016	EIF US Power Fund V	\$23,596,330	\$50,000,000	63%	\$31,374,335	\$20,295,655	\$2,841,391	\$7,095,683	\$18,625,665	0.23	0.98	3/31/2018
2/15/2004	Nogales	\$34,188	\$15,000,000	99%	\$14,805,103	\$0	\$0	\$12,326,577	\$111,251	0.83	0.83	3/31/2017
2/18/2010	Oaktree PIF 2009	\$10,193,407	\$40,000,000	0%	\$34,800,000	\$10,193,407	\$0	\$34,800,000	\$6,671,958	1.00	1.29	6/30/2018
6/11/2014	Ocean Avenue Fund II	\$28,424,473	\$30,000,000	76%	\$22,800,000	\$900,000	\$1,200,806	\$4,790,744	\$7,200,000	0.21	1.46	3/31/2018
4/15/2016	Ocean Avenue Fund III	\$28,039,717	\$50,000,000	47%	\$23,500,000	\$5,000,000	\$0	\$1,000,000	\$26,500,000	0.04	1.24	3/31/2018
11/30/2007	Paladin III	\$22,352,994	\$25,000,000	102%	\$25,514,556	\$188,101	\$0	\$23,414,348	\$983,203	0.92	1.79	3/31/2018
5/24/2011	Pathway 6	\$37,285,106	\$40,000,000	88%	\$35,327,998	\$1,034,712	\$2,662,106	\$13,615,199	\$4,672,002	0.39	1.44	3/31/2018
2/7/2013	Pathway 7	\$60,870,934	\$70,000,000	80%	\$56,221,175	\$2,714,293	\$2,088,347	\$8,834,822	\$13,778,825	0.16	1.24	3/31/2018
11/23/2015	Pathway 8	\$29,913,368	\$50,000,000	53%	\$26,727,963	\$3,566,753	\$586,487	\$2,838,606	\$23,272,037	0.11	1.23	3/31/2018
11/9/1998	Pathway	\$23,759,221	\$125,000,000	98%	\$122,474,914	\$81,000	\$1,614,125	\$162,777,651	\$2,525,086	1.33	1.52	3/31/2018
12/26/2008	Pathway 2008	\$23,285,944	\$30,000,000	94%	\$28,227,224	\$108,696	\$1,528,789	\$20,418,540	\$1,772,776	0.72	1.55	3/31/2018
6/3/2014	Siguler Guff CCCERA Opportunities	\$145,541,870	\$200,000,000	67%	\$134,302,500	\$5,750,000	\$0	\$22,222,898	\$65,697,500	0.17	1.25	3/31/2018
11/30/2016	Siguler Guff Secondary Opportunities	\$25,626,390	\$50,000,000	68%	\$33,786,556	\$9,170,000	\$6,195,287	\$22,518,891	\$16,213,444	0.67	1.42	3/31/2018
12/8/2015	Wastewater Opportunity Fund	\$8,050,321	\$25,000,000	39%	\$9,695,592	\$1,415,420	\$0	\$0	\$15,304,408	0.00	0.83	3/31/2018
Total Private Equity and Venture Capital		\$921,181,773	\$1,634,565,614	79%	\$1,285,153,512	\$75,765,842	\$48,764,290	\$914,440,528	\$348,184,921	0.71	1.43	
% of Portfolio (Market Value)		11.0%										

¹(DPI) is equal to (capital returned / capital called)

²(TVPI) is equal to (market value + capital returned) / capital called

³Latest valuation + capital calls - distributions

⁴EIF IV has \$12,677,767 of recallable distributions

⁵EIF II has \$15,029,557 of recallable distributions

⁶EIF III has \$6,125,861 of recallable distributions

Total Fund

Closed End Funds - IRR Summary

Period Ending: June 30, 2018

Private Credit	Inception	Fund Level (G)	CCCERA (G)	Fund Level (N)	CCCERA (N)	IRR Date
Angelo Gordon Energy Cred Opp.	09/24/2015	-	-	17.5%	15.4%	03/31/2018
Stepstone CC Opportunities Fund ¹	02/02/2018	-	-	-	-	-
Torchlight II	07/01/2006	-0.4%	-0.2%	-1.6%	-1.4%	06/30/2018
Torchlight III	12/12/2008	18.3%	16.3%	13.7%	13.8%	06/30/2018
Torchlight IV	08/01/2012	14.0%	14.3%	10.7%	11.4%	06/30/2018
Torchlight V	03/12/2015	23.3%	23.1%	14.2%	14.1%	03/31/2018

Real Estate	Inception	Fund Level (G)	CCCERA (G)	Fund Level (N)	CCCERA (N)	IRR Date
Angelo Gordon VIII	01/23/2012	-	-	-	16.0%	03/31/2018
Angelo Gordon IX	12/08/2014	-	-	-	11.0%	03/31/2018
DLJ RECP III	06/23/2005	1.0%	1.0%	-2.0%	-2.0%	03/31/2018
DLJ RECP IV	02/11/2008	7.0%	7.0%	4.0%	5.0%	03/31/2018
DLJ RECP V	07/01/2014	29.0%	29.0%	16.0%	16.0%	03/31/2018
Hearthstone II	06/17/1998	-	30.1%	-	30.1%	03/31/2018
Invesco Fund III	06/30/2013	20.5%	-	14.8%	-	03/31/2018
Invesco Fund IV	06/30/2014	19.4%	-	13.5%	-	03/31/2018
LaSalle Income & Growth VI	07/16/2013	16.4%	-	13.6%	-	03/31/2018
LaSalle Income & Growth VII	02/28/2017	16.4%	-	12.8%	-	03/31/2018
Long Wharf IV	07/03/2013	17.9%	17.8%	12.9%	12.9%	06/30/2018
Long Wharf V	09/30/2016	14.4%	17.4%	8.4%	9.9%	06/30/2018
Oaktree REOF V	12/31/2011	17.2%	-	12.8%	-	06/30/2018
Oaktree REOF VI	09/30/2013	15.3%	-	10.2%	-	06/30/2018
Oaktree REOF VII	04/01/2015	109.2%	-	52.5%	-	06/30/2018
Paulson	11/10/2013	-	-	14.9%	-	12/31/2017
Siguler Guff I	01/25/2012	15.0%	17.6%	13.4%	14.4%	03/31/2018
Siguler Guff II	08/31/2013	14.9%	14.0%	13.4%	12.0%	03/31/2018
Siguler Guff DREOF II Co-Inv	01/27/2016	14.8%	14.7%	13.6%	11.3%	03/31/2018

¹ Manager has yet to report IRR figure due to no capital invested or meaningful distributions.

² Fund level data includes CCCERA and all other fund investors.

³ Net IRR calculated after deductions of management fees and carried interest to the General Partner.

Total Fund
Closed End Funds - IRR Summary

Period Ending: June 30, 2018

Private Equity & Venture Capital	Inception	Fund Level (G)	CCCERA (G)	Fund Level (N)	CCCERA (N)	IRR Date
Adams Street Partners	3/18/1996	11.5%	12.4%	-	9.9%	3/31/2018
Adams Street Partners II	1/16/2009	17.4%	17.6%	-	15.1%	3/31/2018
Adams Street Partners - Fund 5	9/21/2012	9.6%	9.6%	-	7.0%	3/31/2018
Adams Street Partners Venture	4/28/2017	-4.9%	-4.9%	-	-12.5%	3/31/2018
Adams Street Partners - BPF	1/18/1996	14.3%	14.3%	-	11.6%	3/31/2018
Aether Real Assets III	11/27/2013	-	-	13.1%	-	3/31/2018
Aether Real Assets III Surplus	11/27/2013	-	-	15.4%	-	3/31/2018
Aether Real Assets IV	1/1/2016	-	-	13.1%	-	3/31/2018
Bay Area Equity Fund I	6/14/2004	25.9%	-	23.3%	-	3/31/2018
Bay Area Equity Fund II	12/7/2009	6.6%	-	5.4%	-	3/31/2018
Carpenter Bancfund	1/31/2008	-	-	-	10.6%	3/31/2018
CommonFund ⁴	6/28/2013	-	11.4%	-	8.7%	3/31/2018
Energy Investor Fund	11/26/2003	33.5%	34.7%	28.5%	28.3%	3/31/2018
Energy Investor Fund II	8/16/2005	6.6%	6.1%	3.9%	3.4%	3/31/2018
Energy Investor Fund III	5/30/2007	8.2%	8.2%	5.7%	5.7%	3/31/2018
Energy Investor Fund IV	11/28/2011	10.6%	10.8%	6.1%	5.8%	3/31/2018
Energy Investor Fund V ¹	11/26/2016	-	-	-	-	-
Nogales	2/15/2004	-	-4.5%	-8.6%	-8.8%	3/31/2017
Oaktree PIF 2009	2/18/2010	7.5%	-	7.4%	-	6/30/2018
Ocean Avenue II	6/11/2014	-	-	15.5%	-	3/31/2018
Ocean Avenue III	4/15/2016	-	-	33.6%	-	3/31/2018
Paladin III	11/30/2007	-	-	7.9%	-	3/31/2018
Pathway 6	5/24/2011	16.0%	16.0%	13.1%	13.1%	3/31/2018
<i>Benchmark⁴</i>		14.8%	-	-	-	3/31/2018
Pathway 7	2/7/2013	14.6%	14.6%	11.2%	11.2%	3/31/2018
<i>Benchmark⁵</i>		14.2%	-	-	-	3/31/2018
Pathway 8 ¹	11/6/2015	-	-	-	-	-
Pathway Private Equity Fund	11/9/1998	10.3%	10.3%	8.5%	8.5%	3/31/2018
<i>Benchmark⁶</i>		10.5%	-	-	-	3/31/2018
Pathway Private Equity Fund 2008	12/26/2008	15.0%	15.0%	12.3%	12.3%	3/31/2018
<i>Benchmark⁷</i>		13.4%	-	-	-	3/31/2018
Siguler Guff CCCERA Opportunities	6/3/2014	16.0%	16.5%	15.3%	13.4%	12/31/2017
Siguler Guff Secondary Opportunities ⁸	11/30/2016	86.2%	492.2%	79.8%	271.1%	3/31/2018
Wastewater Opportunity Fund	12/8/2015	-1.7%	-	-19.3%	-	3/31/2018

¹Manager has yet to report IRR figure due to no capital invested or meaningful distributions.

²Fund level data includes CCCERA and all other fund investors.

³Net IRR calculated after deductions of management fees and carried interest to the General Partner.

⁴Private iQ global all private equity median pooled return for vintage years 2011-2014, as of March 31, 2018.

⁵Private iQ global all private equity median pooled return for vintage years 2012-2016, as of March 31, 2018.

⁶Private iQ global all private equity median pooled return for vintage years 1999-2011, as of March 31, 2018.

⁷Private iQ global all private equity median pooled return for vintage years 2008-2014, as of March 31, 2018.

Total Fund
Performance Analysis - 3 Years (Net of Fees)

Period Ending: June 30, 2018

	3 Years										
	Anlzd Ret	Ann Excess BM Return	Anlzd Std Dev	Anlzd Alpha	Beta	Tracking Error	R-Squared	Sharpe Ratio	Info Ratio	Up Mkt Cap Ratio	Down Mkt Cap Ratio
Jackson Square Partners	9.33%	-5.64%	11.71%	-9.17%	1.24	6.40%	0.73	0.74	-0.88	67.52%	136.22%
Robeco Boston Partners	8.74%	0.48%	9.19%	0.18%	1.04	3.19%	0.88	0.87	0.15	102.28%	94.76%
Emerald Advisers	10.03%	-0.58%	12.70%	-0.21%	0.97	5.25%	0.83	0.73	-0.11	92.72%	93.68%
Ceredex	11.00%	-0.22%	10.56%	3.61%	0.66	7.88%	0.61	0.98	-0.03	88.79%	75.67%
Pyrford	3.52%	0.01%	8.75%	1.32%	0.63	6.46%	0.71	0.32	0.00	61.66%	51.99%
William Blair	6.25%	-0.31%	11.24%	0.25%	0.92	2.91%	0.94	0.49	-0.11	92.59%	92.92%
Artisan Partners	12.42%	4.23%	12.08%	3.08%	1.14	6.58%	0.71	0.97	0.64	122.99%	55.31%
First Eagle	6.81%	-1.37%	6.78%	1.14%	0.69	3.88%	0.84	0.90	-0.35	79.30%	78.88%
Allianz Global Investors	3.88%	-1.66%	5.47%	-1.01%	0.88	1.26%	0.96	0.58	-1.32	78.48%	100.15%
Adelante	6.69%	-1.15%	7.59%	0.42%	0.80	2.40%	0.96	0.79	-0.48	86.78%	94.33%
AFL-CIO	1.40%	-0.32%	3.05%	-0.22%	0.94	0.39%	0.99	0.23	-0.84	91.48%	102.11%
Wellington Real Total Return	-2.46%	-8.36%	6.41%	-11.62%	1.55	6.15%	0.09	-0.49	-1.36	-38.40%	--

Performance Analysis excludes closed end funds and those funds without 3 years of performance.

Total Fund
Performance Analysis - 5 Years (Net of Fees)

Period Ending: June 30, 2018

5 Years

	Anlzd Ret	Ann Excess BM Return	Anlzd Std Dev	Anlzd Alpha	Beta	Tracking Error	R-Squared	Sharpe Ratio	Info Ratio	Up Mkt Cap Ratio	Down Mkt Cap Ratio
Jackson Square Partners	13.64%	-2.71%	10.56%	-6.38%	1.22	5.37%	0.77	1.25	-0.51	83.27%	136.22%
Robeco Boston Partners	10.92%	0.58%	8.37%	0.45%	1.01	2.82%	0.89	1.25	0.21	101.45%	85.22%
Emerald Advisers	15.62%	1.98%	13.62%	1.48%	1.04	5.84%	0.82	1.12	0.34	110.48%	90.70%
Ceredex	12.02%	0.84%	11.60%	2.76%	0.83	6.32%	0.74	1.00	0.13	99.29%	84.69%
William Blair	7.75%	0.58%	10.14%	1.08%	0.93	2.67%	0.94	0.72	0.22	97.85%	88.05%
Artisan Partners	13.52%	4.11%	10.34%	3.49%	1.07	5.66%	0.70	1.27	0.73	128.61%	52.10%
First Eagle	7.50%	-1.91%	6.36%	0.74%	0.72	3.38%	0.85	1.11	-0.57	77.87%	89.53%
Allianz Global Investors	4.19%	-1.31%	4.85%	-0.78%	0.90	1.07%	0.96	0.78	-1.22	81.87%	102.99%
Adelante	8.66%	0.24%	11.22%	1.04%	0.91	2.14%	0.97	0.73	0.11	94.29%	87.75%
AFL-CIO	2.17%	-0.10%	2.79%	0.03%	0.94	0.48%	0.97	0.62	-0.21	93.28%	91.39%
Wellington Real Total Return	-1.33%	-6.92%	6.19%	-10.78%	1.69	5.76%	0.16	-0.28	-1.20	-5.16%	1,307.20%

Performance Analysis excludes closed end funds and those funds without 5 years of performance.

Total Fund Investment Fund Fee Analysis

Period Ending: June 30, 2018

Name	Asset Class	Fee Schedule	Market Value	Estimated Fee Value	Estimated Fee
BlackRock Russell 1000 Index	Global Equity	0.03% of Assets	\$123,396,474	\$37,019	0.03%
Jackson Square Partners	Global Equity	0.50% of First 100.0 Mil, 0.40% of Next 150.0 Mil, 0.35% Thereafter	\$423,687,946	\$1,707,908	0.40%
Robeco Boston Partners	Global Equity	0.50% of First 25.0 Mil, 0.30% Thereafter	\$395,079,843	\$1,235,240	0.31%
Emerald Advisers	Global Equity	0.75% of First 10.0 Mil, 0.60% Thereafter	\$310,233,552	\$1,876,401	0.60%
Ceredex	Global Equity	0.85% of First 10.0 Mil, 0.68% of Next 40.0 Mil, 0.51% Thereafter	\$273,911,563	\$1,498,949	0.55%
Pyrford	Global Equity	0.70% of First 50.0 Mil, 0.50% of Next 50.0 Mil, 0.35% Thereafter	\$443,155,210	\$1,801,043	0.41%
William Blair	Global Equity	0.80% of First 20.0 Mil, 0.60% of Next 30.0 Mil, 0.50% of Next 50.0 Mil, 0.45% of Next 50.0 Mil, 0.40% of Next 50.0 Mil, 0.30% Thereafter	\$490,712,598	\$1,887,138	0.38%
PIMCO RAE Emerging Markets	Global Equity	0.75% of First 50.0 Mil, 0.68% of Next 50.0 Mil, 0.50% of Next 100.0 Mil, 0.45% Thereafter	\$344,791,961	\$1,864,064	0.54%
TT Emerging Markets	Global Equity	0.70% of First 100.0 Mil, 0.65% of Next 100.0 Mil, 0.60% Thereafter	\$323,528,055	\$2,091,168	0.65%
Artisan Partners	Global Equity	0.75% of Assets	\$397,147,350	\$2,978,605	0.75%
First Eagle	Global Equity	0.75% of Assets	\$360,330,728	\$2,702,480	0.75%
Allianz Global Investors	High Yield Fixed Income	0.50% of First 50.0 Mil, 0.40% of Next 50.0 Mil, 0.35% Thereafter	\$346,773,913	\$1,313,709	0.38%
AFL-CIO	Global Fixed Income	0.43% of Assets	\$317,519,384	\$1,365,333	0.43%

Mutual fund fees shown are sourced from Morningstar and are as of the most current prospectus.

Total Fund
Investment Fund Fee Analysis

Period Ending: June 30, 2018

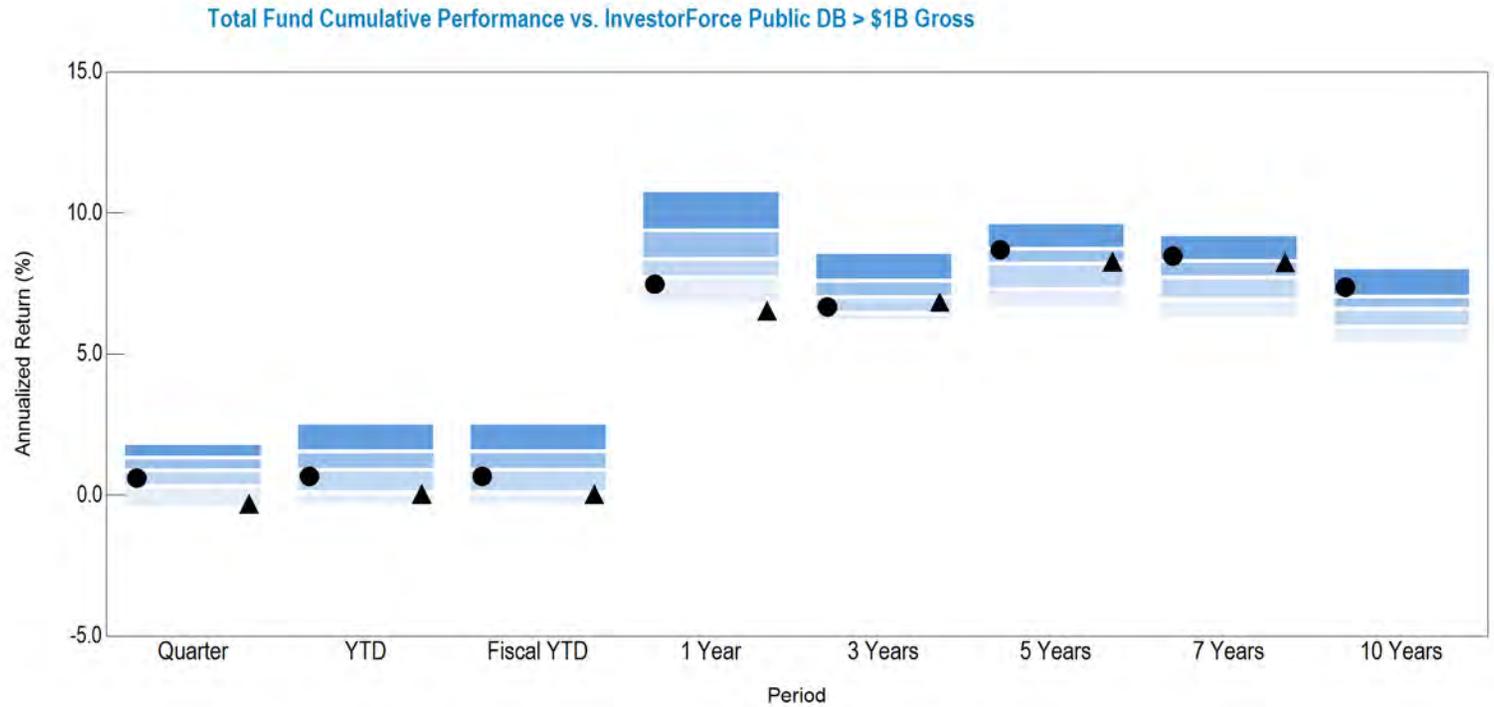
Name	Asset Class	Fee Schedule	Market Value	Estimated Fee Value	Estimated Fee
Wellington Real Total Return	Global Fixed Income	0.55% of Assets	\$187,068,912	\$1,028,879	0.55%
DFA Short Credit	Global Fixed Income	0.20% of First 25.0 Mil, 0.10% Thereafter	\$329,410,558	\$354,411	0.11%
Insight Short Duration	Global Fixed Income	0.06% of First 500.0 Mil, 0.05% of Next 500.0 Mil, 0.04% Thereafter	\$697,455,828	\$398,728	0.06%
Sit Short Duration	Global Fixed Income	0.15% of Assets	\$482,786,680	\$724,180	0.15%

Mutual fund fees shown are sourced from Morningstar and are as of the most current prospectus.

Total Fund

Peer Universe Comparison: Cumulative Performance (Gross of Fees)

Period Ending: June 30, 2018



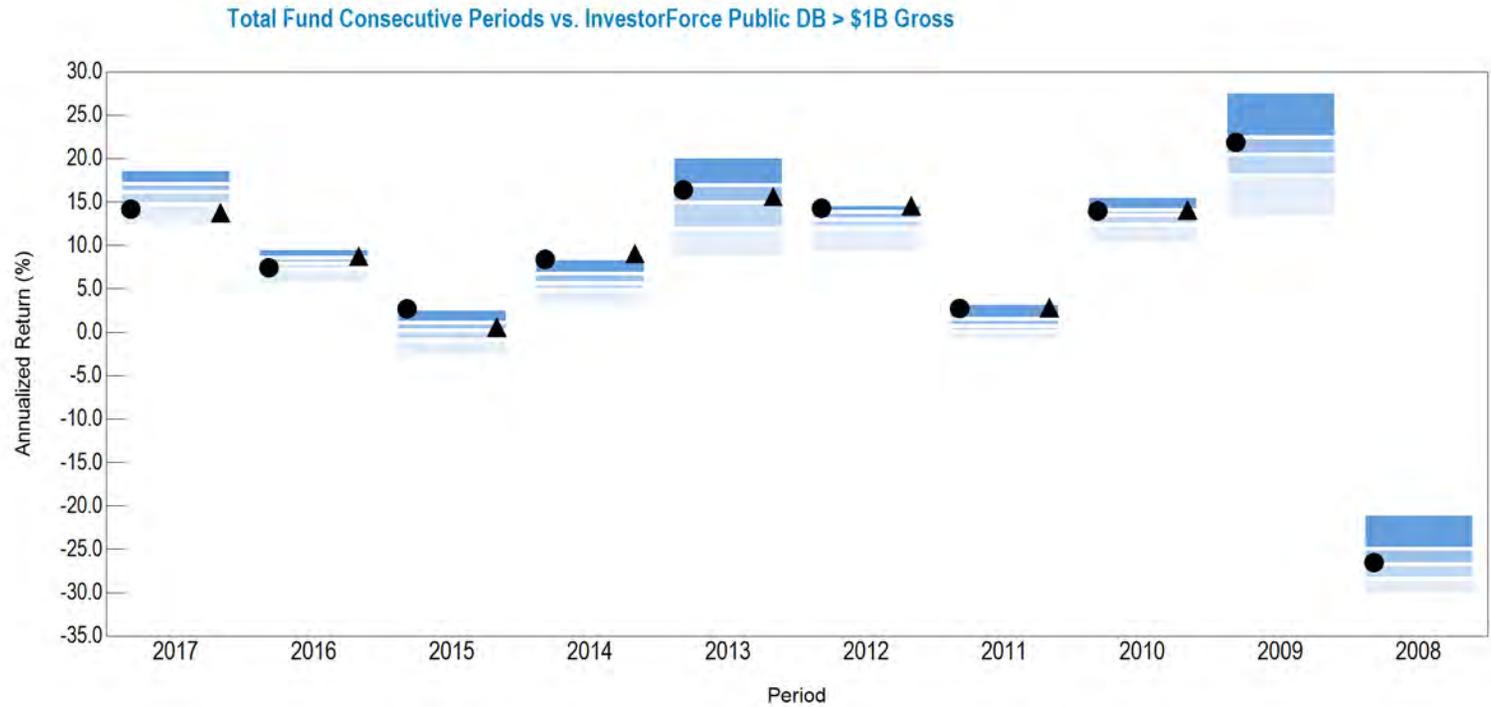
	Quarter		YTD		Fiscal YTD		1 Year		3 Years		5 Years		7 Years		10 Years									
5th Percentile	1.8	2.6	2.6	10.8	8.6	9.7	9.2	8.1	1.3	1.6	1.6	9.4	7.6	8.7	8.3	7.1								
25th Percentile	0.9	0.9	0.9	8.4	7.0	8.2	7.7	6.6	0.3	0.1	0.1	7.7	6.5	7.3	7.0	6.0								
Median	-0.4	-0.3	-0.3	6.8	6.2	6.6	6.3	5.4	-0.3	-0.3	-0.3	6.8	6.2	6.6	6.3	5.4								
75th Percentile	51	51	51	51	51	50	50	47	0.6	(58)	0.7	(58)	0.7	(58)	7.5	(89)	6.7	(68)	8.7	(28)	8.5	(18)	7.4	(16)
95th Percentile	51	51	51	51	51	50	50	47	-0.3	(93)	0.0	(83)	0.0	(83)	6.5	(99)	6.8	(63)	8.3	(46)	8.3	(28)	--	(--)
# of Portfolios	51	51	51	51	51	50	50	47	0.6	(58)	0.7	(58)	0.7	(58)	7.5	(89)	6.7	(68)	8.7	(28)	8.5	(18)	7.4	(16)
● Total Fund	0.6	(58)	0.7	(58)	0.7	(58)	7.5	(89)	6.7	(68)	8.7	(28)	8.5	(18)	7.4	(16)								
▲ Policy Index	-0.3	(93)	0.0	(83)	0.0	(83)	6.5	(99)	6.8	(63)	8.3	(46)	8.3	(28)	--	(--)								

Effective 1/01/2017, only traditional asset class (public equity, public fixed income, REITs) investment management fees will be included in the gross of fee return calculation.

Total Fund

Peer Universe Comparison: Consecutive Periods (Gross of Fees)

Period Ending: June 30, 2018



	Return (Rank)									
	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
5th Percentile	18.8	9.7	2.7	8.5	20.2	14.7	3.3	15.7	27.7	-21.0
25th Percentile	17.2	8.6	1.1	6.8	17.0	13.9	1.6	14.2	22.5	-24.9
Median	16.2	8.0	0.3	5.7	15.0	13.0	0.8	13.5	20.5	-26.7
75th Percentile	14.8	7.4	-0.7	4.9	12.0	12.1	0.1	12.5	18.1	-28.3
95th Percentile	12.4	5.5	-2.8	3.1	8.7	9.2	-0.9	10.2	13.4	-30.2
# of Portfolios	98	92	98	79	67	74	68	66	66	65
● Total Fund	14.2 (83)	7.4 (74)	2.7 (5)	8.4 (6)	16.4 (33)	14.3 (13)	2.7 (9)	14.0 (29)	21.9 (34)	-26.5 (48)
▲ Policy Index	13.8 (89)	8.8 (17)	0.6 (40)	9.0 (2)	15.6 (43)	14.6 (8)	2.8 (9)	14.1 (27)	-- (--)	-- (--)

Effective 1/01/2017, only traditional asset class (public equity, public fixed income, REITs) investment management fees will be included in the gross of fee return calculation.

Total Fund

Peer Universe Comparison: Consecutive Periods (Net of Fees)

Period Ending: June 30, 2018

Total Fund Consecutive Periods vs. InvestorForce Public DB > \$1B Net

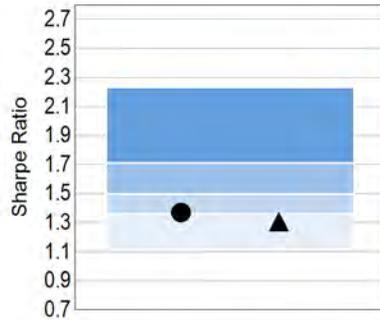


	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
5th Percentile	18.6	9.3	2.4	7.6	19.5	14.3	4.2	15.1	27.5	-20.9
25th Percentile	16.6	8.4	0.8	6.1	16.0	13.4	1.5	13.8	21.7	-25.7
Median	15.6	7.7	-0.4	5.1	14.3	12.7	0.6	12.8	20.0	-26.9
75th Percentile	14.1	7.1	-1.3	4.4	11.0	11.8	-0.3	11.8	17.7	-28.3
95th Percentile	10.7	5.3	-3.2	2.6	8.5	9.0	-1.2	9.3	13.4	-30.5
# of Portfolios	61	62	57	55	48	44	42	41	40	39
● Total Fund	13.9 (81)	6.9 (78)	2.1 (12)	7.7 (5)	15.6 (33)	13.6 (21)	2.1 (12)	13.3 (34)	21.1 (33)	-26.9 (51)
▲ Policy Index	13.8 (84)	8.8 (14)	0.6 (29)	9.0 (2)	15.6 (33)	14.6 (1)	2.8 (11)	14.1 (15)	-- (--)	-- (--)

Total Fund
 Sharpe Ratio Ranking (Gross of Fees)

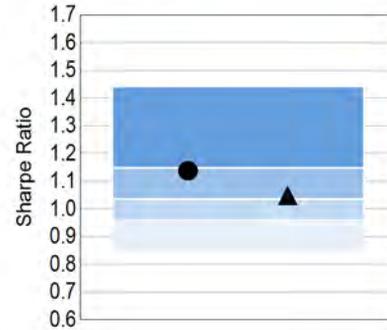
Period Ending: June 30, 2018

Sharpe Ratio
 1 Year



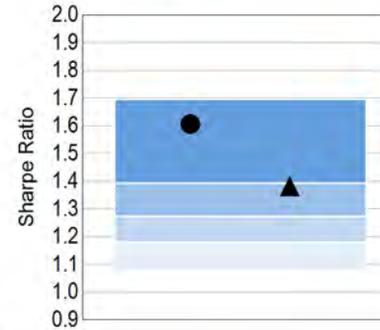
● Total Fund	
Value	1.4
Rank	75
▲ Policy Index	
Value	1.3
Rank	85
Universe	
5th %tile	2.2
25th %tile	1.7
Median	1.5
75th %tile	1.4
95th %tile	1.1

Sharpe Ratio
 3 Year



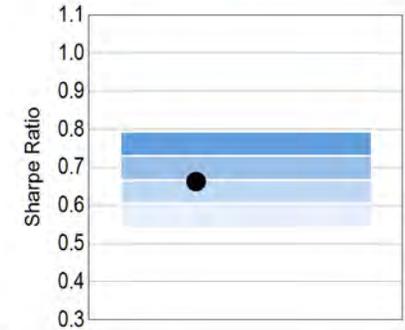
● Total Fund	
Value	1.1
Rank	28
▲ Policy Index	
Value	1.0
Rank	47
Universe	
5th %tile	1.4
25th %tile	1.1
Median	1.0
75th %tile	1.0
95th %tile	0.8

Sharpe Ratio
 5 Year



● Total Fund	
Value	1.6
Rank	11
▲ Policy Index	
Value	1.4
Rank	26
Universe	
5th %tile	1.7
25th %tile	1.4
Median	1.3
75th %tile	1.2
95th %tile	1.1

Sharpe Ratio
 10 Year



● Total Fund	
Value	0.7
Rank	53
▲ Policy Index	
Value	--
Rank	--
Universe	
5th %tile	0.8
25th %tile	0.7
Median	0.7
75th %tile	0.6
95th %tile	0.5

Domestic Equity Managers

Jackson Square Partners Manager Portfolio Overview

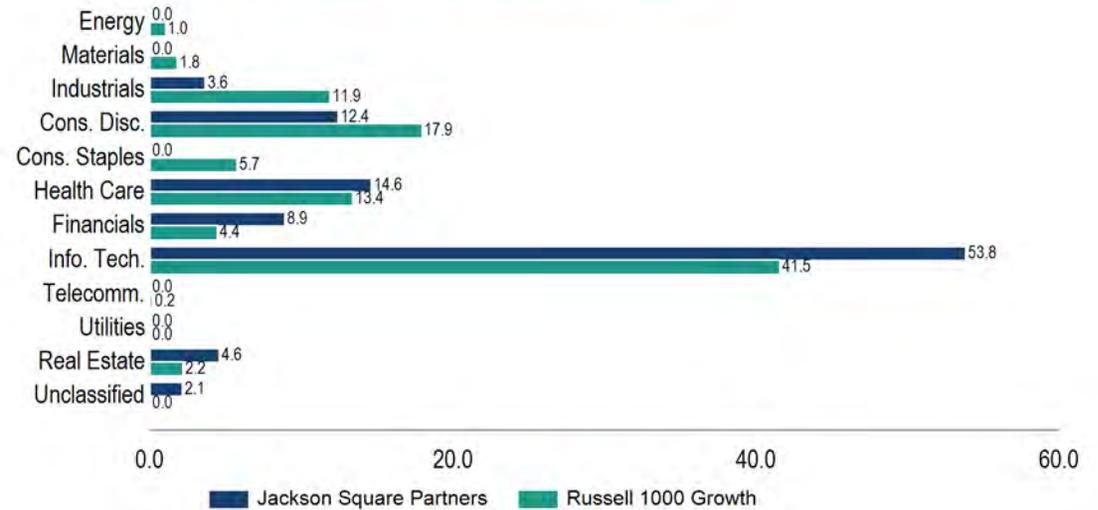
Period Ending: June 30, 2018

Domestic equity large cap growth portfolio concentrated in companies with sustainable long-term growth characteristics. Primary personnel include Jeffrey Van Harte, Christopher Bonavico, Christopher Ericksen, and Daniel Prislin.

Characteristics

	Portfolio	Russell 1000 Growth
Number of Holdings	32	542
Weighted Avg. Market Cap. (\$B)	157.93	247.27
Median Market Cap. (\$B)	43.17	11.99
Price To Earnings	37.53	27.41
Price To Book	8.16	8.07
Price To Sales	7.26	5.49
Return on Equity (%)	19.13	30.43
Yield (%)	0.72	1.25
Beta	1.24	1.00

Sector Allocation (%) vs Russell 1000 Growth



Largest Holdings

	End Weight	Return
MICROSOFT	8.43	8.51
PAYPAL HOLDINGS	6.55	9.75
VISA 'A'	6.25	10.90
MASTERCARD	5.82	12.36
BIOGEN	3.78	6.00
IQVIA HOLDINGS	3.78	1.74
ALPHABET A	3.66	8.88
FEDEX	3.63	-5.18
TAKE TWO INTACT.SFTW.	3.60	21.05
INTERCONTINENTAL EX.	3.51	1.75

Top Contributors

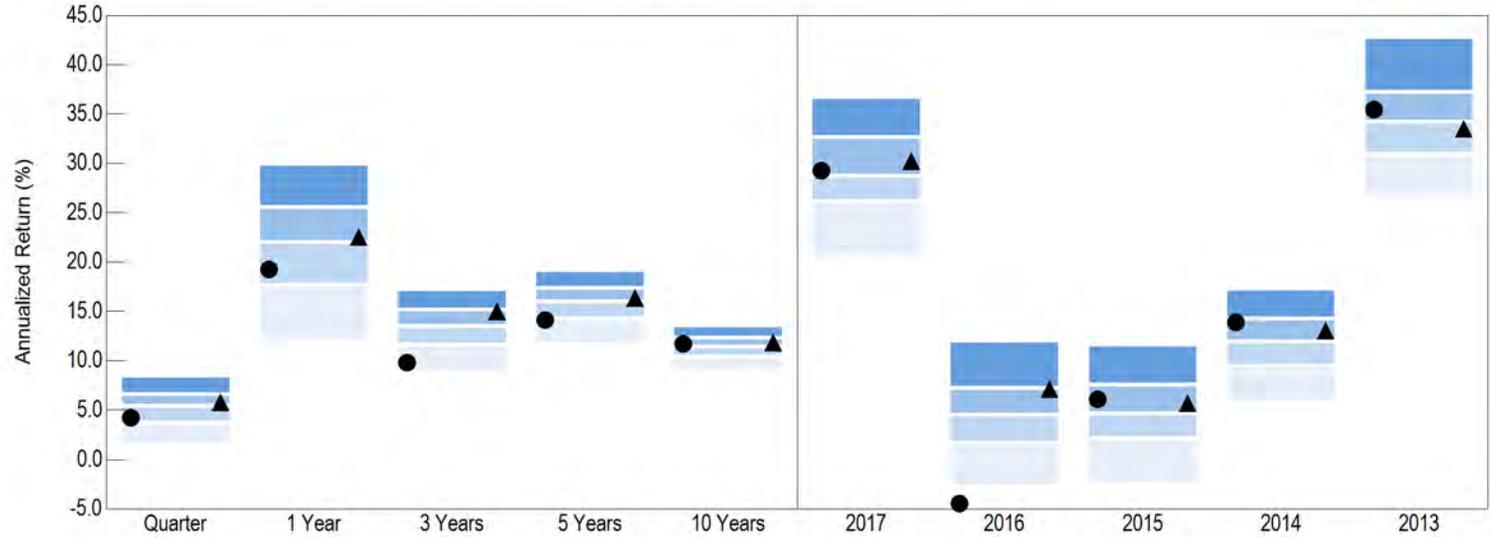
	Avg Wgt	Return	Contribution
TRIPADVISOR 'A'	2.44	36.24	0.88
MICROSOFT	8.39	8.51	0.71
MASTERCARD	5.64	12.36	0.70
TAKE TWO INTACT.SFTW.	3.30	21.05	0.69
VISA 'A'	6.24	10.90	0.68
PAYPAL HOLDINGS	6.58	9.75	0.64
ELECTRONIC ARTS	2.91	16.31	0.47
DOMINO'S PIZZA	2.24	21.06	0.47
UNITEDHEALTH GROUP	2.62	15.05	0.39
ILLUMINA	2.08	18.13	0.38

Bottom Contributors

	Avg Wgt	Return	Contribution
APPLIED MATS.	2.98	-16.61	-0.50
LIBERTY GLOBAL SR.C	2.94	-12.55	-0.37
EBAY	3.47	-9.89	-0.34
QURATE RETAIL SERIES A	2.00	-15.69	-0.31
DENTSPLY SIRONA	2.19	-12.83	-0.28
FEDEX	4.07	-5.18	-0.21
SYMANTEC	1.01	-19.83	-0.20
LIBERTY GLOBAL CL.A	0.68	-12.04	-0.08
CHARLES SCHWAB	3.51	-1.98	-0.07
CROWN CASTLE INTL.	3.00	-0.61	-0.02

Unclassified sector allocation includes cash allocations.

Jackson Square Partners vs. eV US Large Cap Growth Equity Gross Universe



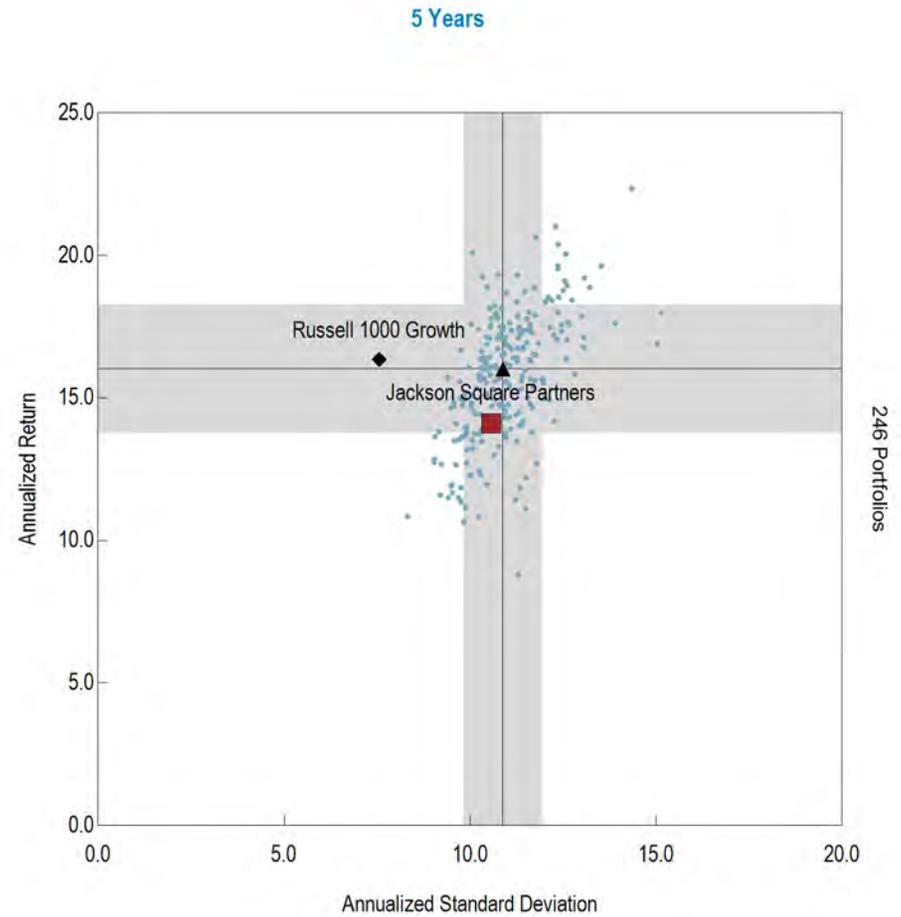
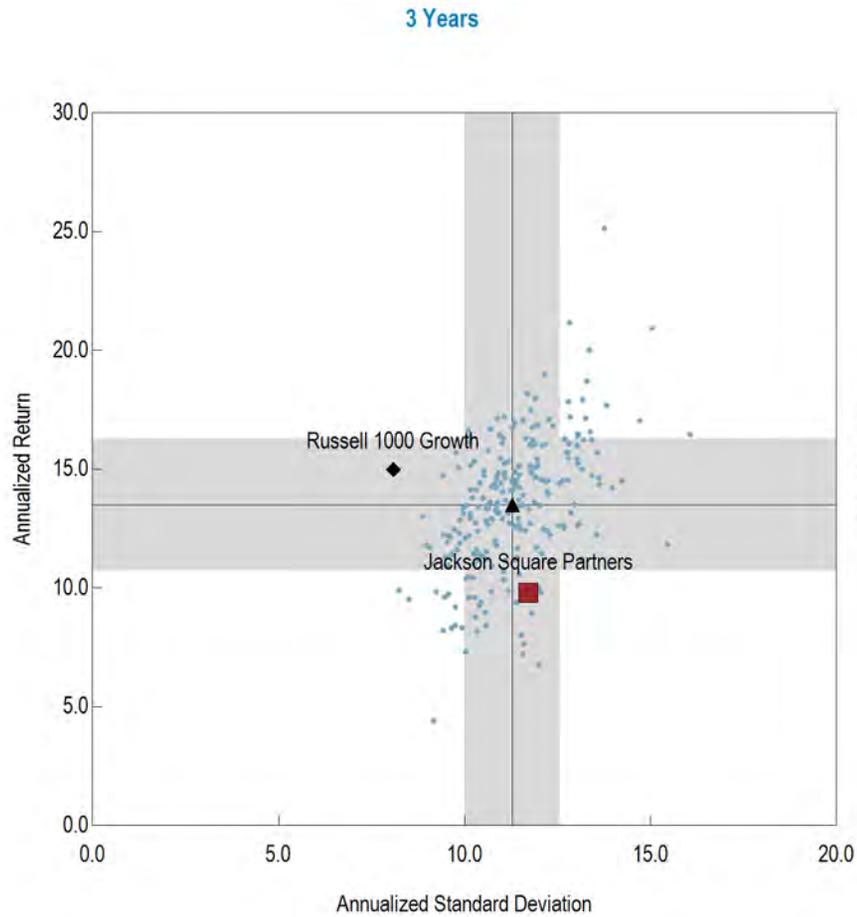
	Quarter	1 Year	3 Years	5 Years	10 Years	2017	2016	2015	2014	2013
5th Percentile	8.4	30.0	17.2	19.2	13.6	36.7	12.0	11.6	17.3	42.8
25th Percentile	6.6	25.6	15.2	17.4	12.3	32.7	7.3	7.6	14.3	37.3
Median	5.4	22.0	13.5	16.0	11.4	28.8	4.6	4.7	12.0	34.3
75th Percentile	3.7	17.7	11.7	14.3	10.5	26.2	1.8	2.1	9.5	31.0
95th Percentile	1.6	12.1	8.9	11.7	9.0	20.5	-2.7	-2.4	5.8	26.6
# of Portfolios	256	256	250	246	219	265	282	270	291	274
● Jackson Square Partners	4.2 (69)	19.2 (67)	9.8 (91)	14.1 (77)	11.7 (44)	29.3 (47)	-4.4 (98)	6.1 (37)	13.9 (31)	35.4 (40)
▲ Russell 1000 Growth	5.8 (43)	22.5 (46)	15.0 (29)	16.4 (44)	11.8 (40)	30.2 (42)	7.1 (26)	5.7 (42)	13.0 (38)	33.5 (56)

Rolling 3 Year Annualized Return (%)



Rolling 5 Year Annualized Return (%)





	3 Years			5 Years			
	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio		Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio
Jackson Square Partners	9.8%	11.7%	0.8	Jackson Square Partners	14.1%	10.6%	1.3
Russell 1000 Growth	15.0%	8.1%	1.8	Russell 1000 Growth	16.4%	7.6%	2.1
eV US Large Cap Growth Equity Gross Median	13.5%	11.3%	1.1	eV US Large Cap Growth Equity Gross Median	16.0%	10.9%	1.4

Robeco Boston Partners Manager Portfolio Overview

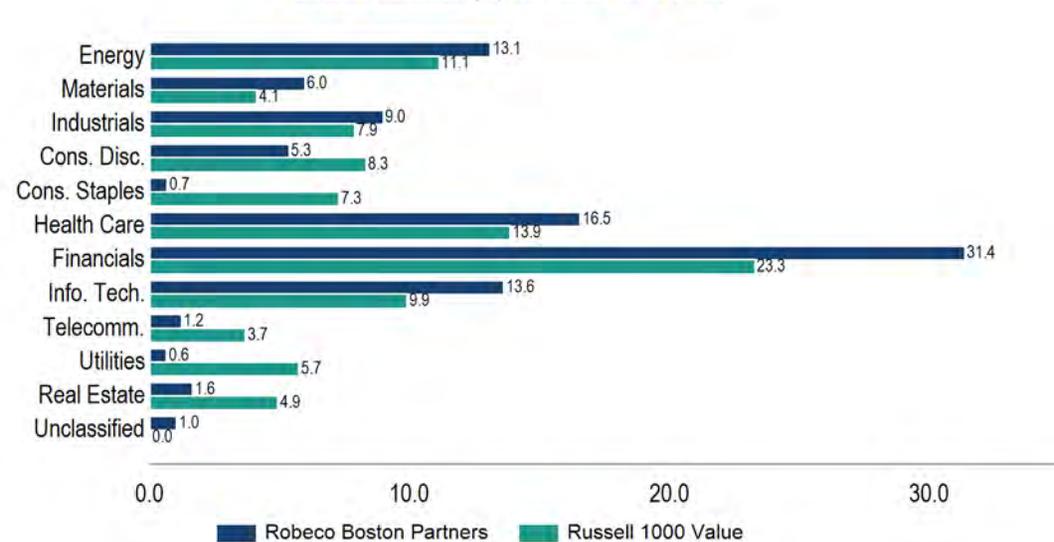
Period Ending: June 30, 2018

Domestic equity large cap value portfolio exhibiting low turnover in companies with low valuations relative to intrinsic value. Primary personnel include Mark Donovan and David Pyle.

Characteristics

	Portfolio	Russell 1000 Value
Number of Holdings	83	729
Weighted Avg. Market Cap. (\$B)	133.37	110.69
Median Market Cap. (\$B)	34.50	9.57
Price To Earnings	18.98	20.09
Price To Book	2.78	2.59
Price To Sales	2.59	2.99
Return on Equity (%)	15.27	12.33
Yield (%)	2.21	2.48
Beta	1.04	1.00

Sector Allocation (%) vs Russell 1000 Value



Largest Holdings

	End Weight	Return
BANK OF AMERICA	4.40	-5.61
BERKSHIRE HATHAWAY 'B'	3.97	-6.43
JP MORGAN CHASE & CO.	3.91	-4.77
JOHNSON & JOHNSON	3.76	-4.61
CITIGROUP	3.59	-0.39
CISCO SYSTEMS	3.26	1.13
WELLS FARGO & CO	3.08	6.58
CHEVRON	2.90	11.82
PFIZER	2.56	3.22
ROYAL DUTCH SHELL A ADR 1:2	2.24	9.93

Top Contributors

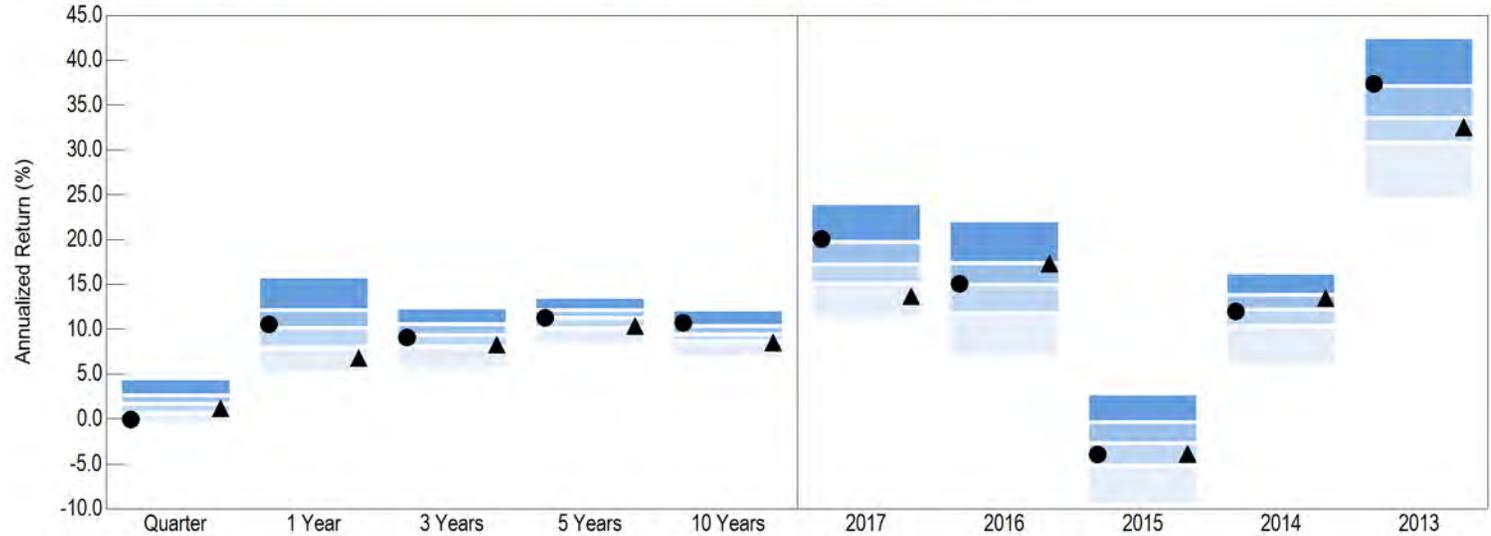
	Avg Wgt	Return	Contribution
ANDEAVOR	1.71	30.98	0.53
NETAPP	1.25	27.70	0.35
CHEVRON	2.79	11.82	0.33
CONOCOPHILLIPS	1.75	17.90	0.31
MERCK & COMPANY	1.83	12.31	0.23
ROYAL DUTCH SHELL A ADR 1:2	2.16	9.93	0.21
WELLS FARGO & CO	2.67	6.58	0.18
MARATHON OIL	0.50	29.63	0.15
METHANEX (NAS)	0.76	17.13	0.13
LABORATORY CORP. OF AM. HDG.	1.01	10.99	0.11

Bottom Contributors

	Avg Wgt	Return	Contribution
BERKSHIRE HATHAWAY 'B'	4.12	-6.43	-0.27
BANK OF AMERICA	4.52	-5.61	-0.25
CUMMINS	1.28	-17.34	-0.22
JP MORGAN CHASE & CO.	4.00	-4.77	-0.19
TE CONNECTIVITY	1.89	-9.43	-0.18
JOHNSON & JOHNSON	3.82	-4.61	-0.18
GOLDMAN SACHS GP.	1.43	-12.12	-0.17
BORGWARNER	0.97	-13.78	-0.13
DELTA AIR LINES	1.35	-9.09	-0.12
GENERAL DYNAMICS	0.75	-15.25	-0.11

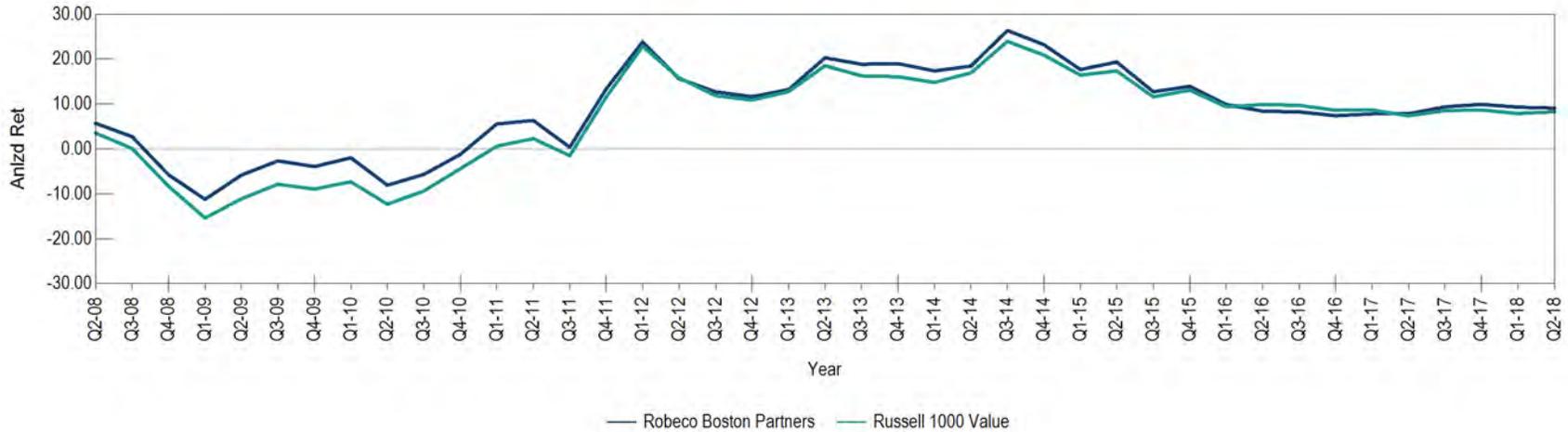
Unclassified sector allocation includes cash allocations.

Robeco Boston Partners vs. eV US Large Cap Value Equity Gross Universe

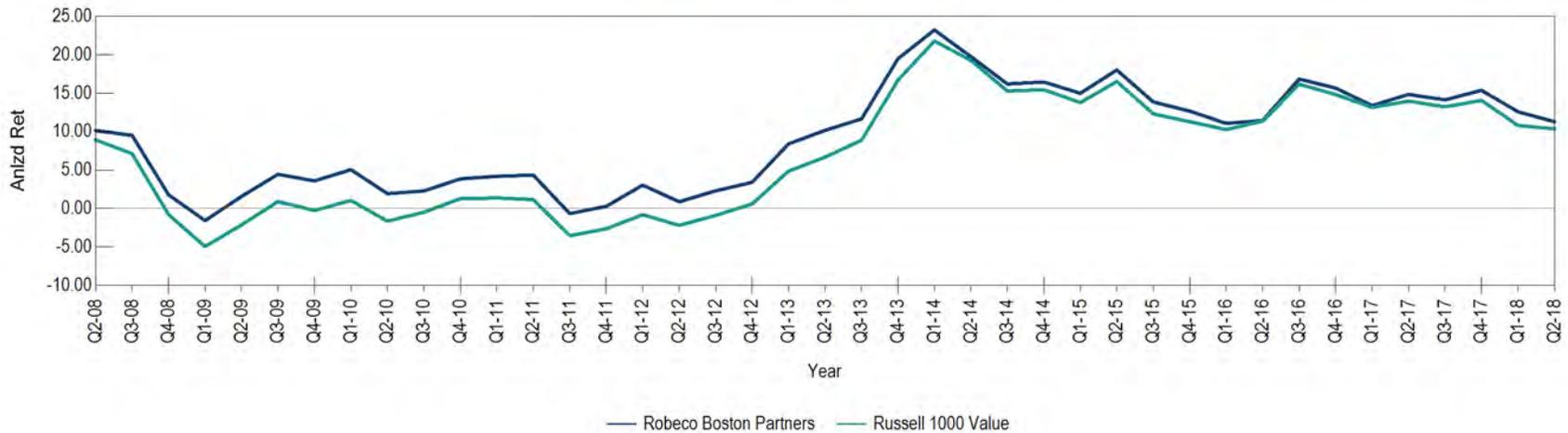


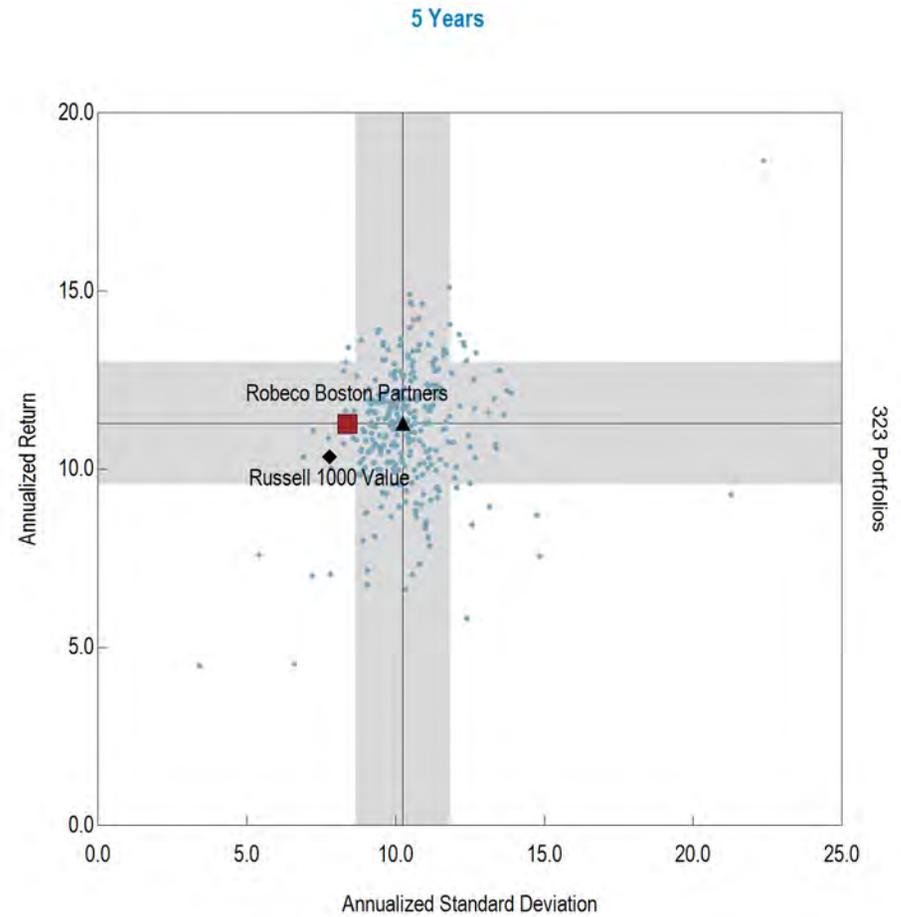
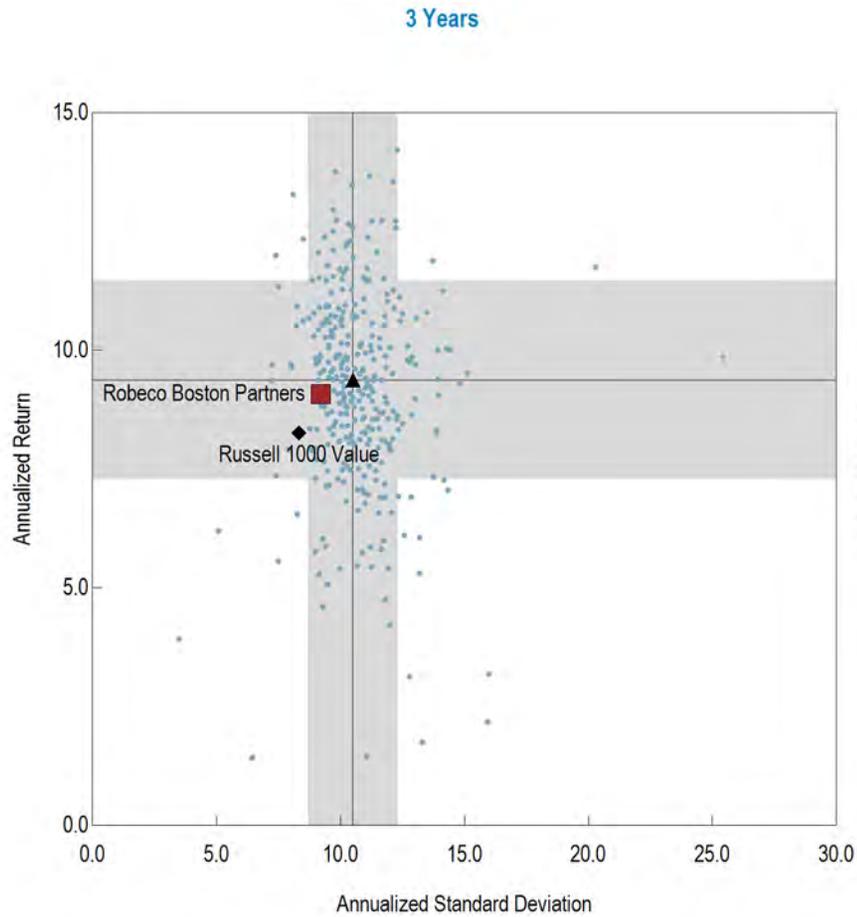
	Quarter	1 Year	3 Years	5 Years	10 Years	2017	2016	2015	2014	2013
5th Percentile	4.5	15.9	12.4	13.6	12.1	24.0	22.1	2.8	16.3	42.5
25th Percentile	2.6	12.1	10.6	12.2	10.4	19.8	17.4	-0.4	13.9	37.2
Median	1.7	10.2	9.4	11.3	9.5	17.2	15.0	-2.6	12.2	33.6
75th Percentile	0.7	8.1	8.1	10.2	8.7	15.1	11.8	-5.1	10.4	30.8
95th Percentile	-0.5	5.2	5.5	8.3	6.8	11.2	7.0	-9.4	5.9	24.6
# of Portfolios	336	336	333	323	268	342	346	312	307	310
● Robeco Boston Partners	-0.1 (91)	10.5 (46)	9.1 (56)	11.3 (51)	10.7 (18)	20.1 (23)	15.1 (50)	-3.9 (65)	12.0 (55)	37.4 (24)
▲ Russell 1000 Value	1.2 (66)	6.8 (86)	8.3 (73)	10.3 (72)	8.5 (79)	13.7 (87)	17.3 (26)	-3.8 (64)	13.5 (33)	32.5 (60)

Rolling 3 Year Annualized Return (%)



Rolling 5 Year Annualized Return (%)





	3 Years			5 Years			
	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio	
Robeco Boston Partners	9.1%	9.2%	0.9	Robeco Boston Partners	11.3%	8.4%	1.3
Russell 1000 Value	8.3%	8.3%	0.9	Russell 1000 Value	10.3%	7.8%	1.3
eV US Large Cap Value Equity Gross Median	9.4%	10.5%	0.8	eV US Large Cap Value Equity Gross Median	11.3%	10.2%	1.1

Emerald Advisers Manager Portfolio Overview

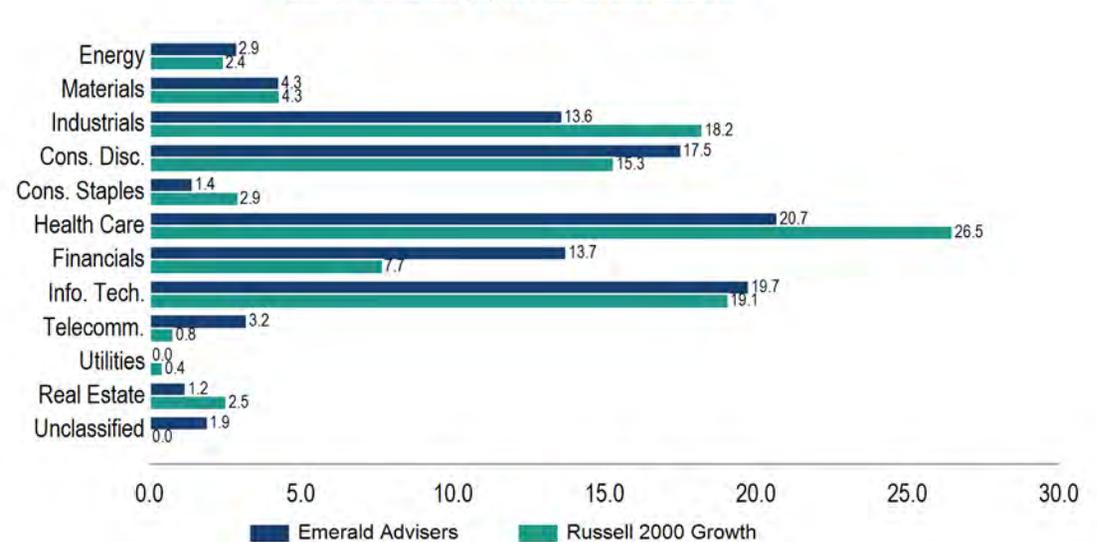
Period Ending: June 30, 2018

Domestic equity small cap growth portfolio of companies with significantly high growth rates. Primary personnel include Kenneth Mertz, Joseph Garner, and Stacey Sears.

Characteristics

	Portfolio	Russell 2000 Growth
Number of Holdings	119	1,225
Weighted Avg. Market Cap. (\$B)	2.53	2.41
Median Market Cap. (\$B)	1.83	1.00
Price To Earnings	-5.46	19.23
Price To Book	6.06	5.25
Price To Sales	4.10	3.56
Return on Equity (%)	-5.07	5.61
Yield (%)	0.42	0.49
Beta	0.97	1.00

Sector Allocation (%) vs Russell 2000 Growth



Largest Holdings

	End Weight	Return
CHEGG	2.74	34.51
FCB FINANCIAL HDG.CL.A	2.40	15.07
VONAGE HOLDINGS	2.12	21.03
VARONIS SYSTEMS	2.06	23.14
CADENCE BANCORP.'A'	1.99	6.48
TREX	1.82	15.09
EPAM SYSTEMS	1.79	8.57
PROOFPOINT	1.77	1.46
FIVE BELOW	1.67	33.23
SAREPTA THERAPEUTICS	1.48	78.40

Top Contributors

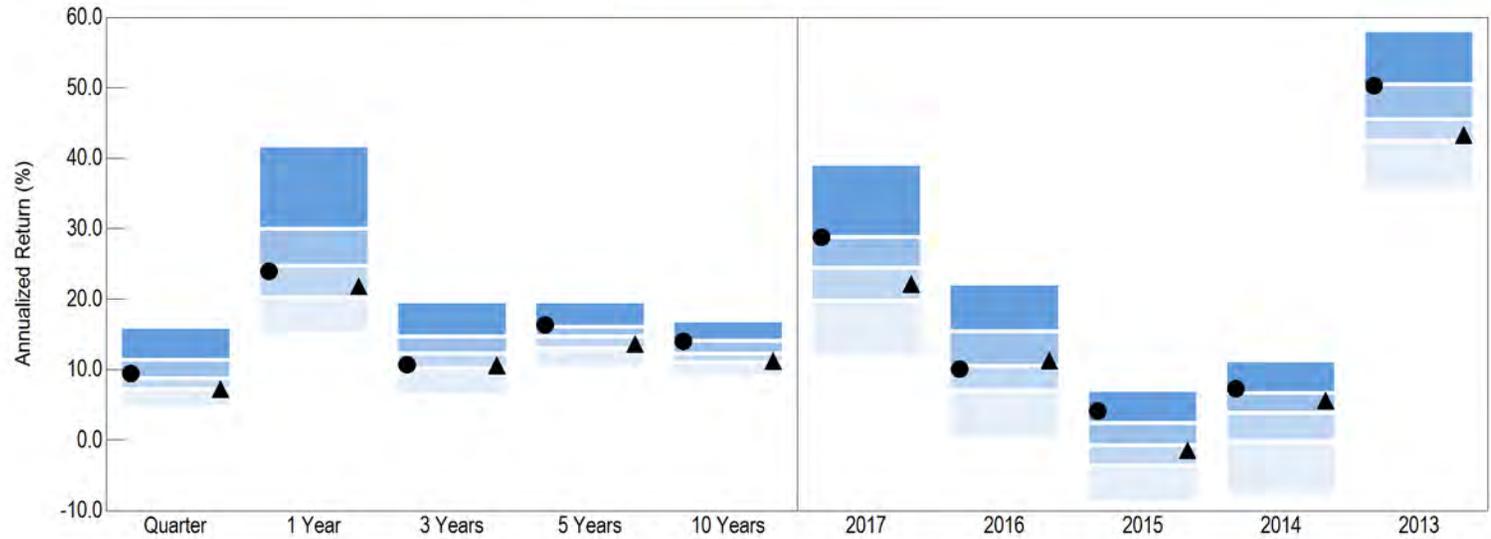
	Avg Wgt	Return	Contribution
CHEGG	2.47	34.51	0.85
SAREPTA THERAPEUTICS	1.02	78.40	0.80
TABULA RASA HEALTHCARE	0.71	64.51	0.46
TELADOC	1.03	44.04	0.46
FRESHPET	0.67	66.87	0.45
VARONIS SYSTEMS	1.90	23.14	0.44
FIVE BELOW	1.29	33.23	0.43
DECIPHERA PHARMS.	0.44	96.36	0.42
NUTRISYSTEM	0.93	43.99	0.41
VONAGE HOLDINGS	1.94	21.03	0.41

Bottom Contributors

	Avg Wgt	Return	Contribution
LENDINGTREE	2.14	-34.85	-0.75
GTT COMMUNICATIONS	1.59	-20.63	-0.33
CLOUDERA	0.75	-36.79	-0.28
MERCURY SYSTEMS	0.98	-21.23	-0.21
CALLON PTL.DEL.	0.80	-18.88	-0.15
KENNAMETAL	1.39	-10.15	-0.14
TUTOR PERINI	0.85	-16.33	-0.14
DYCOM INDS.	1.04	-12.19	-0.13
PUMA BIOTECHNOLOGY	0.91	-13.08	-0.12
US CONCRETE	0.80	-13.08	-0.10

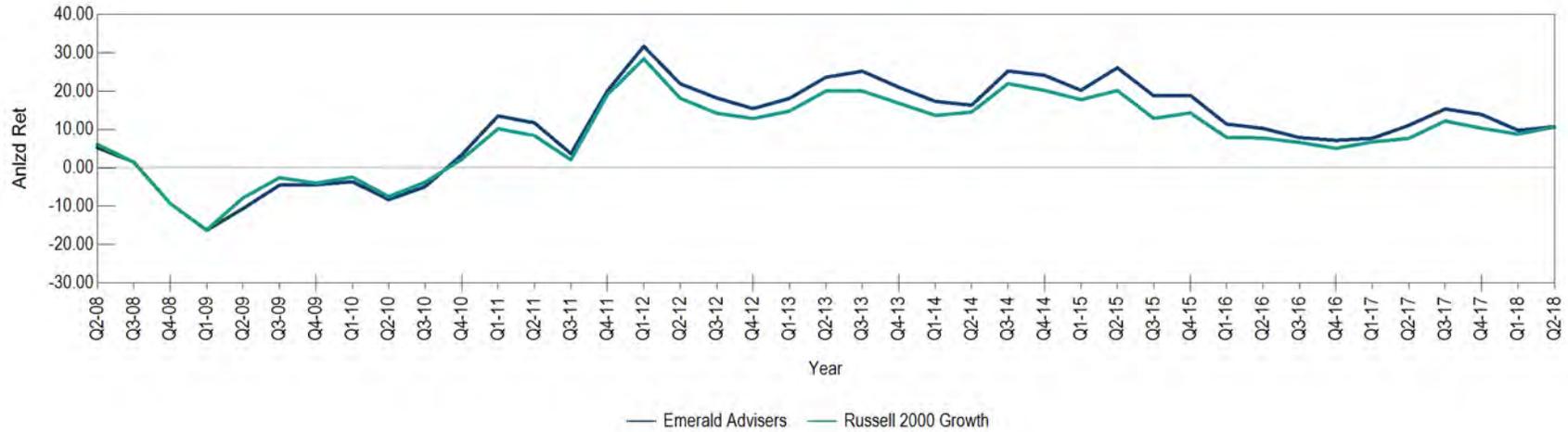
Unclassified sector allocation includes cash allocations.

Emerald Advisers vs. eV US Small Cap Growth Equity Gross Universe

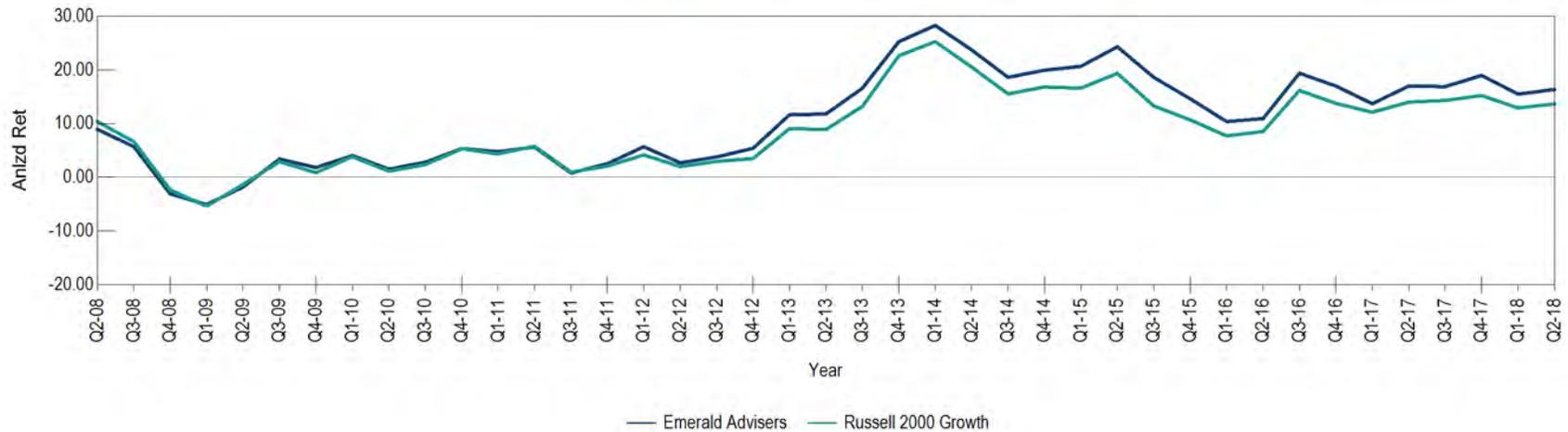


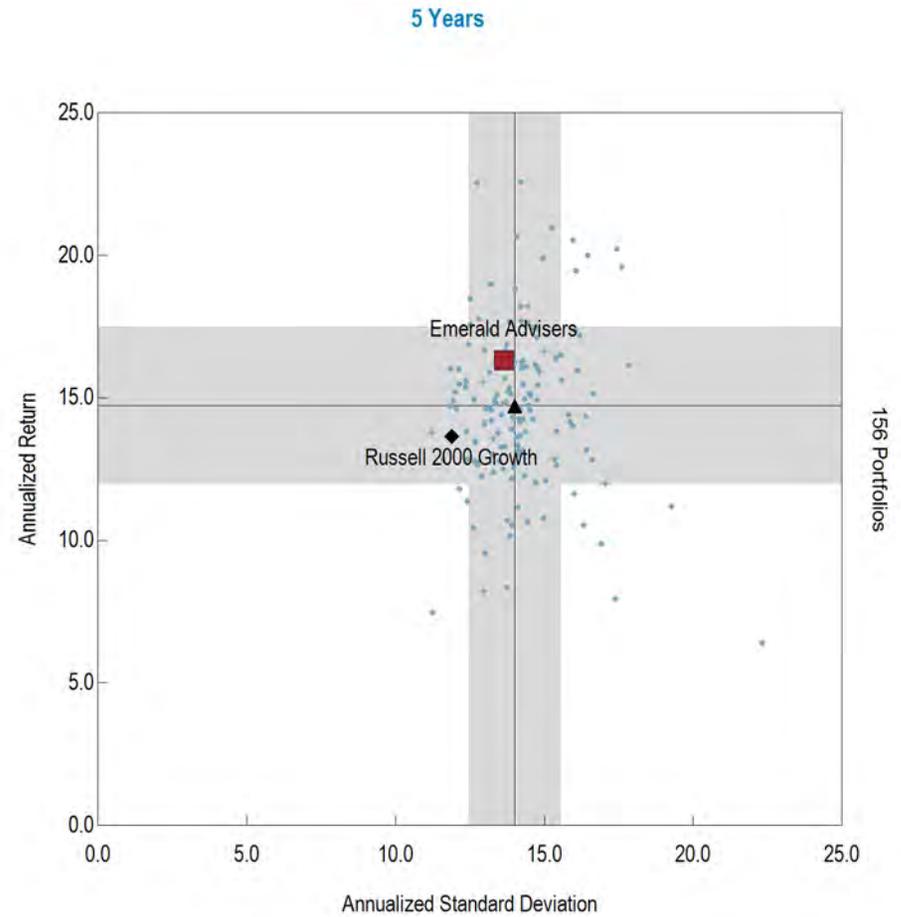
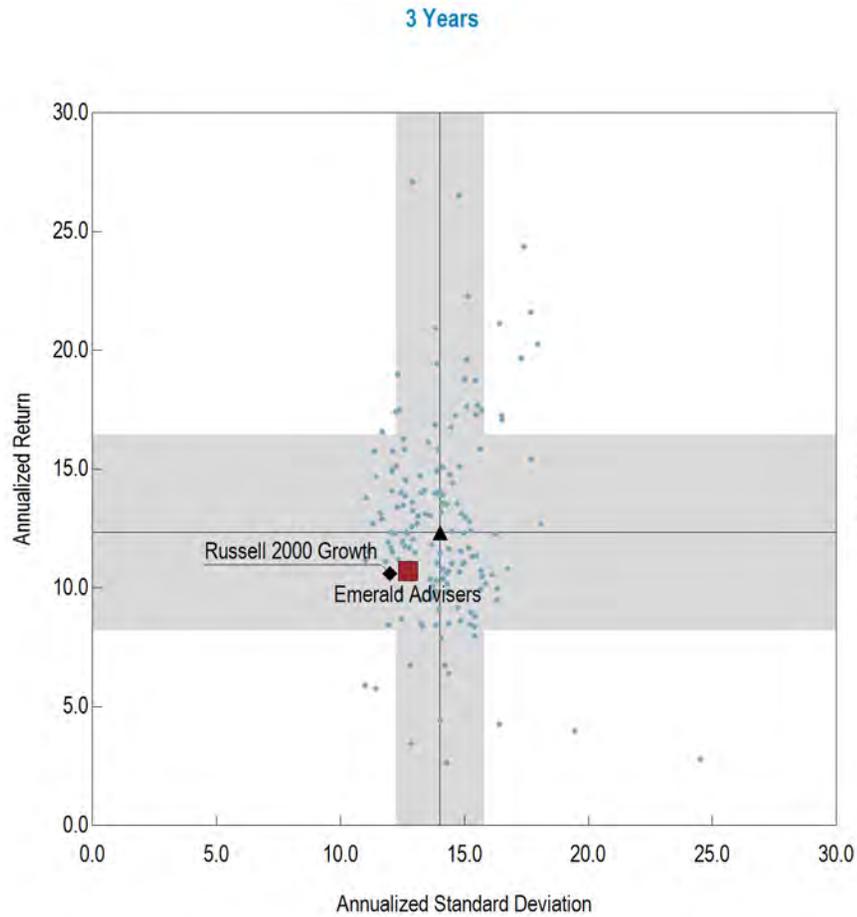
	Quarter	1 Year	3 Years	5 Years	10 Years	2017	2016	2015	2014	2013
5th Percentile	16.0	41.8	19.7	19.7	16.9	39.2	22.2	7.1	11.3	58.2
25th Percentile	11.4	30.0	14.7	16.1	14.1	28.9	15.5	2.5	6.7	50.6
Median	8.8	24.8	12.3	14.7	12.3	24.6	10.6	-0.6	3.9	45.6
75th Percentile	7.2	20.3	10.3	13.0	11.1	19.8	7.1	-3.5	-0.1	42.6
95th Percentile	4.7	15.2	6.5	10.4	9.1	12.1	0.2	-8.7	-7.6	35.6
# of Portfolios	168	168	163	156	138	174	170	154	161	160
● Emerald Advisers	9.4 (42)	24.0 (56)	10.7 (71)	16.3 (22)	14.0 (26)	28.8 (26)	10.1 (54)	4.1 (19)	7.3 (21)	50.3 (27)
▲ Russell 2000 Growth	7.2 (75)	21.9 (70)	10.6 (72)	13.6 (69)	11.2 (72)	22.2 (62)	11.3 (49)	-1.4 (59)	5.6 (32)	43.3 (70)

Rolling 3 Year Annualized Return (%)



Rolling 5 Year Annualized Return (%)





	3 Years			5 Years			
	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio	
Emerald Advisers	10.7%	12.7%	0.8	Emerald Advisers	16.3%	13.6%	1.2
Russell 2000 Growth	10.6%	12.0%	0.8	Russell 2000 Growth	13.6%	11.9%	1.1
eV US Small Cap Growth Equity Gross Median	12.3%	14.0%	0.9	eV US Small Cap Growth Equity Gross Median	14.7%	14.0%	1.0

Ceredex Manager Portfolio Overview

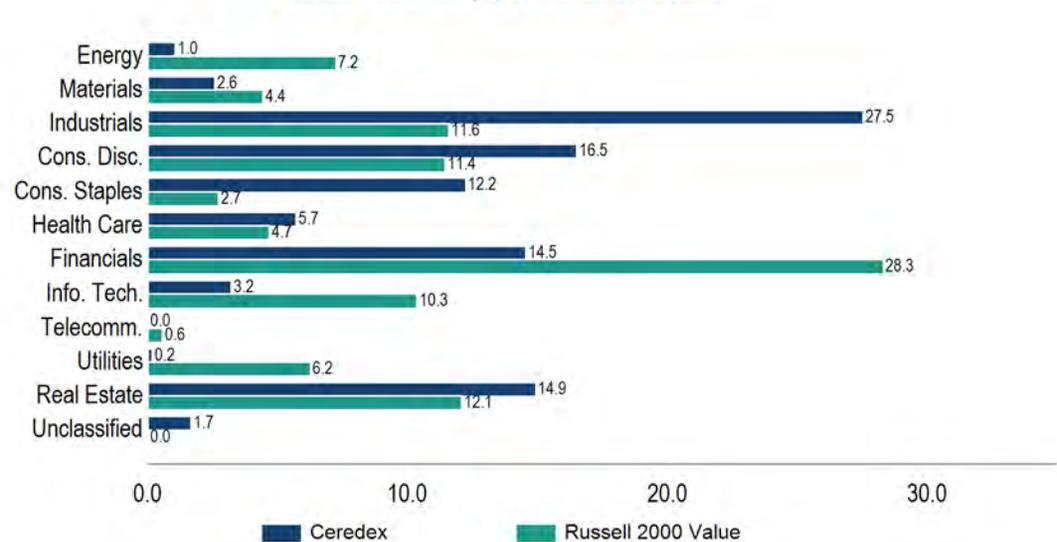
Period Ending: June 30, 2018

Domestic equity small cap value portfolio of companies with dividend yields and low valuations. Primary personnel include Brett Barner and David Maynard.

Characteristics

	Portfolio	Russell 2000 Value
Number of Holdings	83	1,364
Weighted Avg. Market Cap. (\$B)	2.53	2.05
Median Market Cap. (\$B)	1.86	0.81
Price To Earnings	25.80	15.57
Price To Book	3.25	1.73
Price To Sales	2.31	2.59
Return on Equity (%)	16.28	7.16
Yield (%)	2.59	1.78
Beta	0.66	1.00

Sector Allocation (%) vs Russell 2000 Value



Largest Holdings

	End Weight	Return
ENERGIZER HOLDINGS	4.83	6.22
B & G FOODS	4.35	28.05
MEREDITH	4.09	-4.18
KEMPER	3.80	33.15
HILL-ROM HOLDINGS	3.66	0.61
TETRA TECH	3.20	19.78
EVERCORE A	3.18	21.48
EDUCATION REAL.TST.	3.05	28.24
AMER.EAG.OUTFITTERS	2.81	17.41
PHYSICIANS REALTY TST.	2.78	3.95

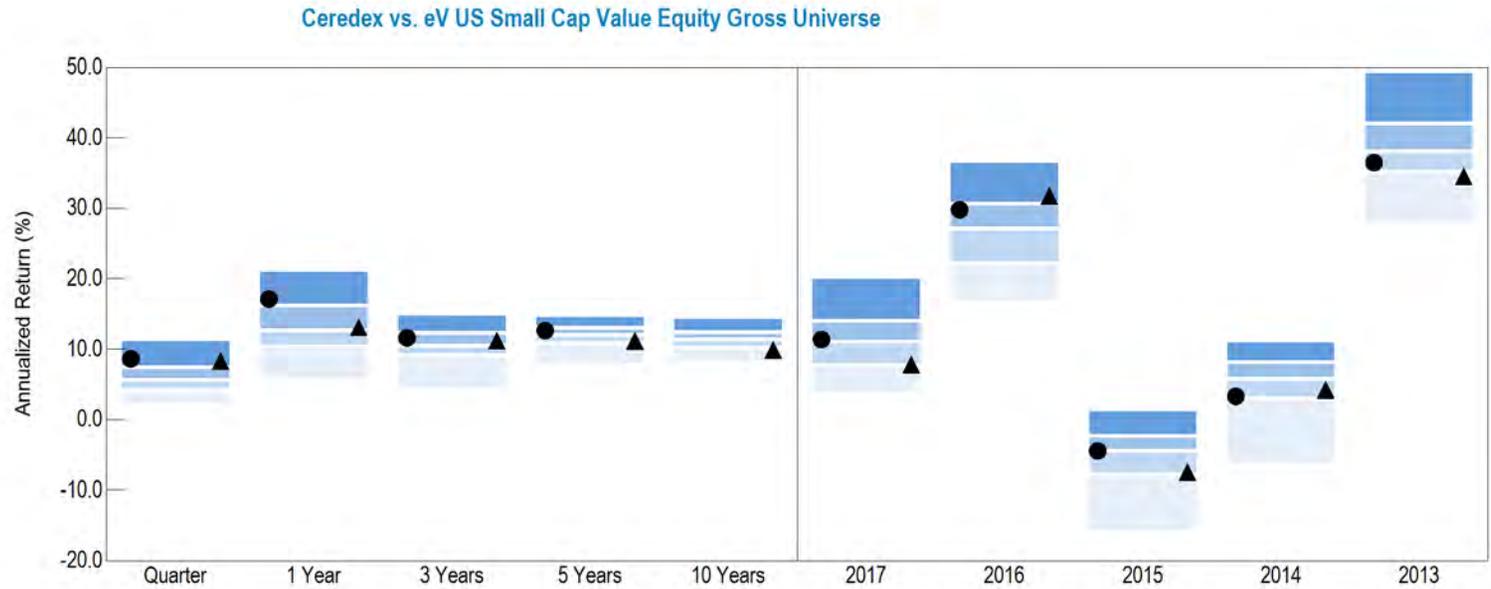
Top Contributors

	Avg Wgt	Return	Contribution
KEMPER	3.33	33.15	1.10
B & G FOODS	3.49	28.05	0.98
EDUCATION REAL.TST.	2.63	28.24	0.74
EVERCORE A	3.09	21.48	0.66
PLANTRONICS	2.39	26.58	0.64
TETRA TECH	3.03	19.78	0.60
AMER.EAG.OUTFITTERS	2.63	17.41	0.46
SM ENERGY	0.95	42.79	0.41
COVANTA HOLDING	2.53	15.52	0.39
KFORCE	1.23	27.25	0.34

Bottom Contributors

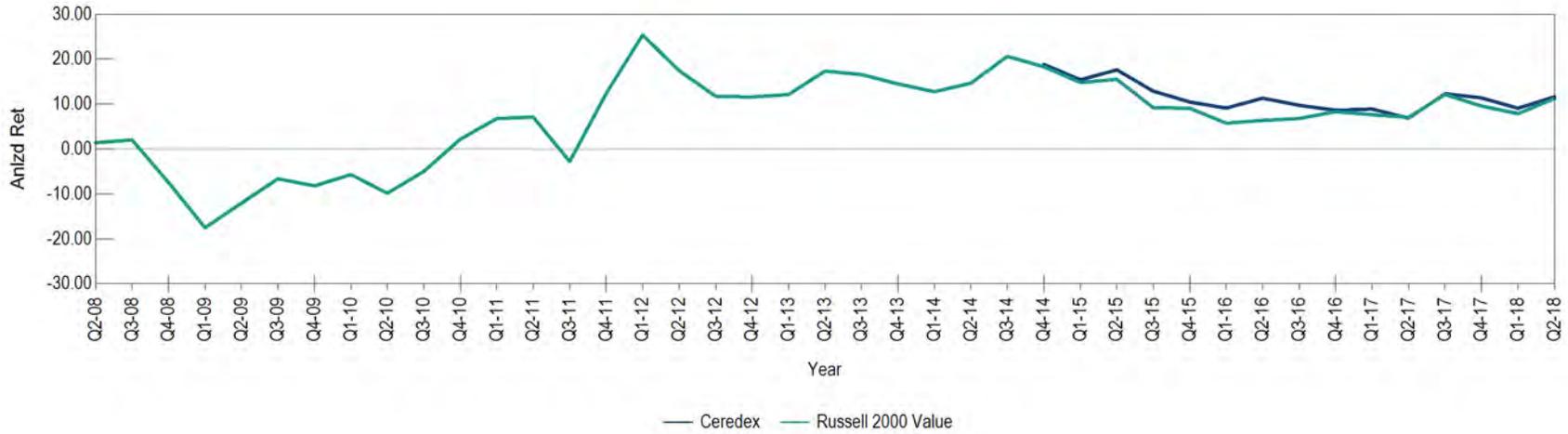
	Avg Wgt	Return	Contribution
KELLY SERVICES 'A'	1.63	-22.45	-0.37
BLOOMIN' BRANDS	1.45	-16.91	-0.24
MEREDITH	4.33	-4.18	-0.18
LITHIA MOTORS 'A'	2.20	-5.64	-0.12
SUN HYDRAULICS	0.81	-9.87	-0.08
CHICO'S FAS	0.82	-9.05	-0.07
ENPRO INDS.	0.79	-9.31	-0.07
HECLA MINING	1.25	-5.12	-0.06
KENNAMETAL	0.28	-10.15	-0.03
NN	0.14	-20.99	-0.03

Unclassified sector allocation includes cash allocations.

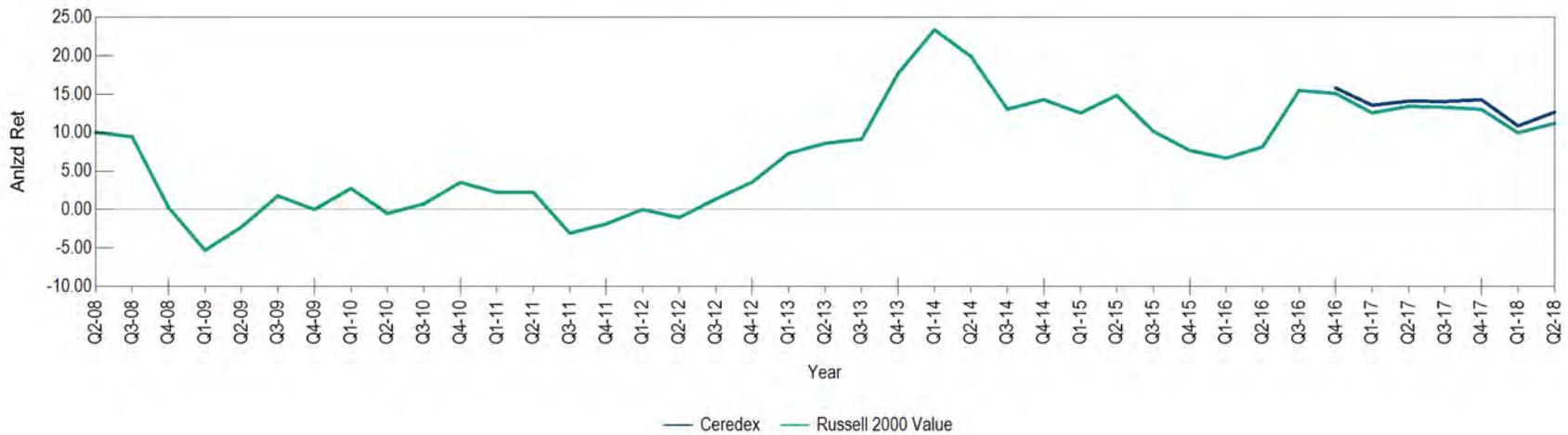


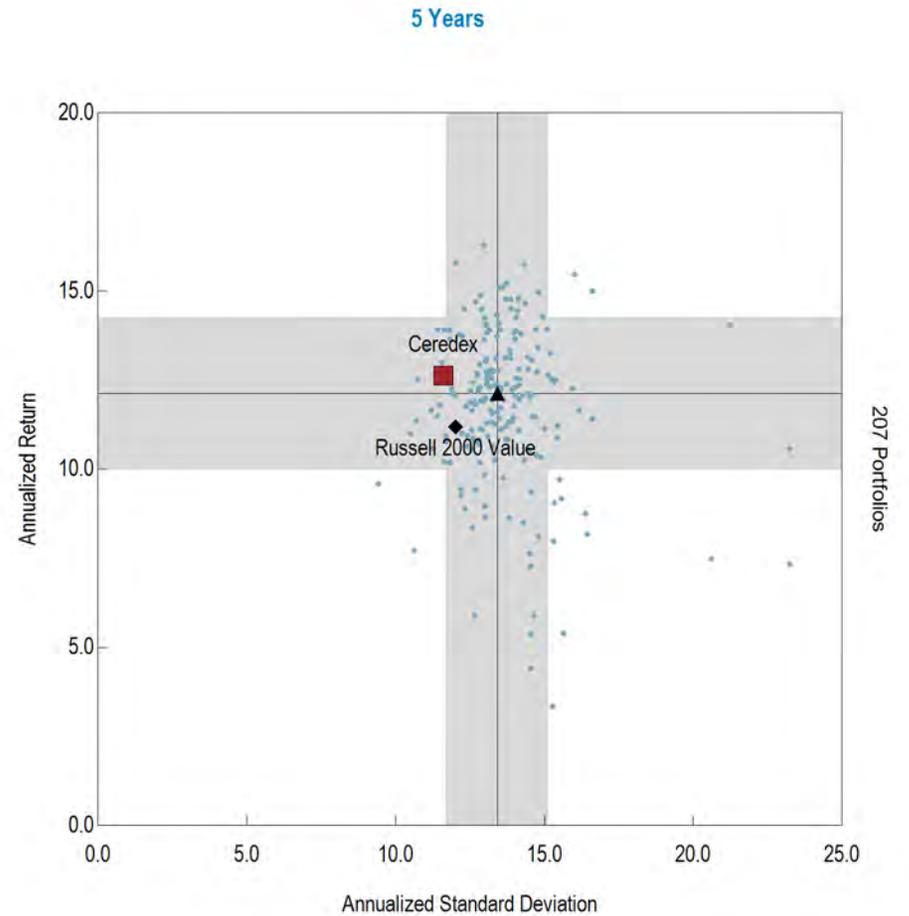
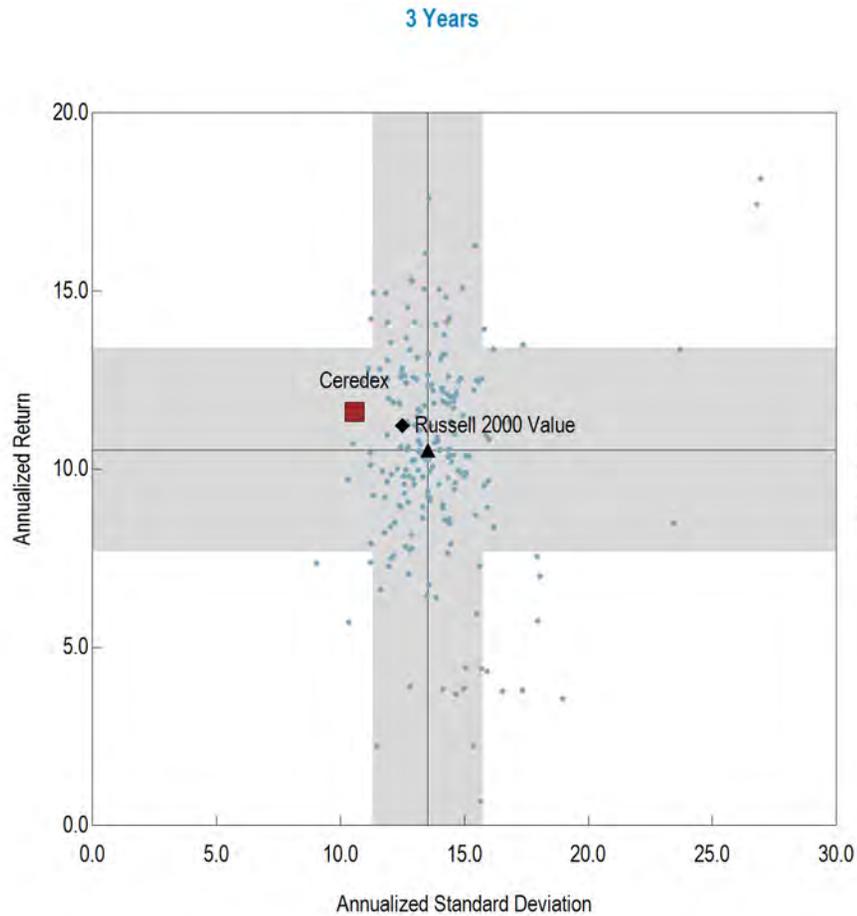
	Quarter	1 Year	3 Years	5 Years	10 Years	2017	2016	2015	2014	2013
5th Percentile	11.4	21.2	14.9	14.8	14.5	20.2	36.7	1.5	11.2	49.4
25th Percentile	7.5	16.3	12.4	13.1	12.5	14.1	30.7	-2.2	8.2	42.1
Median	5.7	12.8	10.5	12.1	11.5	11.1	27.2	-4.3	5.8	38.1
75th Percentile	4.3	10.4	9.2	10.9	10.2	7.8	22.2	-7.7	3.1	35.2
95th Percentile	2.3	5.6	4.4	7.8	8.2	3.7	16.8	-15.8	-6.3	27.8
# of Portfolios	223	223	215	207	178	224	222	212	206	199
● Ceredex	8.6 (16)	17.1 (19)	11.6 (36)	12.6 (35)	-- (--)	11.4 (48)	29.8 (32)	-4.4 (52)	3.3 (74)	36.5 (66)
▲ Russell 2000 Value	8.3 (19)	13.1 (47)	11.2 (42)	11.2 (69)	9.9 (84)	7.8 (75)	31.7 (17)	-7.5 (74)	4.2 (68)	34.5 (78)

Rolling 3 Year Annualized Return (%)



Rolling 5 Year Annualized Return (%)





3 Years

	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio
Ceredex	11.6%	10.6%	1.0
Russell 2000 Value	11.2%	12.5%	0.8
eV US Small Cap Value Equity Gross Median	10.5%	13.5%	0.7

5 Years

	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio
Ceredex	12.6%	11.6%	1.1
Russell 2000 Value	11.2%	12.0%	0.9
eV US Small Cap Value Equity Gross Median	12.1%	13.4%	0.9

International Equity Managers

Pyrford Manager Portfolio Overview

Period Ending: June 30, 2018

International equity value portfolio of non-US companies with low valuations at the country and stock level. Primary personnel include Tony Cousins, Daniel McDonagh, and Paul Simons.

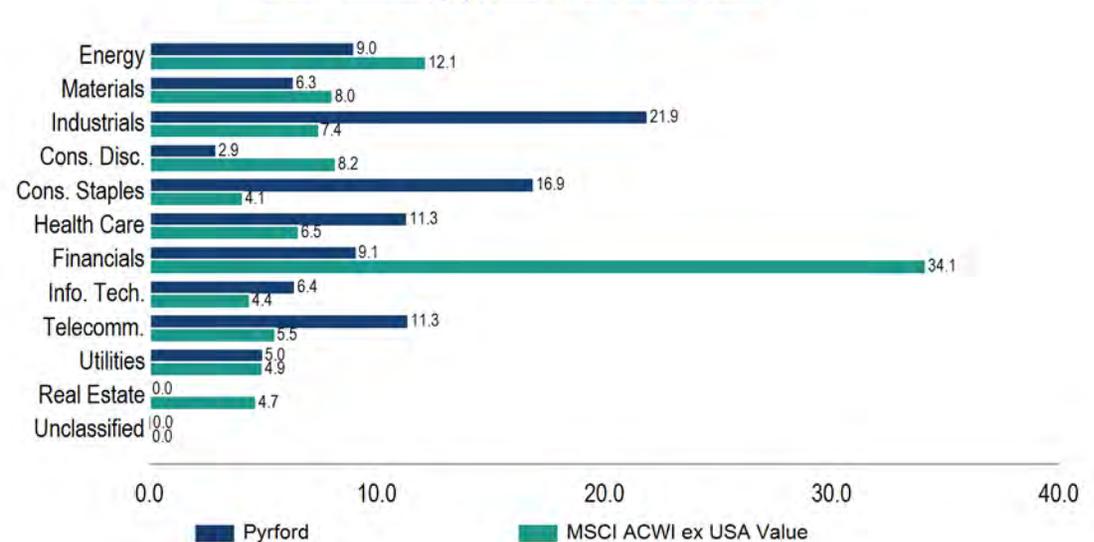
Characteristics

	MSCI ACWI Portfolio	MSCI ACWI ex USA Value
Number of Holdings	74	1,267
Weighted Avg. Market Cap. (\$B)	60.21	57.58
Median Market Cap. (\$B)	24.39	6.98
Price To Earnings	21.21	13.94
Price To Book	3.40	1.49
Price To Sales	2.36	1.70
Return on Equity (%)	18.13	11.66
Yield (%)	3.67	4.06
Beta	0.63	1.00

Country Allocation

	Manager Ending Allocation (USD)	Index Ending Allocation (USD)
Totals		
Developed	93.4%	75.3%
Emerging*	6.5%	24.7%
Cash	0.0%	
Top 10 Largest Countries		
Switzerland	14.5%	4.5%
United Kingdom	13.9%	16.4%
Australia	11.7%	4.8%
Japan	10.9%	16.7%
France	9.1%	7.0%
Netherlands	6.8%	1.2%
Germany	6.8%	5.2%
Sweden	5.5%	1.2%
Singapore	4.8%	0.9%
Taiwan*	4.0%	3.0%
Total-Top 10 Largest Countries	87.9%	60.9%

Sector Allocation (%) vs MSCI ACWI ex USA Value



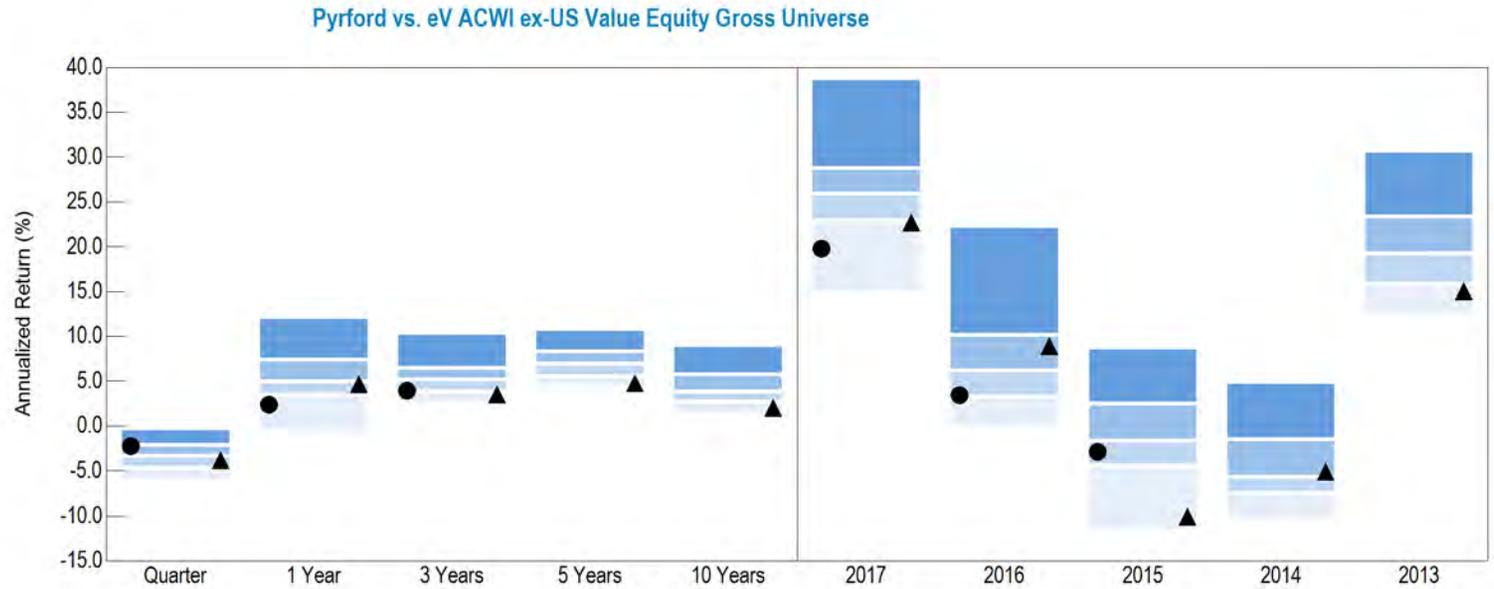
Top Contributors

	Avg Wgt	Return	Contribution
WOODSIDE PETROLEUM	1.69	16.81	0.28
WOOLWORTHS GROUP	2.29	11.82	0.27
COMFORTDELGRO CORPORATION	1.63	13.28	0.22
SAP	1.50	12.04	0.18
ROYAL DUTCH SHELL A	1.46	11.06	0.16
KDDI	2.16	7.13	0.15
TOTAL	1.61	8.71	0.14
ROYAL DUTCH SHELL B	0.94	13.61	0.13
RIO TINTO	0.95	10.55	0.10
AIR LIQUIDE	1.82	5.32	0.10

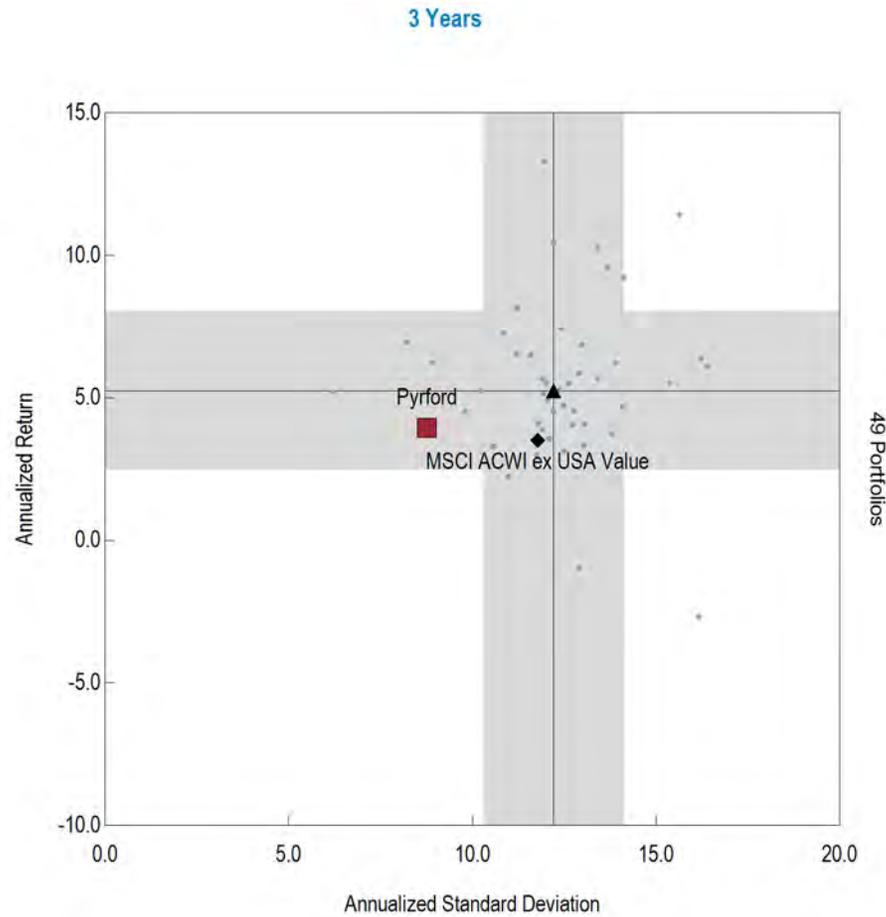
Bottom Contributors

	Avg Wgt	Return	Contribution
AXIATA GROUP	1.67	-32.70	-0.55
BRAMBLES	2.35	-14.29	-0.34
DEUTSCHE POST	1.36	-23.06	-0.31
PROXIMUS	1.15	-25.31	-0.29
MALAYAN BANKING	1.62	-16.00	-0.26
mitsubishi electric	1.38	-16.80	-0.23
TAIWAN SEMICON.MNFG.	1.69	-12.75	-0.22
ABC-MART	1.21	-17.00	-0.21
SUMITOMO RUBBER INDS.	1.64	-11.94	-0.20
GEA GROUP	1.01	-17.95	-0.18

Unclassified sector allocation includes cash allocations.



	Return (Rank)													
5th Percentile	-0.3	12.1	10.4	10.8	9.0	38.8	22.3	8.7	4.9	30.7				
25th Percentile	-2.0	7.5	6.5	8.4	5.8	28.8	10.2	2.5	-1.4	23.4				
Median	-3.3	5.0	5.3	7.0	3.9	26.0	6.2	-1.6	-5.7	19.3				
75th Percentile	-4.6	3.6	3.9	5.6	2.8	23.0	3.3	-4.3	-7.4	15.9				
95th Percentile	-6.1	-0.7	2.5	4.4	1.3	15.0	-0.1	-11.6	-10.4	12.4				
# of Portfolios	52	52	49	40	27	56	55	45	37	34				
● Pyrford	-2.2 (29)	2.4 (82)	3.9 (75)	-- (--)	-- (--)	19.8 (84)	3.4 (74)	-2.9 (59)	-- (--)	-- (--)				
▲ MSCI ACWI ex USA Value	-3.8 (65)	4.6 (57)	3.5 (82)	4.8 (91)	2.0 (87)	22.7 (77)	8.9 (35)	-10.1 (93)	-5.1 (49)	15.0 (83)				



3 Years

	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio
Pyrford	3.9%	8.8%	0.4
MSCI ACWI ex USA Value	3.5%	11.8%	0.2
eV ACWI ex-US Value Equity Gross Median	5.3%	12.2%	0.4

William Blair Manager Portfolio Overview

Period Ending: June 30, 2018

International equity growth portfolio of non-US companies with high growth rates constructed from the security level. Primary personnel include Simon Fennell and Jeffrey Urbina.

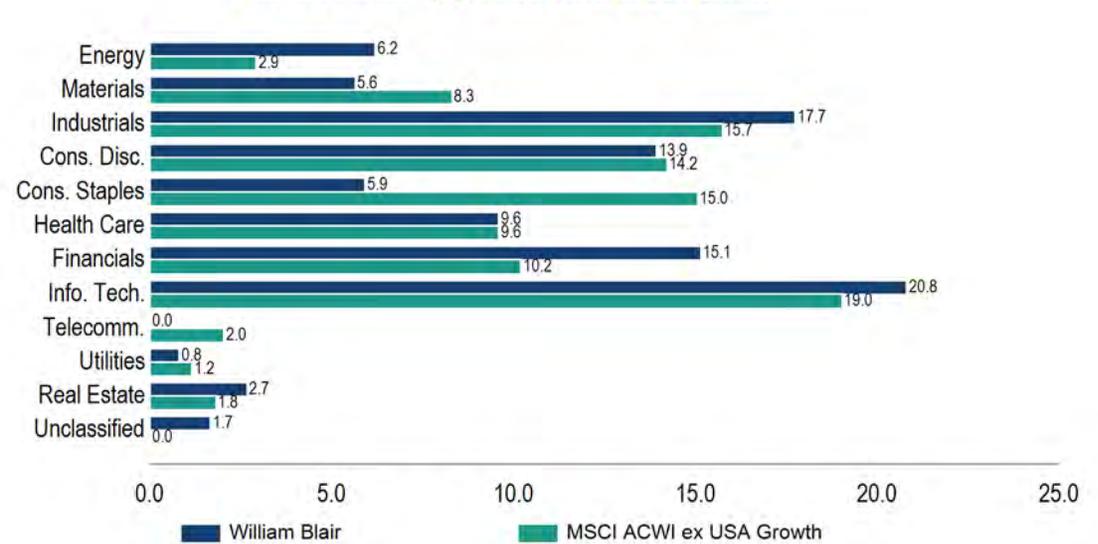
Characteristics

	Portfolio	MSCI ACWI ex USA Growth
Number of Holdings	196	1,142
Weighted Avg. Market Cap. (\$B)	54.08	68.64
Median Market Cap. (\$B)	8.98	8.75
Price To Earnings	29.71	24.37
Price To Book	5.73	4.38
Price To Sales	4.46	3.03
Return on Equity (%)	24.90	20.00
Yield (%)	1.71	1.93
Beta	0.92	1.00

Country Allocation

	Manager Ending Allocation (USD)	Index Ending Allocation (USD)
Totals		
Developed	83.9%	75.1%
Emerging*	14.4%	24.9%
Frontier**	0.1%	0.0%
Top 10 Largest Countries		
Japan	14.8%	16.7%
France	14.1%	8.0%
United Kingdom	12.9%	8.4%
Hong Kong	7.2%	2.5%
China*	5.7%	8.3%
Canada	4.9%	6.6%
Germany	4.7%	7.7%
Sweden	3.8%	2.3%
Netherlands	3.3%	3.7%
Denmark	3.3%	1.9%
Total-Top 10 Largest Countries	74.8%	65.8%

Sector Allocation (%) vs MSCI ACWI ex USA Growth



Top Contributors

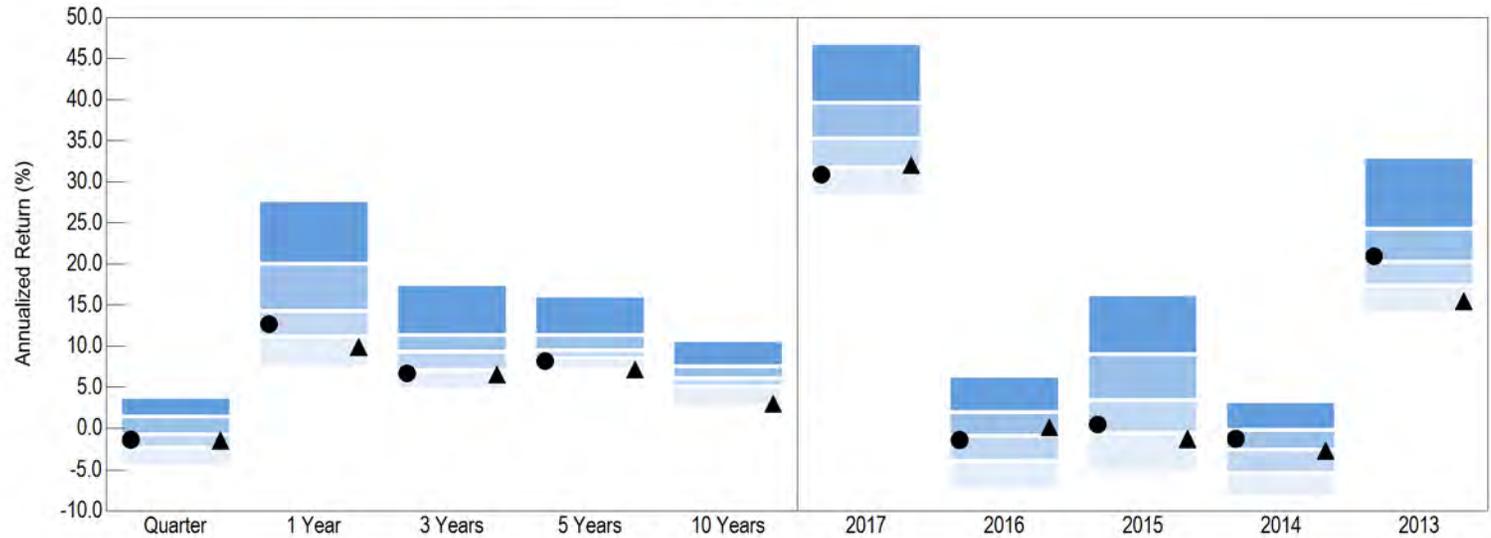
	Avg Wgt	Return	Contribution
KERING	1.23	28.09	0.35
SUNCOR ENERGY	1.30	18.67	0.24
SHISEIDO	0.80	24.20	0.19
TOTAL	1.98	8.71	0.17
LONZA GROUP	1.07	14.02	0.15
WIRECARD	0.37	36.94	0.14
MTU AERO ENGINES HLDG.	0.80	15.86	0.13
DAIKIN INDUSTRIES	1.18	8.57	0.10
INFOSYS	0.69	12.65	0.09
ARISTOCRAT LEISURE	0.35	24.48	0.09

Bottom Contributors

	Avg Wgt	Return	Contribution
ITAU UNIBANCO HOLDING PN	1.69	-32.02	-0.54
NINTENDO	1.31	-25.83	-0.34
FANUC	1.20	-21.63	-0.26
TAIWAN SEMICON.SPN.ADR 1:5	1.54	-13.37	-0.21
GALAXY ENTERTAINMENT GP.	1.26	-14.71	-0.18
INDL&COML.BOC.'H'	1.36	-12.75	-0.17
KOMATSU	1.09	-14.25	-0.15
MITSUBISHI UFJ FINL.GP.	1.09	-13.06	-0.14
SAMSUNG ELECTRONICS	1.51	-9.35	-0.14
PING AN INSURANCE (GROUP) OF CHINA 'H'	1.75	-7.82	-0.14

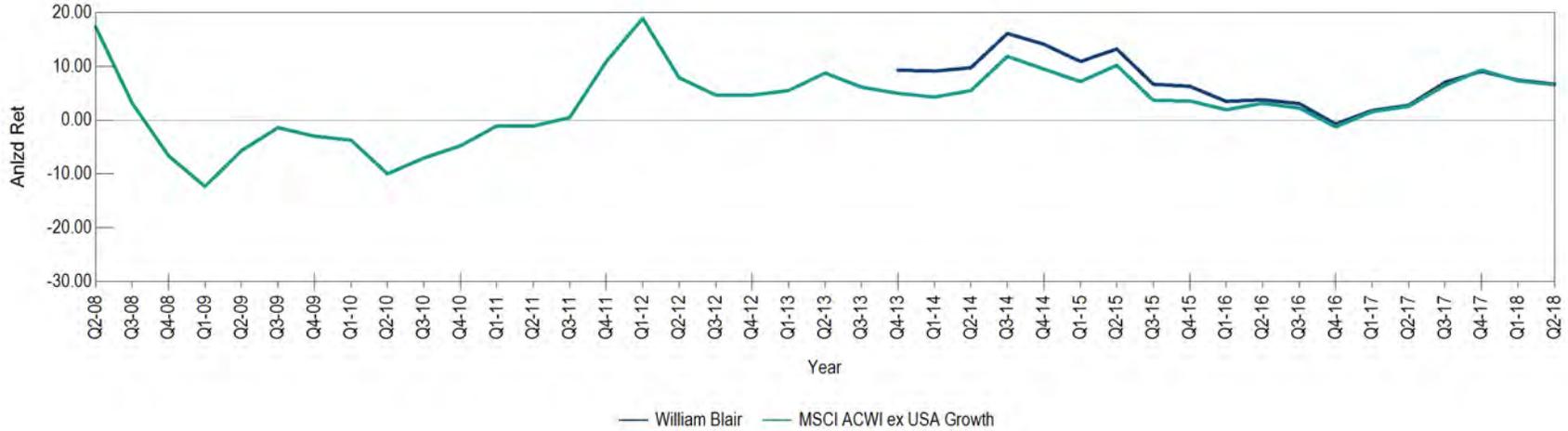
Unclassified sector allocation includes cash allocations.

William Blair vs. eV ACWI ex-US Growth Equity Gross Universe

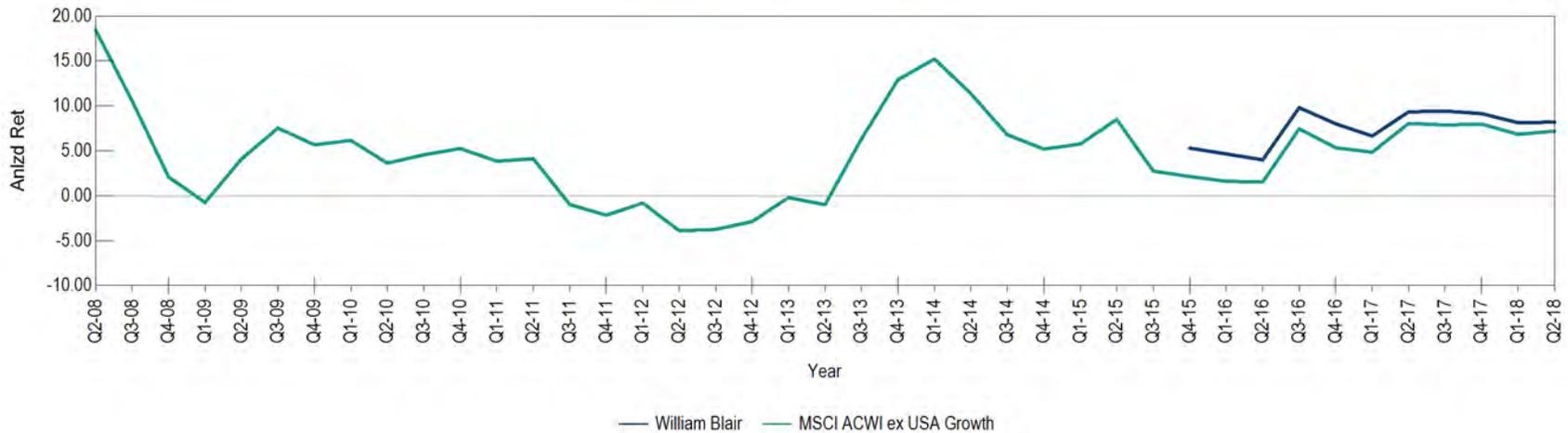


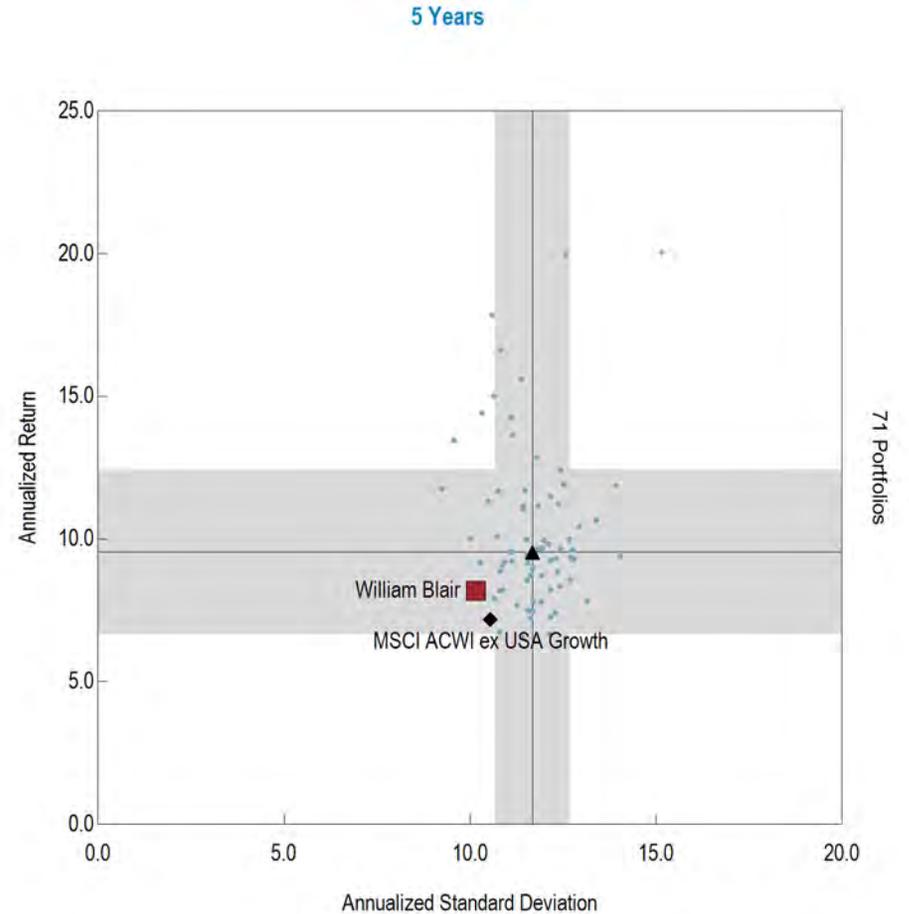
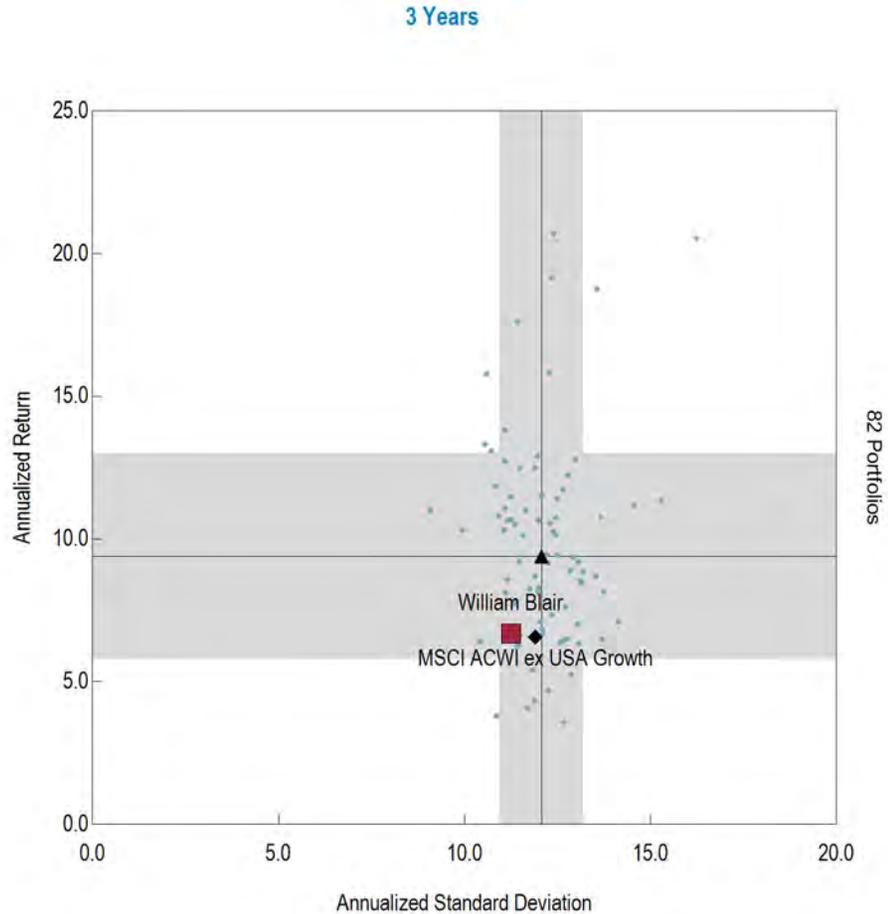
	Return (Rank)									
	Quarter	1 Year	3 Years	5 Years	10 Years	2017	2016	2015	2014	2013
5th Percentile	3.8	27.7	17.5	16.1	10.7	46.8	6.3	16.3	3.2	33.0
25th Percentile	1.4	20.1	11.4	11.4	7.6	39.6	2.0	9.0	-0.1	24.3
Median	-0.7	14.3	9.4	9.5	6.1	35.3	-0.9	3.5	-2.5	20.3
75th Percentile	-2.2	11.2	7.1	8.6	5.1	31.8	-3.9	-0.5	-5.3	17.5
95th Percentile	-4.5	7.4	4.7	7.2	2.7	28.3	-7.4	-5.4	-8.2	14.0
# of Portfolios	86	86	82	71	56	94	90	70	50	46
● William Blair	-1.3 (66)	12.7 (64)	6.7 (80)	8.2 (82)	-- (--)	30.9 (81)	-1.4 (55)	0.5 (69)	-1.2 (37)	20.9 (44)
▲ MSCI ACWI ex USA Growth	-1.4 (67)	9.9 (84)	6.6 (81)	7.2 (96)	3.0 (94)	32.0 (75)	0.1 (45)	-1.3 (83)	-2.6 (53)	15.5 (87)

Rolling 3 Year Annualized Return (%)



Rolling 5 Year Annualized Return (%)





	3 Years		
	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio
William Blair	6.7%	11.2%	0.5
MSCI ACWI ex USA Growth	6.6%	11.9%	0.5
eV ACWI ex-US Growth Equity Gross Median	9.4%	12.1%	0.7

	5 Years		
	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio
William Blair	8.2%	10.2%	0.8
MSCI ACWI ex USA Growth	7.2%	10.6%	0.6
eV ACWI ex-US Growth Equity Gross Median	9.5%	11.7%	0.8

PIMCO RAE Emerging Markets Manager Portfolio Overview

Period Ending: June 30, 2018

The PIMCO RAE Emerging Markets seeks to invest 80% of its assets in investments that are economically tied to emerging market countries. The portfolio is sub-advised by Research Affiliates, LLC.

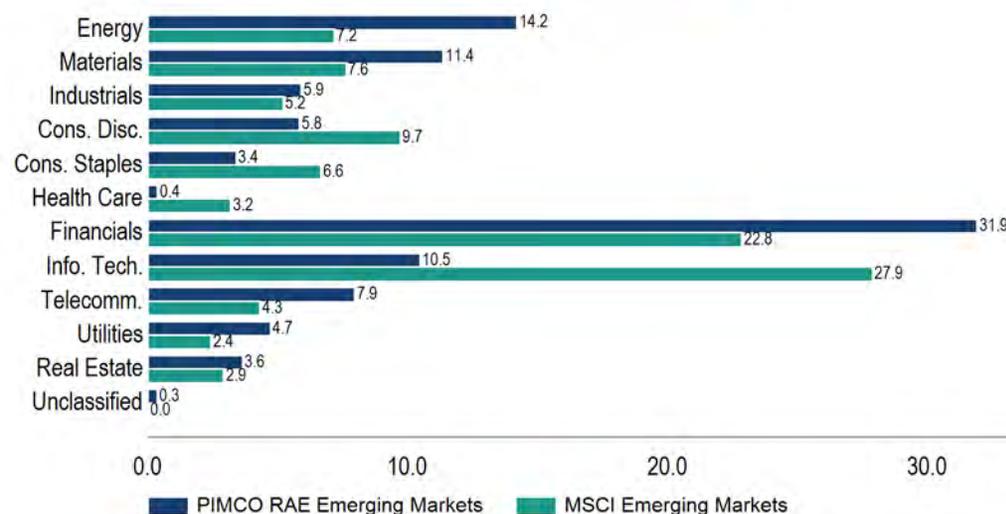
Characteristics

	Portfolio	MSCI Emerging Markets
Number of Holdings	600	1,138
Weighted Avg. Market Cap. (\$B)	37.55	87.78
Median Market Cap. (\$B)	3.65	5.47
Price To Earnings	13.52	19.43
Price To Book	1.31	2.63
Price To Sales	1.21	2.53
Return on Equity (%)	11.57	18.65
Yield (%)	3.73	2.52
Beta		1.00

Country Allocation

	Manager Ending Allocation (USD)	Index Ending Allocation (USD)
Totals		
Developed	11.3%	0.0%
Emerging*	88.4%	100.0%
Top 10 Largest Countries		
Korea*	20.1%	14.7%
China*	18.9%	32.7%
Hong Kong	10.7%	0.0%
Russia*	10.0%	3.4%
Taiwan*	9.9%	11.6%
Brazil*	5.6%	5.9%
South Africa*	4.9%	6.4%
India*	4.5%	8.6%
Thailand*	2.8%	2.2%
Turkey*	2.5%	0.8%
Total-Top 10 Largest Countries	90.0%	86.4%

Sector Allocation (%) vs MSCI Emerging Markets



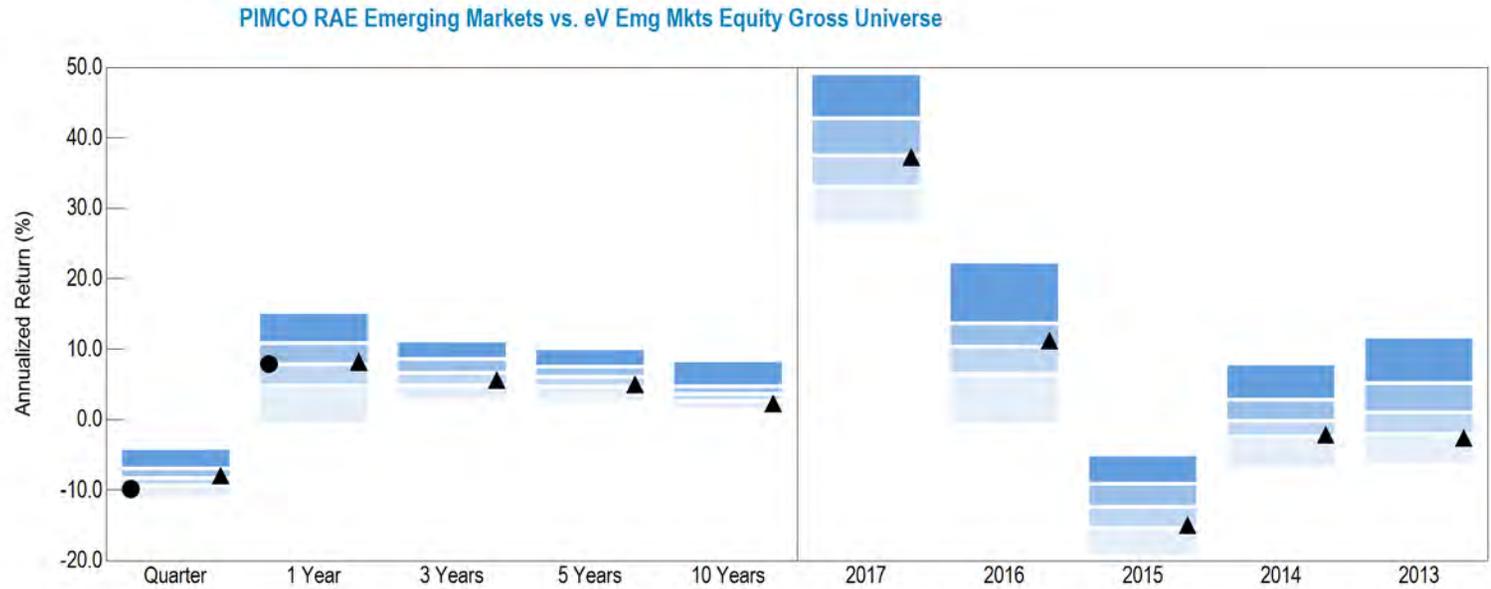
Top Contributors

	End Weight	Return	Contribution
YAGEO	0.40	106.11	0.42
CNOOC	1.55	19.78	0.31
INDAH KIAT PULP & PAPER	0.25	62.45	0.16
CHINA PTL.& CHM. 'H'	0.99	8.61	0.09
SASOL	1.00	7.81	0.08
CHINA RESOURCES BEER HOLDINGS	0.61	12.37	0.08
KOREA GAS	0.28	26.73	0.07
PETROCHINA 'H'	0.52	12.12	0.06
KUMHO TIRES	0.19	30.77	0.06
SINOTRUK (HONG KONG)	0.14	39.12	0.05

Bottom Contributors

	End Weight	Return	Contribution
CHINA CON.BANK 'H'	4.08	-10.02	-0.41
PJSC GAZPROM ADR (LON)	3.33	-9.56	-0.32
SAMSUNG ELECTRONICS	3.25	-9.35	-0.30
INDL&COML.BOC.'H'	2.28	-12.75	-0.29
LG ELECTRONICS	0.76	-27.51	-0.21
BANCO DO BRASIL ON	0.46	-39.11	-0.18
HYUNDAI MOTOR	1.10	-16.36	-0.18
BANK OF CHINA 'H'	2.21	-7.79	-0.17
ITAU UNIBANCO BANCO HLDG.ADR 1:1	0.45	-33.40	-0.15
PETROLEO BRASILEIRO ADR 1:2	0.52	-28.95	-0.15

Unclassified sector allocation includes cash allocations.



	Return (Rank)																
5th Percentile	-4.1	15.3	11.2	10.1	8.3	49.2	22.4	-5.0	8.0	11.7							
25th Percentile	-6.9	10.9	8.6	7.6	4.8	42.8	13.7	-9.0	2.9	5.2							
Median	-8.2	7.9	6.7	6.1	3.7	37.6	10.4	-12.2	-0.1	1.0							
75th Percentile	-9.4	4.8	5.0	4.8	2.7	33.2	6.6	-15.3	-2.4	-2.0							
95th Percentile	-11.1	-0.6	2.6	2.5	1.3	27.8	-0.6	-19.2	-7.0	-6.3							
# of Portfolios	344	343	325	280	140	343	337	273	251	198							
● PIMCO RAE Emerging Markets	-9.8 (84)	7.9 (51)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)							
▲ MSCI Emerging Markets	-8.0 (45)	8.2 (48)	5.6 (67)	5.0 (69)	2.3 (85)	37.3 (53)	11.2 (45)	-14.9 (70)	-2.2 (74)	-2.6 (80)							

TT Emerging Markets Manager Portfolio Overview

Period Ending: June 30, 2018

The Emerging Markets Unconstrained strategy aims to outperform its benchmark, MSCI Emerging Markets Index by 5% per annum over a three-year rolling period. It targets high returns and long term capital growth by investing in a focused portfolio of primarily equity and equity-related securities traded in the Emerging Markets.

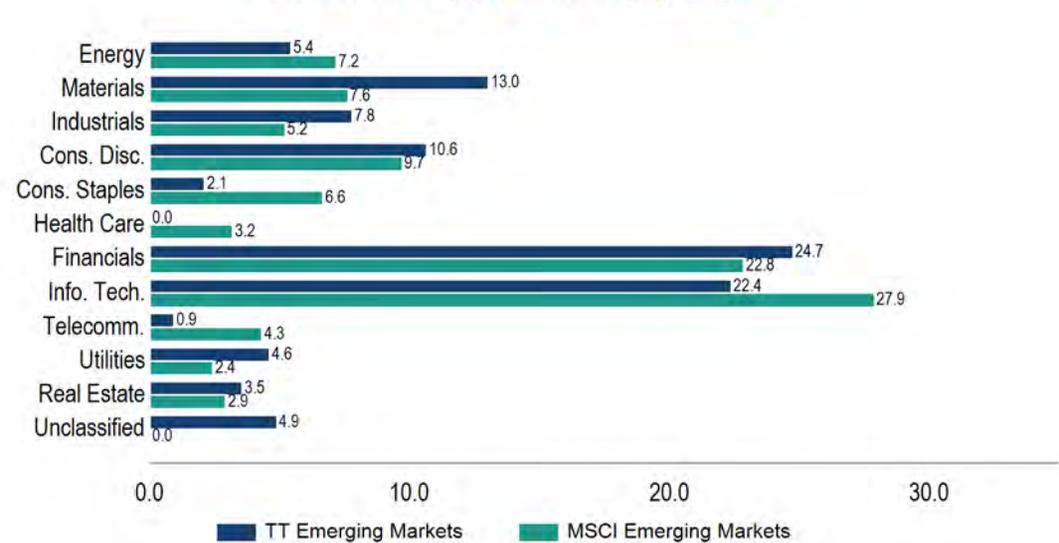
Characteristics

	Portfolio	MSCI Emerging Markets
Number of Holdings	60	1,138
Weighted Avg. Market Cap. (\$B)	76.97	87.78
Median Market Cap. (\$B)	5.35	5.47
Price To Earnings	18.11	19.43
Price To Book	3.43	2.63
Price To Sales	3.99	2.53
Return on Equity (%)	22.62	18.65
Yield (%)	2.52	2.52
Beta		1.00

Country Allocation

	Manager Ending Allocation (USD)	Index Ending Allocation (USD)
Totals		
Developed	14.4%	0.0%
Emerging*	81.2%	100.0%
Frontier**	2.5%	0.0%
Top 10 Largest Countries		
China*	18.0%	32.7%
Korea*	17.5%	14.7%
India*	12.6%	8.6%
Hong Kong	8.0%	0.0%
Russia*	7.5%	3.4%
Taiwan*	6.8%	11.6%
Brazil*	6.1%	5.9%
South Africa*	5.9%	6.4%
Mexico*	3.6%	2.9%
United Kingdom	3.1%	0.0%
Total-Top 10 Largest Countries	89.1%	86.3%

Sector Allocation (%) vs MSCI Emerging Markets



Top Contributors

	End Weight	Return	Contribution
CNOOC	2.40	19.78	0.47
SUZANO PAPEL E CELULOSE ON	1.13	17.01	0.19
EDELWEISS FNSR.	1.08	17.69	0.19
GRUMA	2.09	8.67	0.18
NASPERS	4.13	4.18	0.17
PAO NOVATEK GDR	1.47	9.38	0.14
TERNIUM SPN.ADR 1:10	1.33	10.13	0.13
MONDI	1.67	7.49	0.13
GODREJ INDUSTRIES	1.56	7.97	0.12
PVR	1.03	7.65	0.08

Bottom Contributors

	End Weight	Return	Contribution
BANCO DO BRASIL ON	1.58	-39.11	-0.62
BANCO MACRO 'B' SPN.ADR 1:10	1.28	-44.08	-0.56
CHINA PACIFIC INSURANCE (GROUP) 'H'	4.57	-11.05	-0.51
PAMPA ENERGIA ADR 1:25	1.25	-39.98	-0.50
CIA SANEAMENTO DO PARANA UNITS	1.56	-31.61	-0.49
HANA FINANCIAL GROUP	3.96	-10.42	-0.41
CIA ENERGETICA DE MINAS GERAIS PN	1.79	-21.56	-0.39
CHINA CON.BANK 'H'	3.82	-10.02	-0.38
SAMSUNG ELTN.PREF.	3.25	-11.74	-0.38
DALMIA BHARAT	1.43	-24.48	-0.35

Unclassified sector allocation includes cash allocations.

Global Equity Managers

Artisan Partners Manager Portfolio Overview

Period Ending: June 30, 2018

Global equity portfolio of companies that is benchmark agnostic with accelerating profit cycles and a focus on capital allocation. Primary personnel include James Hamel, Craigh Cepukenas, and Matthew Kamm.

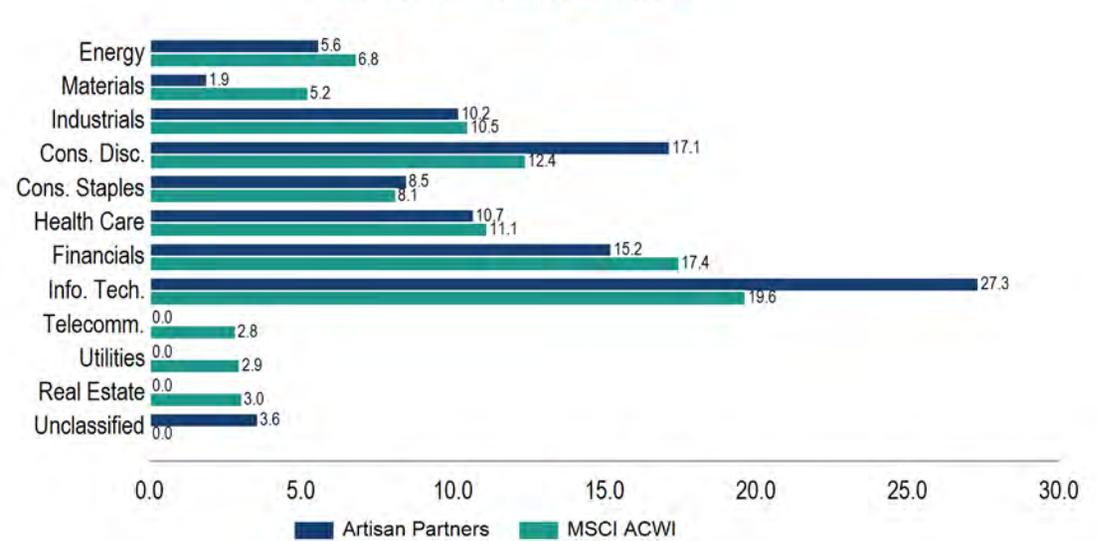
Characteristics

	Portfolio	MSCI ACWI
Number of Holdings	47	2,781
Weighted Avg. Market Cap. (\$B)	77.21	131.78
Median Market Cap. (\$B)	33.13	9.84
Price To Earnings	40.13	21.28
Price To Book	6.50	3.74
Price To Sales	6.12	3.15
Return on Equity (%)	20.31	17.96
Yield (%)	1.14	2.39
Beta	1.14	1.00

Country Allocation

	Manager Ending Allocation (USD)	Index Ending Allocation (USD)
Totals		
Developed	91.9%	88.6%
Emerging*	4.6%	11.4%
Top 10 Largest Countries		
United States	49.4%	54.0%
Japan	7.8%	7.7%
United Kingdom	6.9%	5.7%
Hong Kong	6.7%	1.1%
Netherlands	4.3%	1.1%
Switzerland	4.3%	2.4%
Cash	3.6%	0.0%
Australia	3.3%	2.2%
Spain	2.3%	1.0%
India*	2.3%	1.0%
Total-Top 10 Largest Countries	90.9%	76.2%

Sector Allocation (%) vs MSCI ACWI



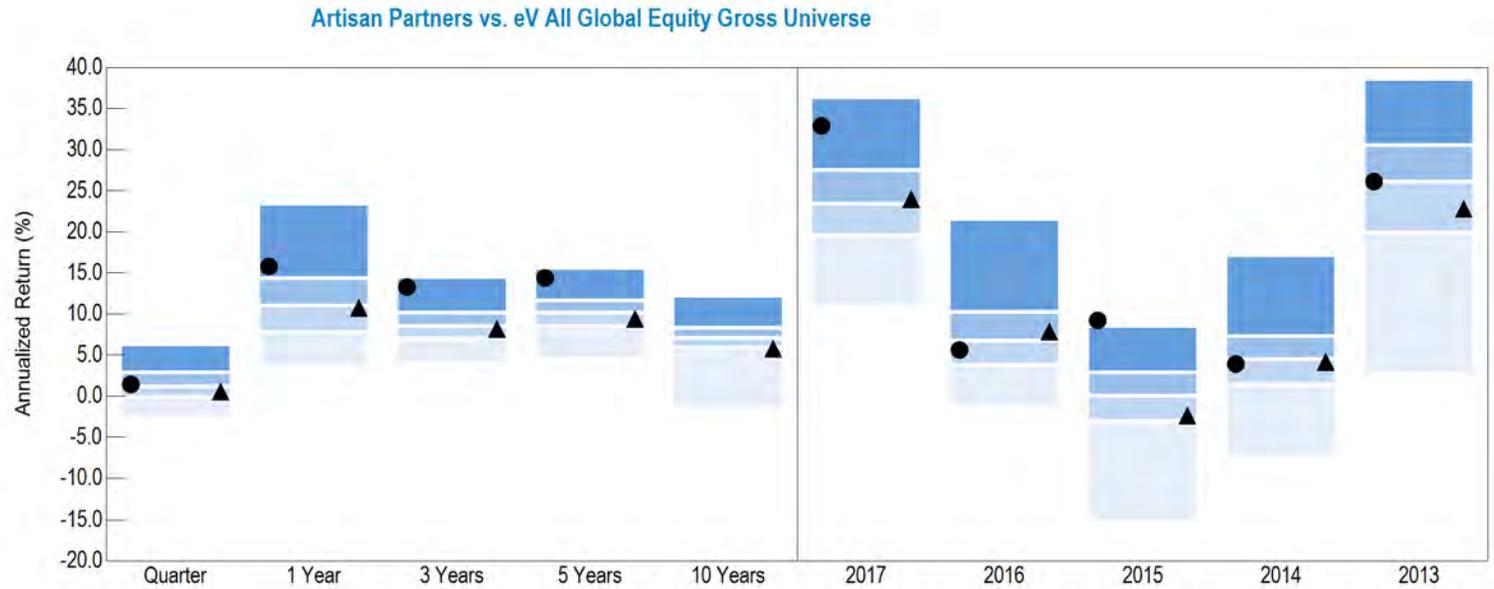
Top Contributors

	Avg Wgt	Return	Contribution
SHISEIDO	3.05	24.20	0.74
VISA 'A'	5.72	10.90	0.62
TEMENOS N	1.92	27.01	0.52
BOSTON SCIENTIFIC	2.37	19.69	0.47
FEVERTREE DRINKS	2.07	21.56	0.45
IHS MARKIT	6.26	6.94	0.43
NOBLE ENERGY	2.38	16.83	0.40
FACEBOOK CLASS A	1.44	21.61	0.31
INTERTEK GROUP	1.73	16.52	0.29
SALESFORCE.COM	1.51	17.28	0.26

Bottom Contributors

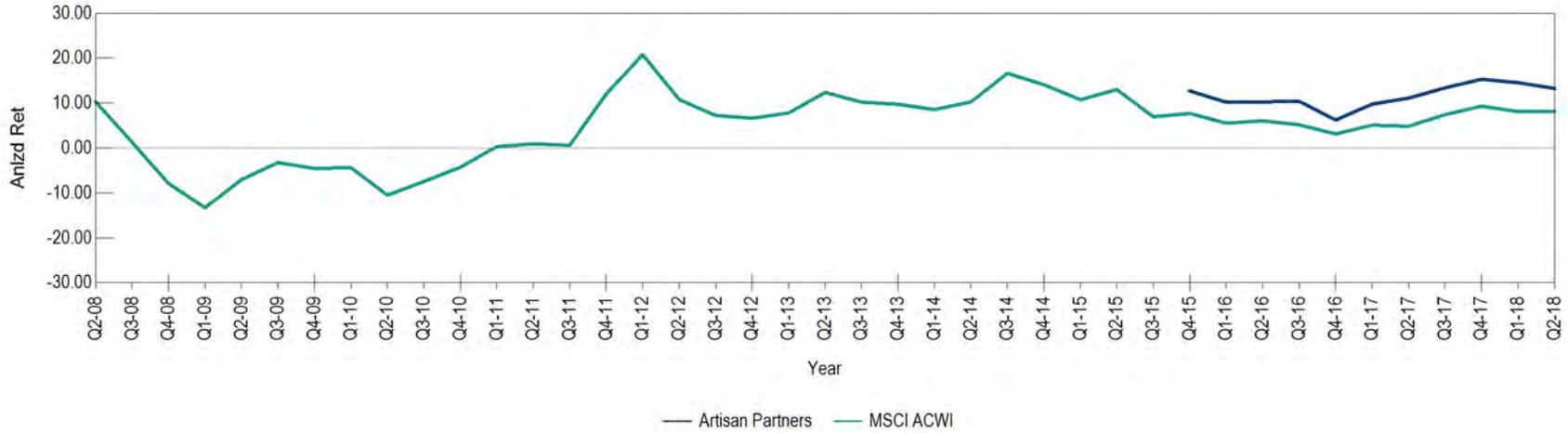
	Avg Wgt	Return	Contribution
GENMAB	3.49	-27.94	-0.98
NINTENDO	2.55	-25.83	-0.66
LKQ	2.60	-15.94	-0.42
DAIFUKU	1.51	-26.82	-0.40
CIELO ON	0.87	-31.03	-0.27
ING GROEP	2.22	-11.94	-0.26
SAMSONITE INTERNATIONAL	1.01	-20.64	-0.21
STATE STREET	3.28	-6.24	-0.20
BANK OF AMERICA	3.36	-5.61	-0.19
KEYENCE	1.58	-9.05	-0.14

Unclassified sector allocation includes cash allocations.

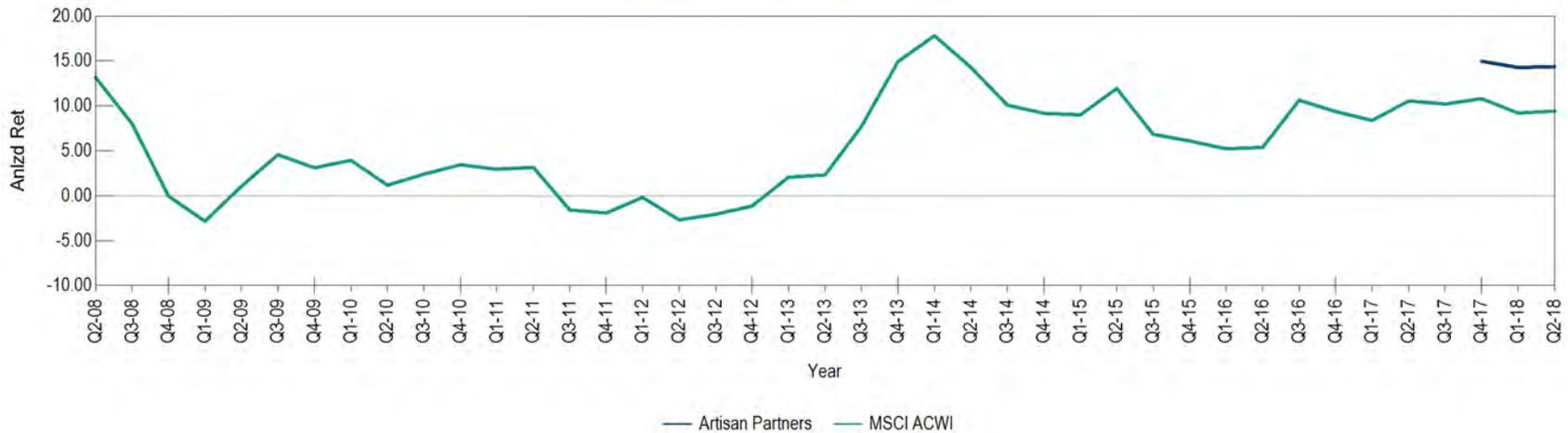


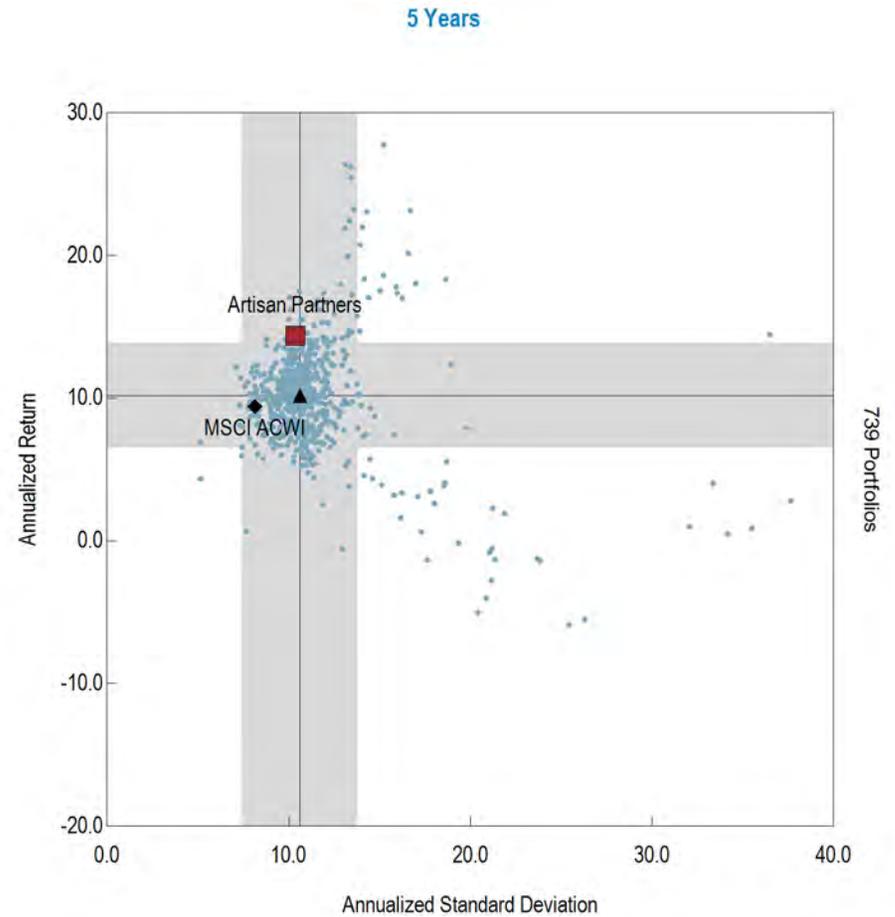
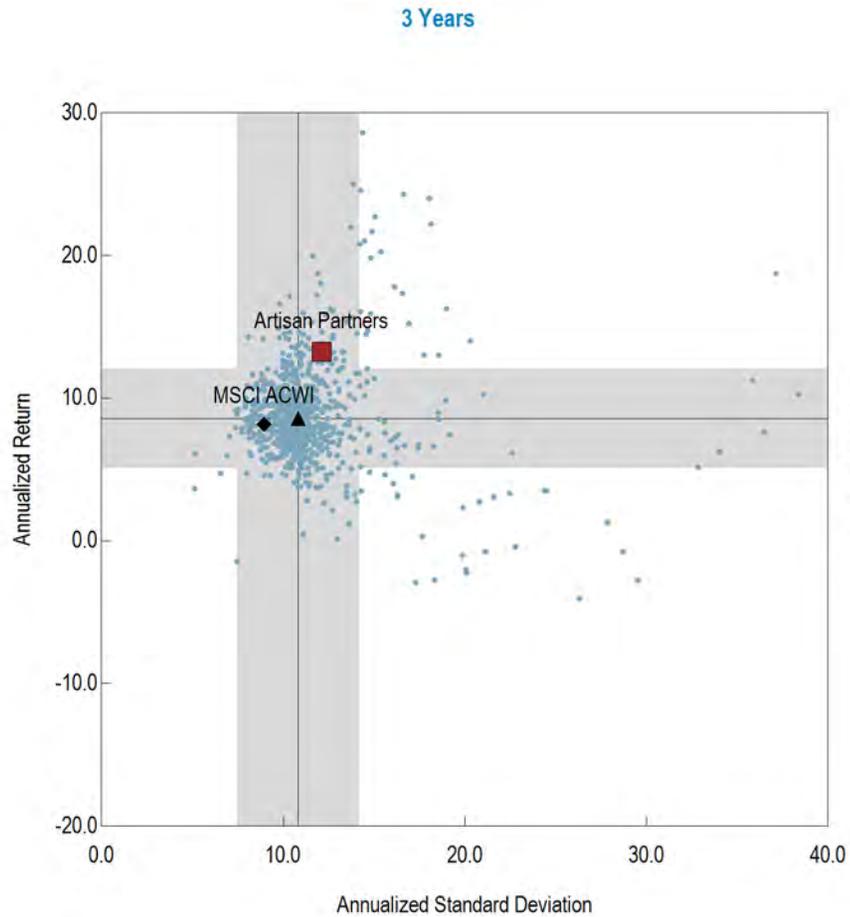
	Quarter	1 Year	3 Years	5 Years	10 Years	2017	2016	2015	2014	2013
5th Percentile	6.3	23.4	14.5	15.5	12.2	36.3	21.5	8.5	17.1	38.6
25th Percentile	3.0	14.4	10.2	11.7	8.4	27.6	10.3	3.0	7.4	30.6
Median	1.2	11.1	8.6	10.2	7.1	23.5	6.8	0.1	4.6	26.2
75th Percentile	-0.1	7.8	7.1	8.6	5.9	19.6	3.9	-2.9	1.5	20.0
95th Percentile	-2.6	3.6	4.1	4.6	-1.5	11.0	-1.4	-15.1	-7.4	2.7
# of Portfolios	899	897	836	739	453	880	842	692	609	552
● Artisan Partners	1.4 (47)	15.8 (20)	13.3 (8)	14.4 (7)	-- (--)	32.9 (11)	5.6 (61)	9.2 (4)	3.9 (56)	26.1 (51)
▲ MSCI ACWI	0.5 (64)	10.7 (53)	8.2 (57)	9.4 (67)	5.8 (78)	24.0 (47)	7.9 (42)	-2.4 (73)	4.2 (54)	22.8 (66)

Rolling 3 Year Annualized Return (%)



Rolling 5 Year Annualized Return (%)





	3 Years		
	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio
Artisan Partners	13.3%	12.1%	1.0
MSCI ACWI	8.2%	8.9%	0.8
eV All Global Equity Gross Median	8.6%	10.8%	0.7

	5 Years		
	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio
Artisan Partners	14.4%	10.4%	1.3
MSCI ACWI	9.4%	8.1%	1.1
eV All Global Equity Gross Median	10.2%	10.6%	1.0

First Eagle Manager Portfolio Overview

Period Ending: June 30, 2018

Global equity portfolio that is benchmark agnostic comprised of companies with low valuations. Primary personnel include Matt McLennan and Kimball Brooker.

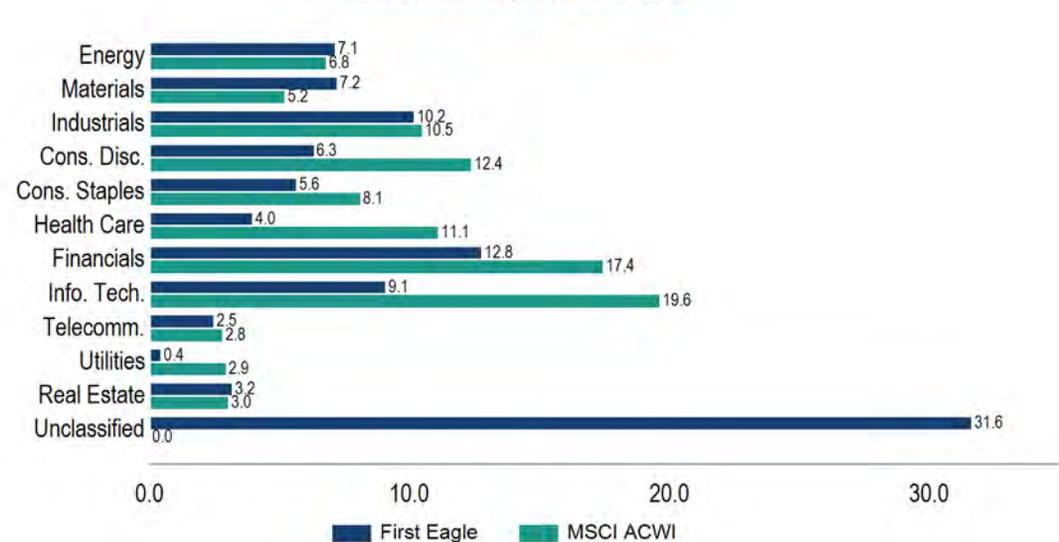
Characteristics

	Portfolio	MSCI ACWI
Number of Holdings	175	2,781
Weighted Avg. Market Cap. (\$B)	74.89	131.78
Median Market Cap. (\$B)	18.52	9.84
Price To Earnings	22.87	21.28
Price To Book	3.19	3.74
Price To Sales	3.33	3.15
Return on Equity (%)	15.06	17.96
Yield (%)	2.27	2.39
Beta	0.69	1.00

Country Allocation

	Manager Ending Allocation (USD)	Index Ending Allocation (USD)
Totals		
Developed	77.8%	88.6%
Emerging*	3.4%	11.4%
Cash	18.8%	
Top 10 Largest Countries		
United States	47.4%	54.0%
Cash	18.8%	0.0%
Japan	10.9%	7.7%
France	5.0%	3.4%
United Kingdom	3.9%	5.7%
Canada	3.1%	3.0%
Korea*	1.5%	1.7%
Switzerland	1.3%	2.4%
Germany	1.2%	3.0%
Singapore	1.1%	0.4%
Total-Top 10 Largest Countries	94.4%	81.3%

Sector Allocation (%) vs MSCI ACWI



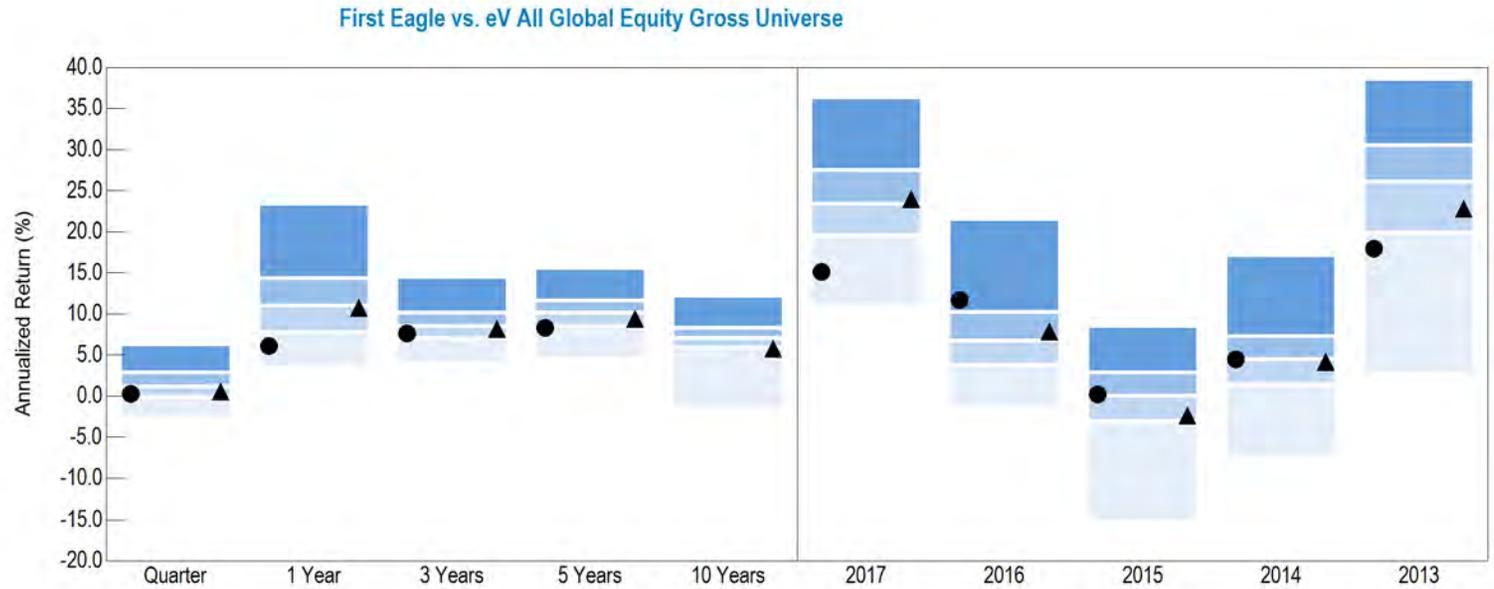
Top Contributors

	Avg Wgt	Return	Contribution
NATIONAL OILWELL VARCO	1.20	18.04	0.22
EXXON MOBIL	1.53	12.00	0.18
NUTRIEN (NYS)	1.00	15.93	0.16
TIFFANY & CO	0.45	35.30	0.16
IMPERIAL OIL	0.49	26.09	0.13
CONOCOPHILLIPS	0.70	17.90	0.12
MICROSOFT	1.41	8.51	0.12
HOYA	0.74	14.00	0.10
KDDI	1.45	7.13	0.10
DEVON ENERGY	0.21	38.55	0.08

Bottom Contributors

	Avg Wgt	Return	Contribution
FANUC	1.61	-21.63	-0.35
CIELO ON	0.43	-31.03	-0.13
HEIDELBERGCEMENT	0.93	-11.86	-0.11
3M	0.96	-9.78	-0.09
KEYENCE	1.00	-9.05	-0.09
SAINT GOBAIN	0.60	-12.58	-0.08
DEERE	0.78	-9.55	-0.07
FRESNILLO	0.51	-13.71	-0.07
ORACLE	2.13	-3.30	-0.07
BRITISH AMERICAN TOBACCO	0.57	-11.64	-0.07

Unclassified sector allocation includes cash allocations and Gold allocations (6.8% as of 6/30/2018).

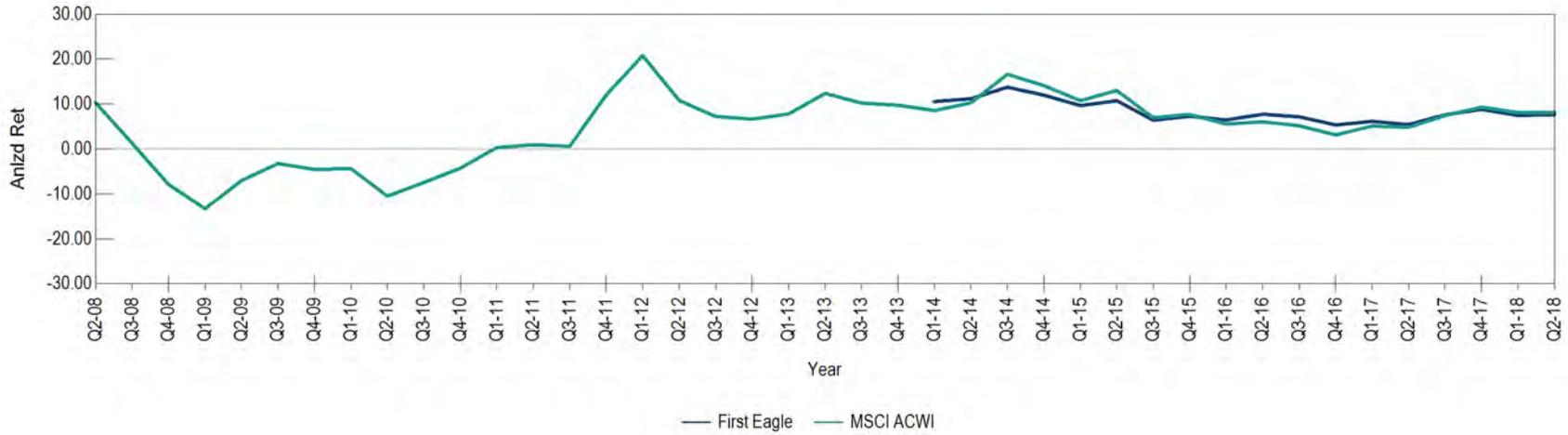


	Quarter	1 Year	3 Years	5 Years	10 Years	2017	2016	2015	2014	2013
5th Percentile	6.3	23.4	14.5	15.5	12.2	36.3	21.5	8.5	17.1	38.6
25th Percentile	3.0	14.4	10.2	11.7	8.4	27.6	10.3	3.0	7.4	30.6
Median	1.2	11.1	8.6	10.2	7.1	23.5	6.8	0.1	4.6	26.2
75th Percentile	-0.1	7.8	7.1	8.6	5.9	19.6	3.9	-2.9	1.5	20.0
95th Percentile	-2.6	3.6	4.1	4.6	-1.5	11.0	-1.4	-15.1	-7.4	2.7
# of Portfolios	899	897	836	739	453	880	842	692	609	552
● First Eagle	0.3 (69)	6.1 (87)	7.6 (66)	8.3 (77)	-- (--)	15.1 (89)	11.7 (19)	0.2 (49)	4.5 (51)	17.9 (80)
▲ MSCI ACWI	0.5 (64)	10.7 (53)	8.2 (57)	9.4 (67)	5.8 (78)	24.0 (47)	7.9 (42)	-2.4 (73)	4.2 (54)	22.8 (66)

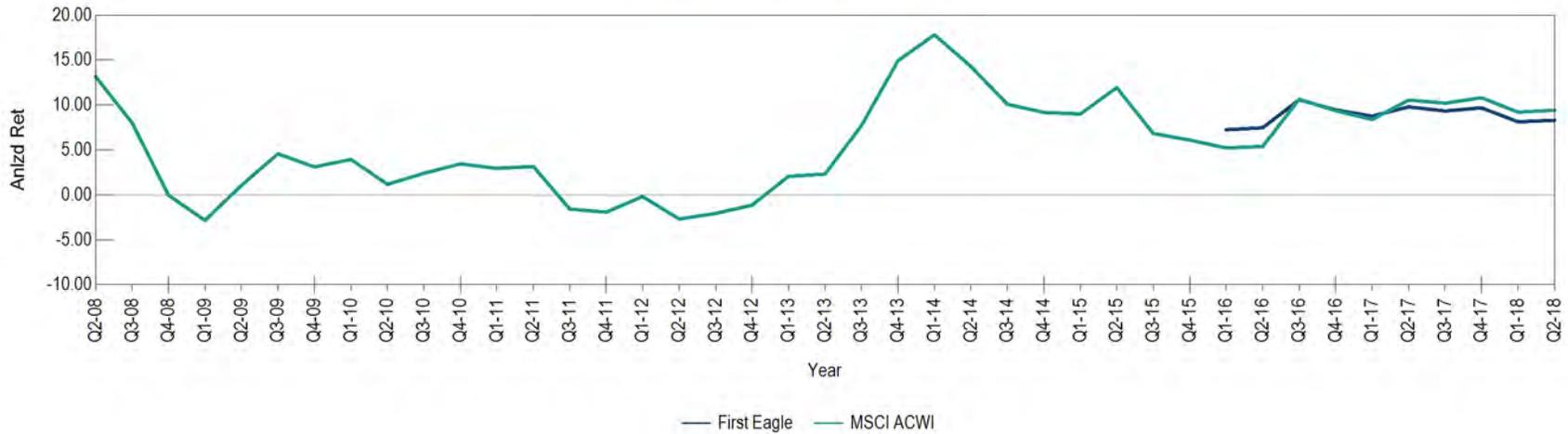
First Eagle
 Manager Performance - Rolling 3 & 5 Year (Gross of Fees)

Period Ending: June 30, 2018

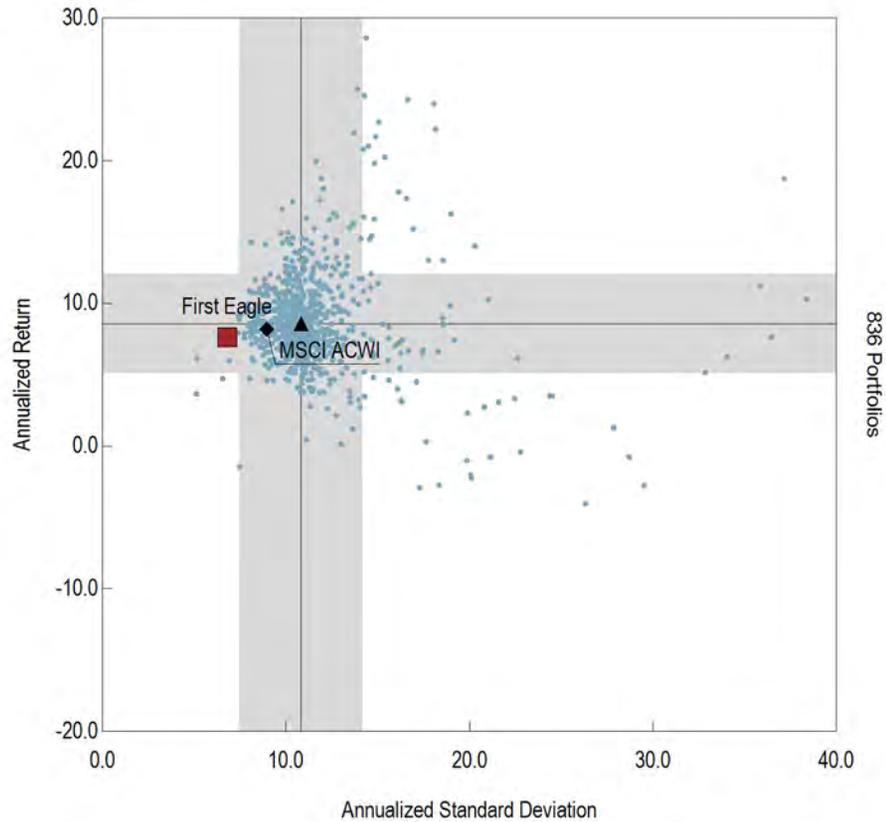
Rolling 3 Year Annualized Return (%)



Rolling 5 Year Annualized Return (%)

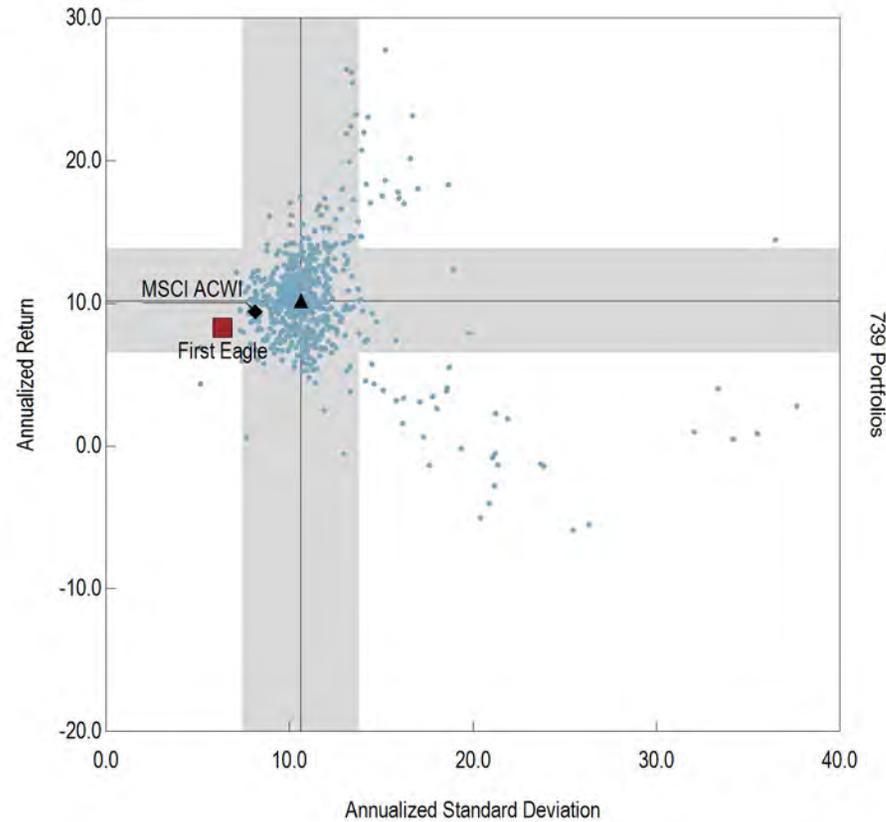


3 Years



836 Portfolios

5 Years



739 Portfolios

3 Years

	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio
First Eagle	7.6%	6.8%	1.0
MSCI ACWI	8.2%	8.9%	0.8
eV All Global Equity Gross Median	8.6%	10.8%	0.7

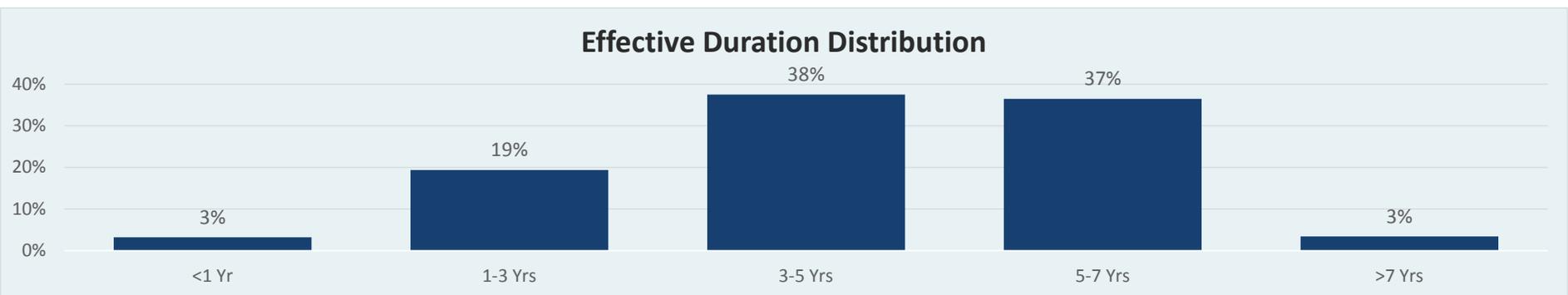
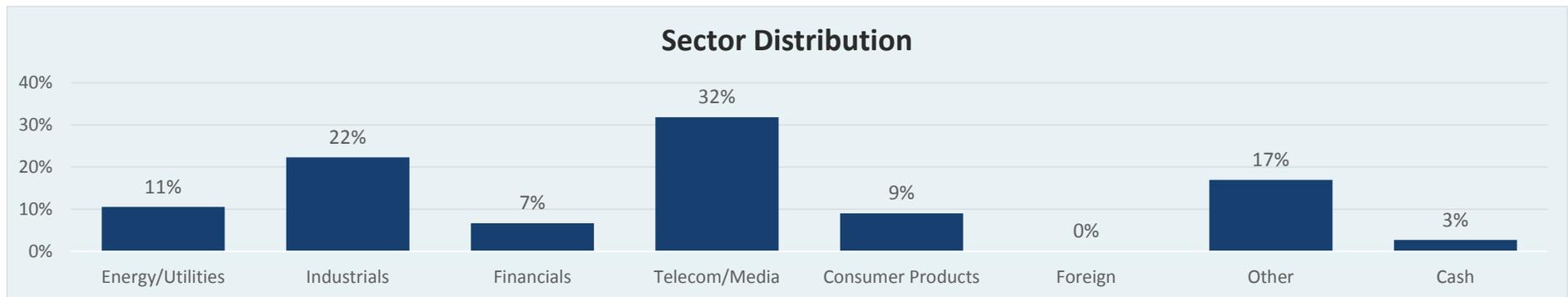
5 Years

	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio
First Eagle	8.3%	6.4%	1.2
MSCI ACWI	9.4%	8.1%	1.1
eV All Global Equity Gross Median	10.2%	10.6%	1.0

High Yield Managers

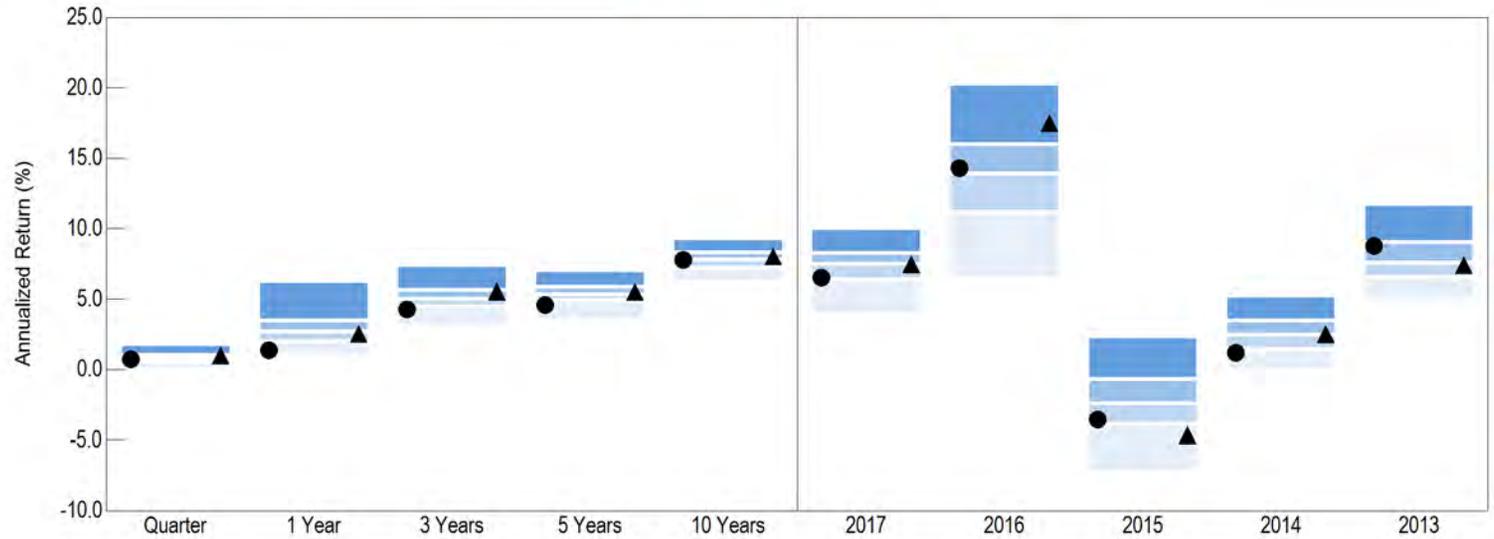
Domestic high yield fixed income portfolio with a focus on security selection. Primary personnel include Douglas Forsyth, Justin Kass, William Stickney, and Michael Yee.

	Allianz	ICE BofAML HY Master II
Effective Duration	4.30	4.20
Yield to Maturity	6.60	6.70
Average Quality	B1	B1
Average Coupon	6.3%	6.3%



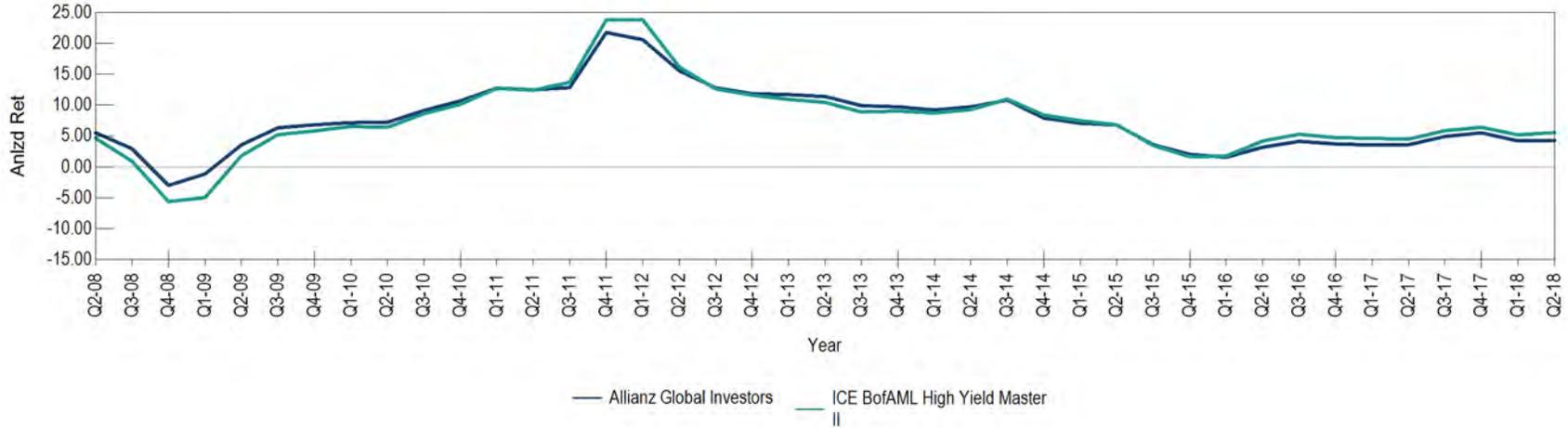
Quality distribution excludes cash.

Allianz Global Investors vs. eV US High Yield Fixed Inc Gross Universe



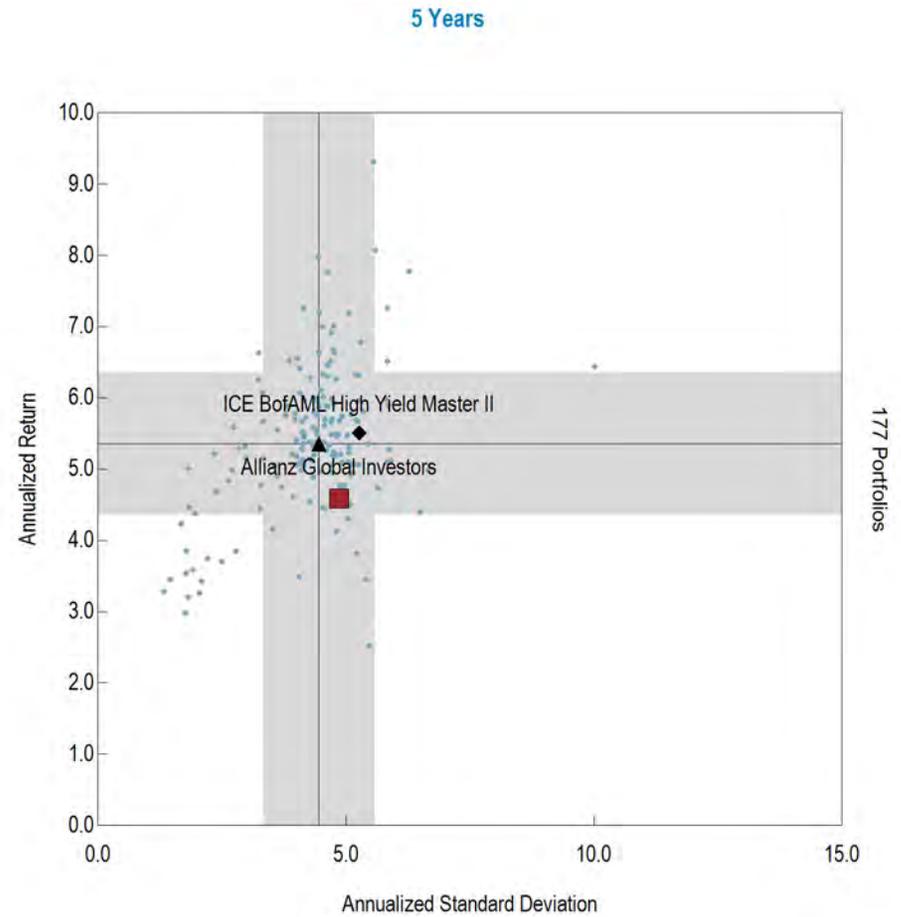
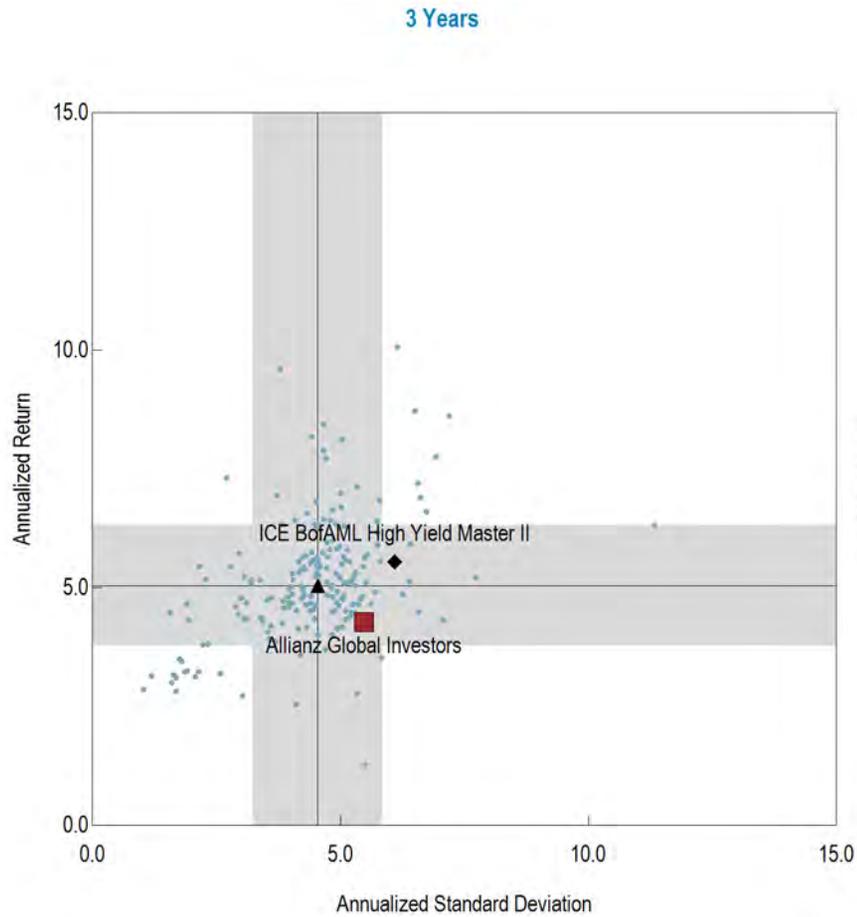
	Return (Rank)										
	Quarter	1 Year	3 Years	5 Years	10 Years	2017	2016	2015	2014	2013	
5th Percentile	1.8	6.3	7.4	7.0	9.3	10.0	20.3	2.3	5.2	11.7	
25th Percentile	1.1	3.5	5.7	5.9	8.3	8.3	16.0	-0.7	3.5	9.1	
Median	0.8	2.7	5.1	5.4	7.9	7.5	14.0	-2.4	2.5	7.6	
75th Percentile	0.5	2.0	4.5	4.9	7.3	6.5	11.3	-3.8	1.5	6.6	
95th Percentile	0.1	1.0	3.2	3.5	6.3	4.0	6.6	-7.2	0.0	5.0	
# of Portfolios	206	205	197	177	127	198	183	155	141	130	
● Allianz Global Investors	0.7 (58)	1.4 (90)	4.3 (83)	4.6 (84)	7.8 (52)	6.5 (74)	14.3 (47)	-3.5 (68)	1.2 (83)	8.8 (28)	
▲ ICE BofAML High Yield Master II	1.0 (29)	2.5 (61)	5.5 (31)	5.5 (42)	8.0 (40)	7.5 (53)	17.5 (14)	-4.6 (83)	2.5 (50)	7.4 (55)	

Rolling 3 Year Annualized Return (%)



Rolling 5 Year Annualized Return (%)





	3 Years			5 Years			
	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio	
Allianz Global Investors	4.3%	5.5%	0.7	Allianz Global Investors	4.6%	4.9%	0.9
ICE BofAML High Yield Master II	5.5%	6.1%	0.8	ICE BofAML High Yield Master II	5.5%	5.3%	1.0
eV US High Yield Fixed Inc Gross Median	5.1%	4.5%	1.0	eV US High Yield Fixed Inc Gross Median	5.4%	4.5%	1.2

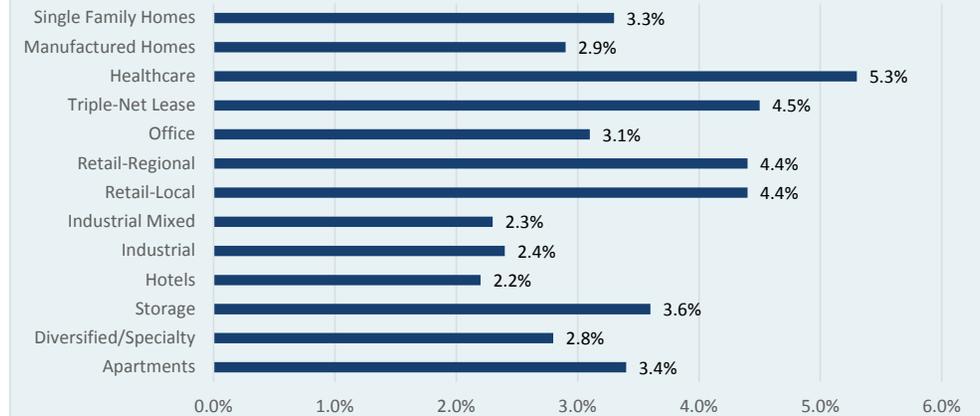
Real Estate Managers

Diversified portfolio of U.S. REITs with a focus on the underlying real estate assets

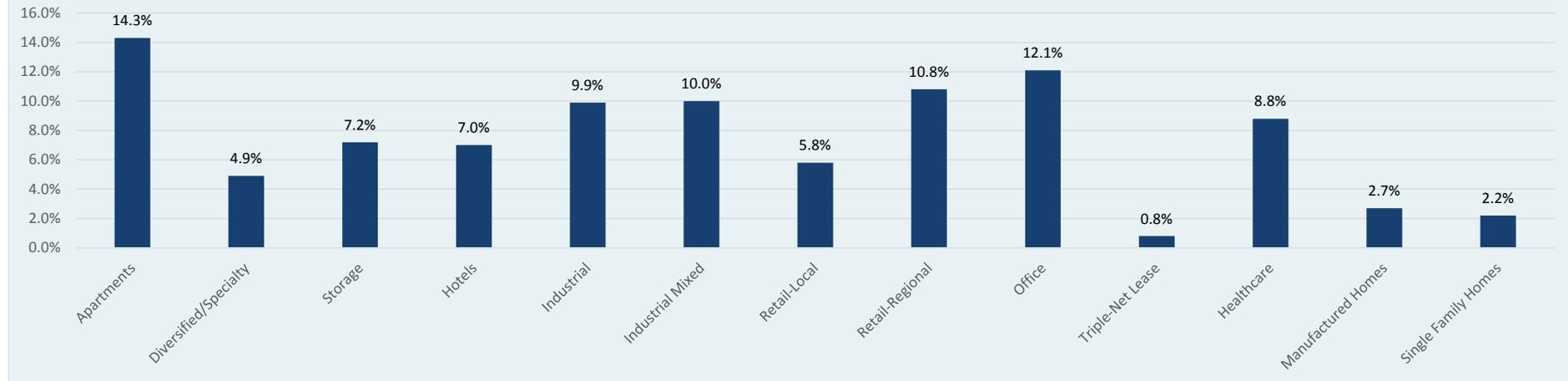
Top Five Holdings

Company	Property Type	Allocation
Simon Property Group	Retail-Regional	8.2%
Equinix Inc	Industrial Mixed	6.2%
Essex Property Trust	Apartments	4.7%
Alexandria RE Equities	Office	4.4%
Equity Residential	Apartments	4.4%

Dividend Yield by Property Type



Property Type Allocation

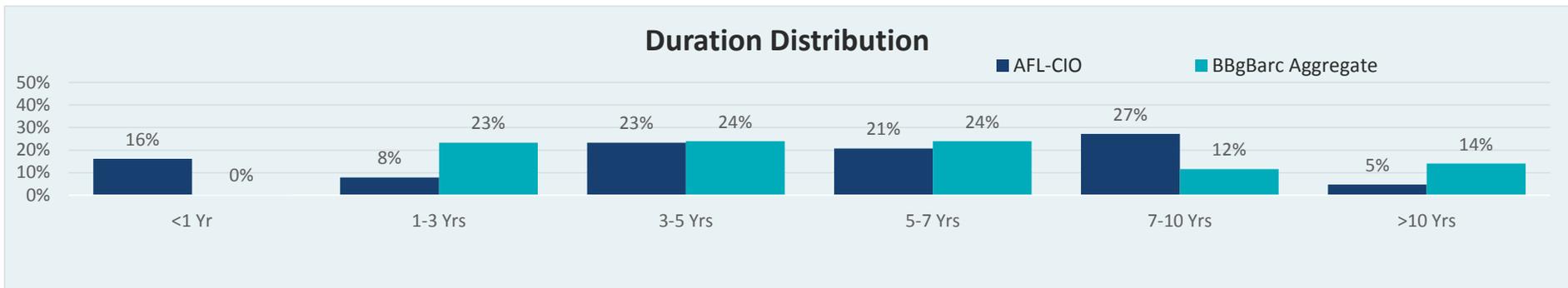
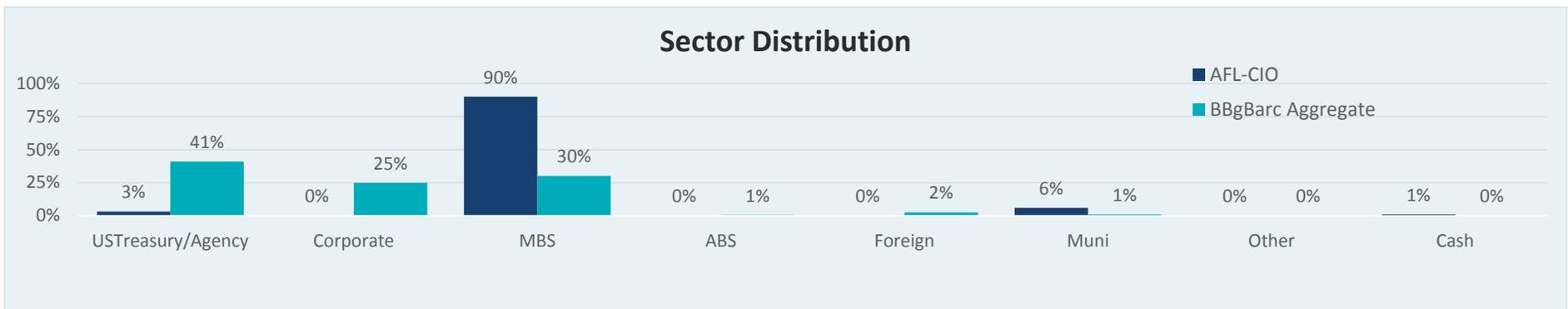


3.6% is allocated to Cash and Cash Equivalents.

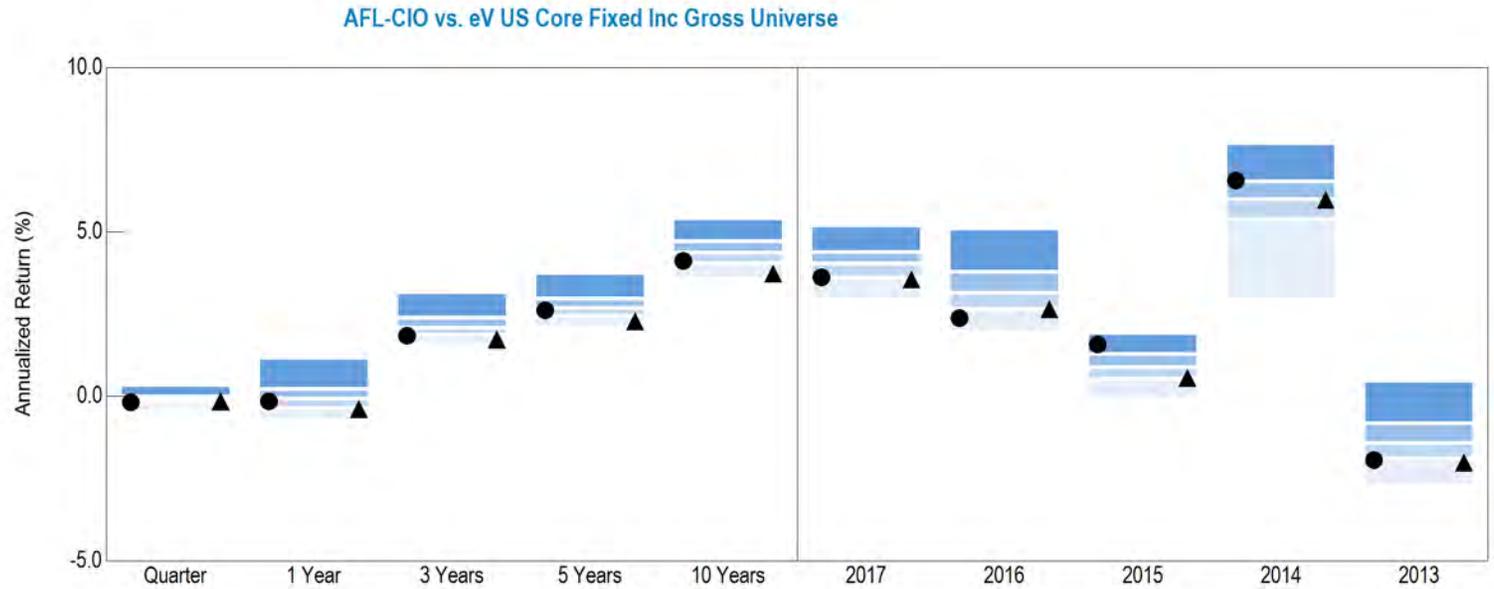
Diversifying Fixed Income Managers

Domestic core fixed income portfolio with an exclusive focus on mortgage-related securities. Primary personnel include Stephen Coyle and Chang Su.

	AFL-CIO	BBgBarc Aggregate
Effective Duration	5.54	5.99
Yield to Maturity	3.37	3.11
Average Quality	AAA	AA
Average Coupon	3.3%	3.2%

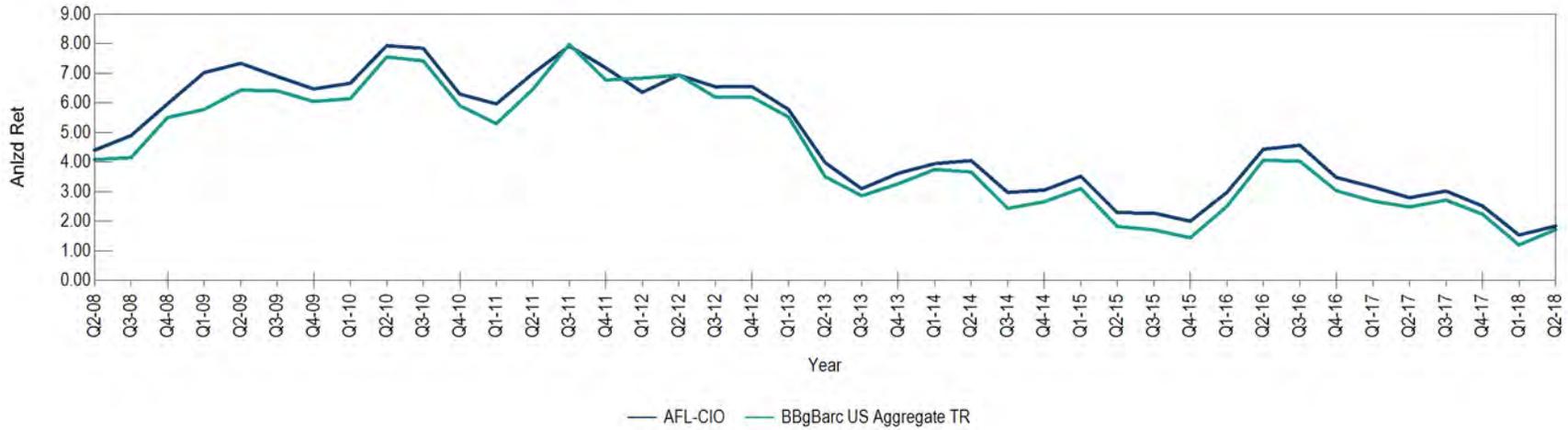


Duration and Quality distributions exclude cash.

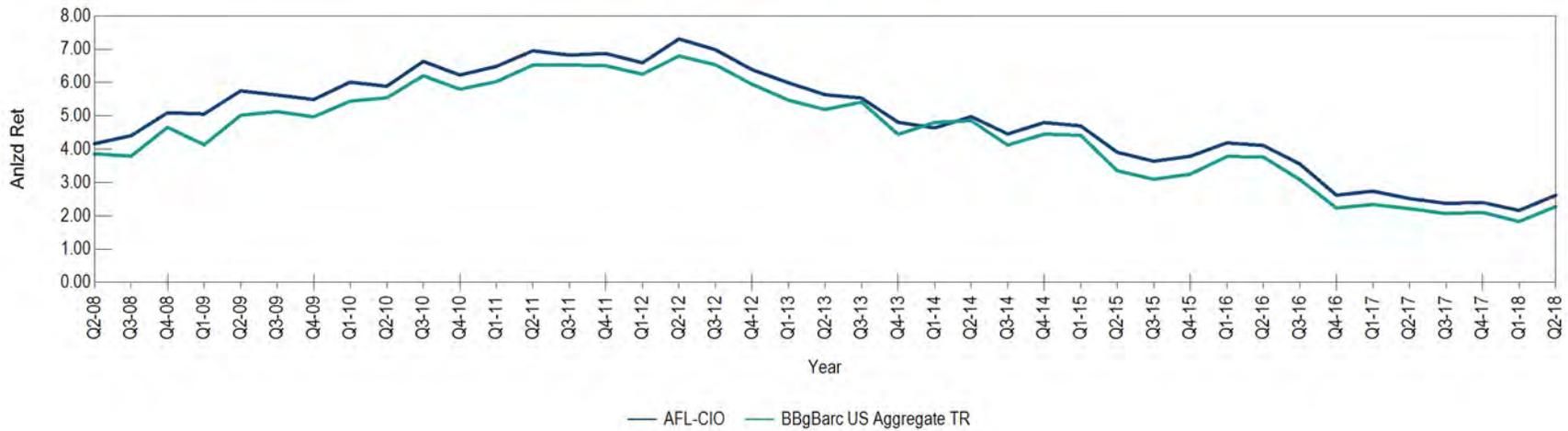


	Return (Rank)									
5th Percentile	0.3	1.2	3.1	3.7	5.4	5.2	5.1	1.9	7.7	0.5
25th Percentile	0.0	0.2	2.4	3.0	4.7	4.4	3.8	1.3	6.5	-0.8
Median	-0.1	-0.1	2.1	2.7	4.4	4.0	3.2	0.9	6.0	-1.4
75th Percentile	-0.2	-0.3	1.9	2.4	4.1	3.6	2.7	0.5	5.4	-1.9
95th Percentile	-0.5	-0.7	1.6	2.1	3.6	2.9	2.0	-0.1	2.9	-2.7
# of Portfolios	230	230	226	223	202	233	223	196	213	209
● AFL-CIO	-0.2 (73)	-0.2 (57)	1.8 (79)	2.6 (56)	4.1 (72)	3.6 (76)	2.4 (87)	1.6 (15)	6.6 (25)	-1.9 (78)
▲ BBgBarc US Aggregate TR	-0.2 (63)	-0.4 (82)	1.7 (88)	2.3 (89)	3.7 (92)	3.5 (79)	2.6 (77)	0.6 (75)	6.0 (52)	-2.0 (82)

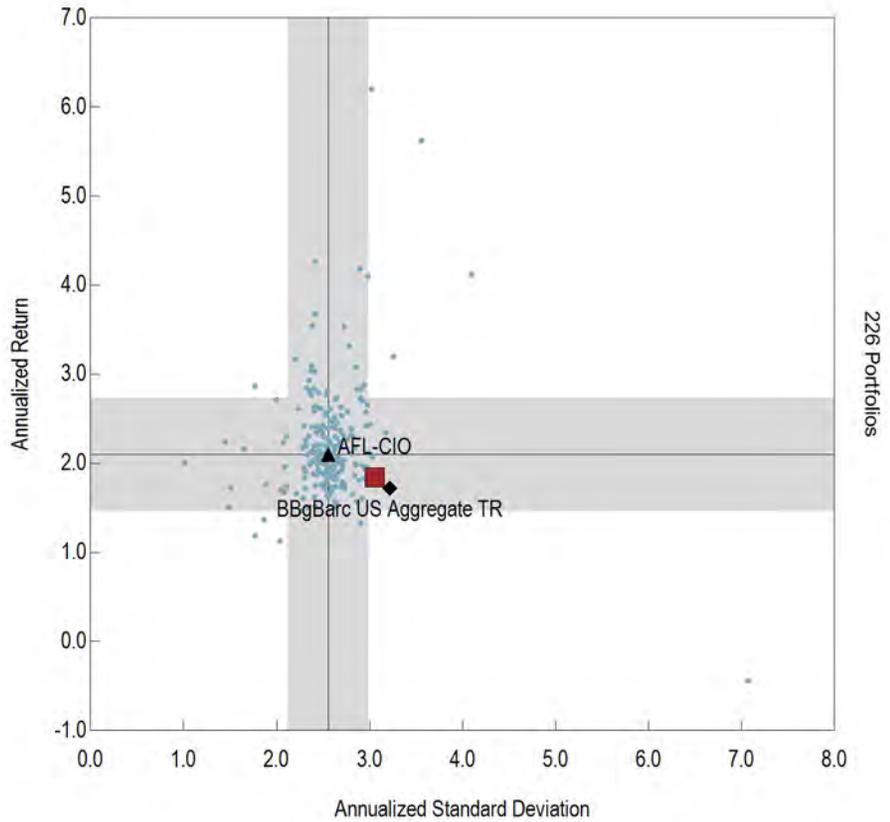
Rolling 3 Year Annualized Return (%)



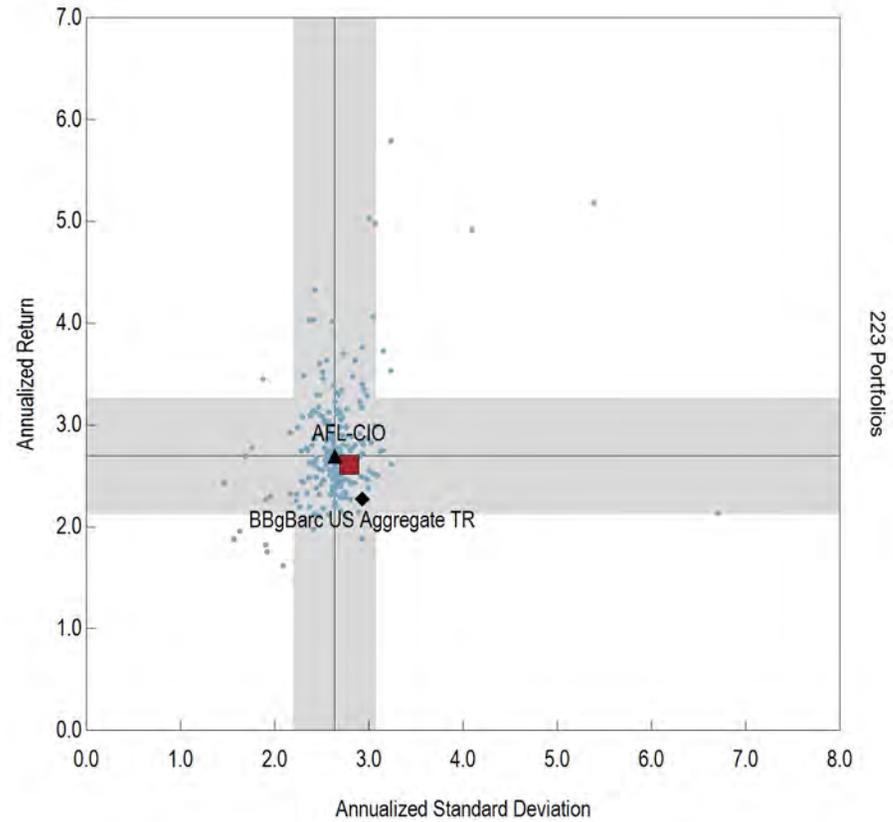
Rolling 5 Year Annualized Return (%)



3 Years



5 Years



3 Years

	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio
AFL-CIO	1.8%	3.1%	0.4
BBgBarc US Aggregate TR	1.7%	3.2%	0.3
eV US Core Fixed Inc Gross Median	2.1%	2.6%	0.6

5 Years

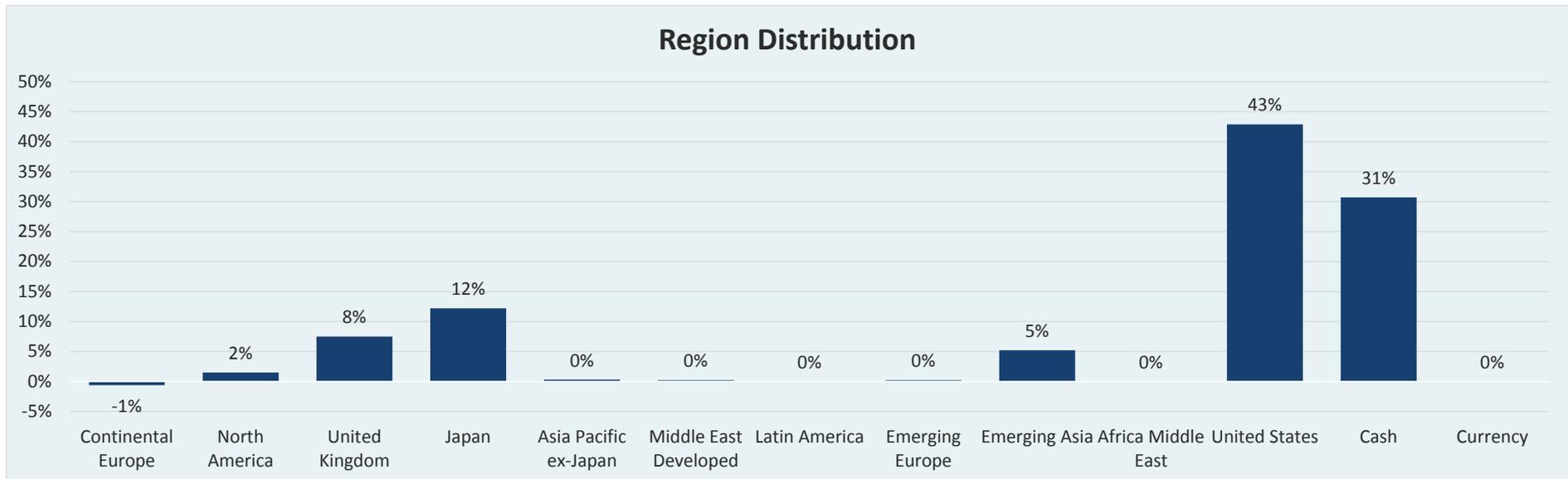
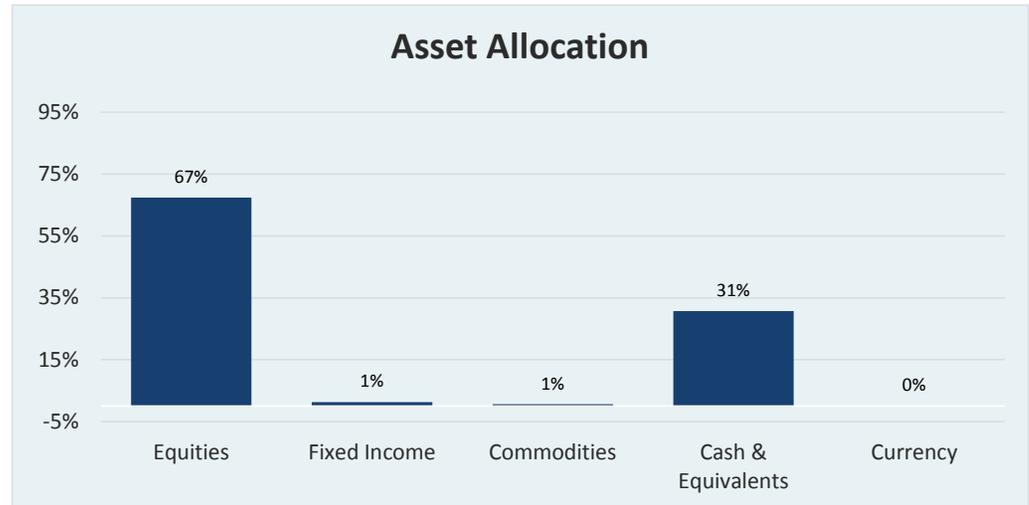
	Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio
AFL-CIO	2.6%	2.8%	0.8
BBgBarc US Aggregate TR	2.3%	2.9%	0.6
eV US Core Fixed Inc Gross Median	2.7%	2.6%	0.9

Wellington Total Return Manager Portfolio Overview

Period Ending: June 30, 2018

Tactical multi-asset class real return strategy with a focus on managing risk of active strategies used to gain exposure to attractive assets of markets.

	Wellington Total Return
Number of Equity Holdings	959
Number of Commodity Holdings	141
Effective Duration (Years)	3.90
Average Quality	D



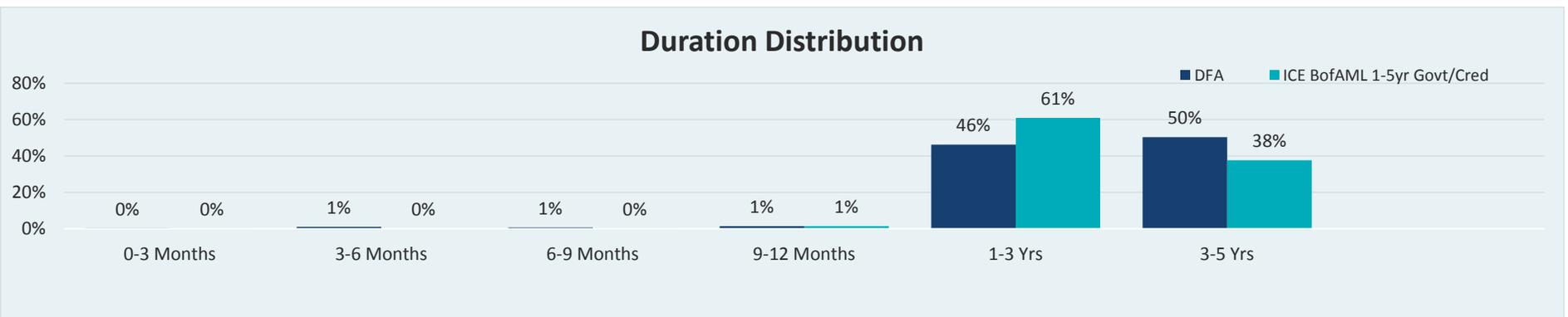
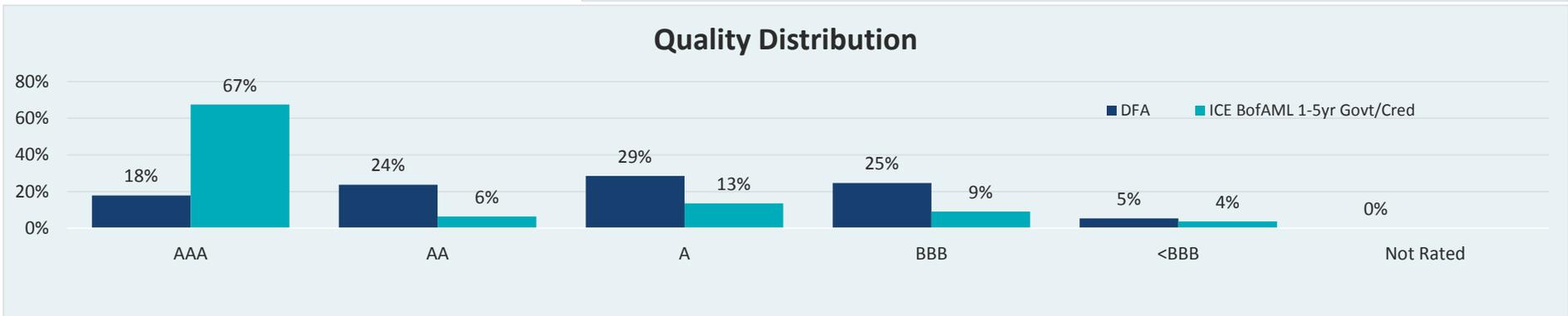
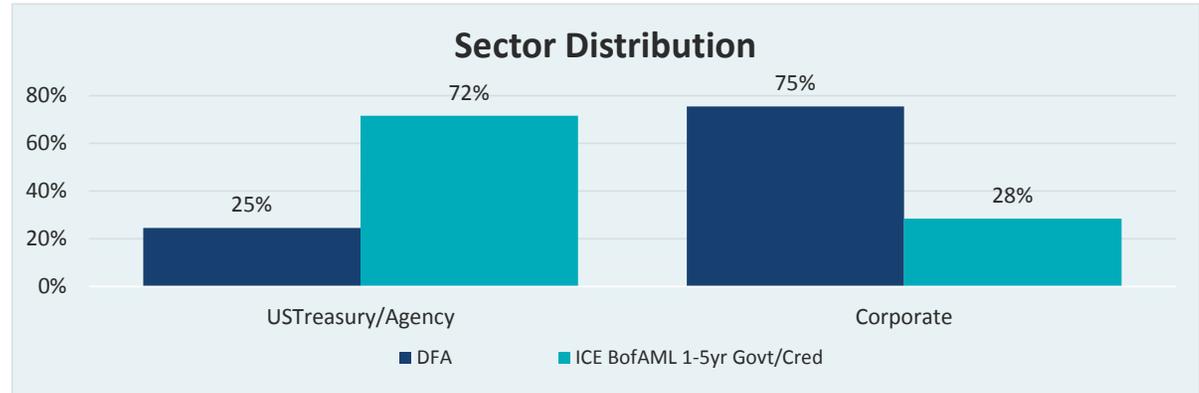
Liquidity Managers

DFA Short Credit
 Manager Portfolio Overview

Period Ending: June 30, 2018

Domestic short term US credit fixed income portfolio that maximizes total return through income and capital appreciation. Primary personnel include Dave Plecha and Joseph Kolerich.

	DFA	ICE BofAML 1-5yr Govt/Cred
Effective Duration	2.83	2.66
Yield to Maturity	3.25	2.88
Average Quality	A+	Aa1
Average Coupon	2.75%	2.50%

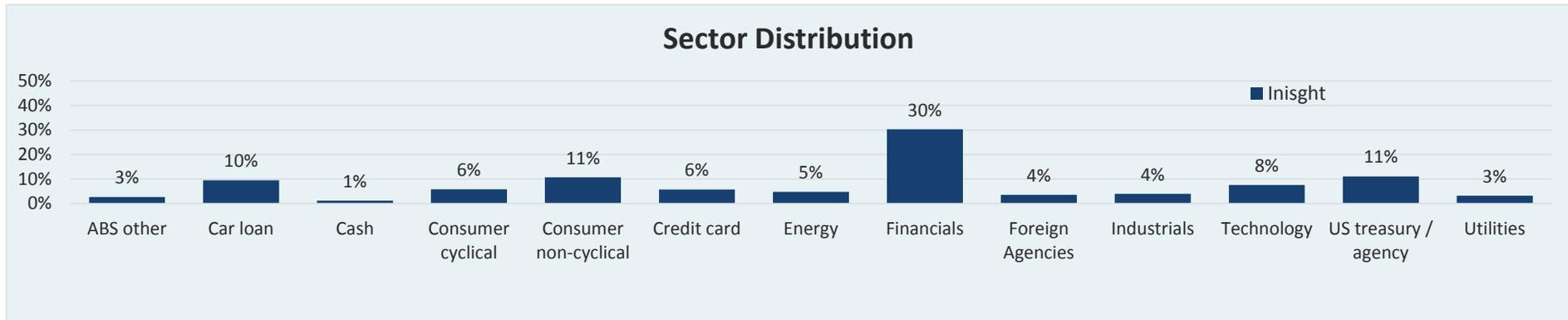


Insight Short Duration Manager Portfolio Overview

Period Ending: June 30, 2018

High quality, short duration multi-sector fixed income portfolio comprised of Treasuries, Agencies, investment grade corporates, and ABS designed specifically to meet CCCERA's liabilities. Key personnel include Gerard Berrigan and Jesse Fogarty.

	Insight	BBgBarc 1-3yr Govt
Effective Duration	1.16	1.90
Yield to Maturity	2.87	2.54
Average Quality	AA-	AAA
Average Coupon	2.5%	1.9%

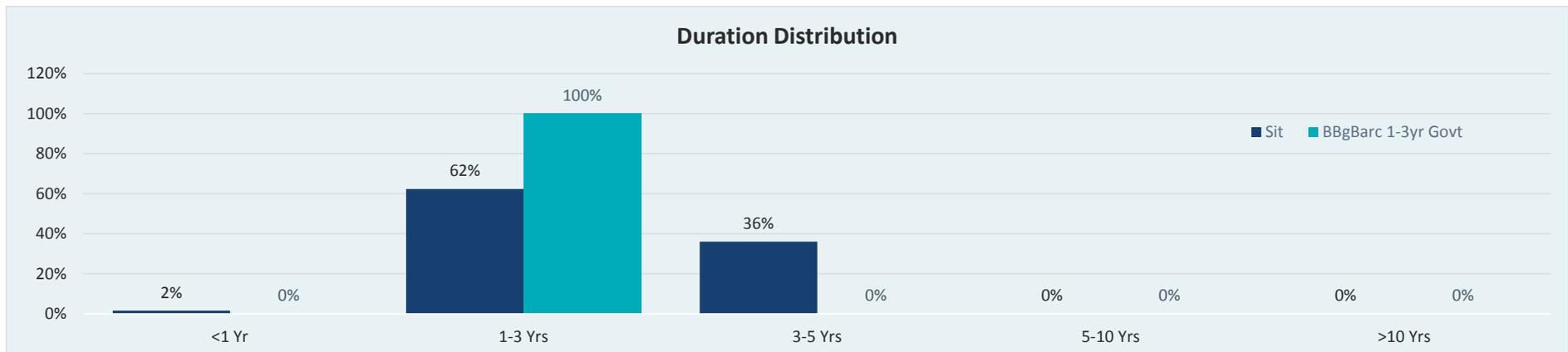
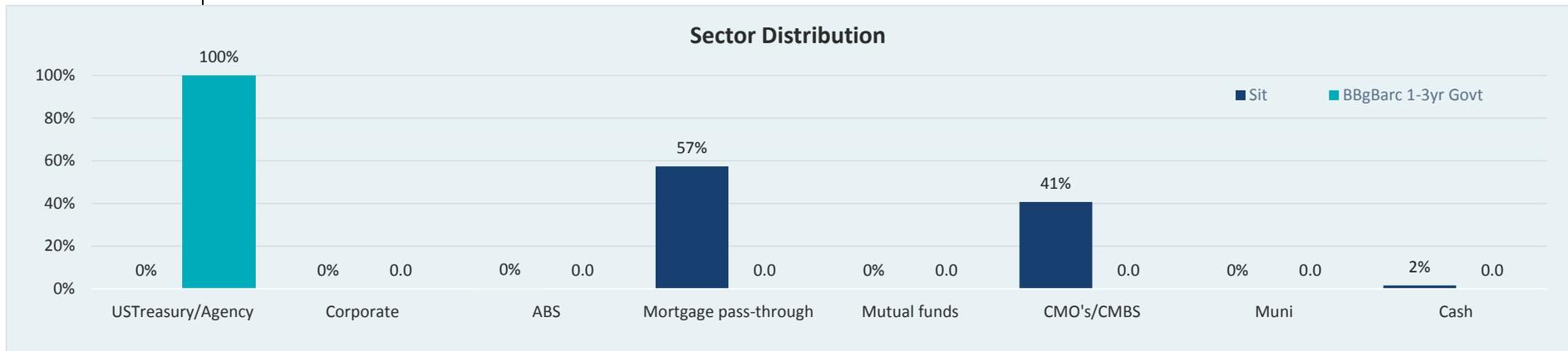


Sit Short Duration Manager Portfolio Overview

Period Ending: June 30, 2018

Short duration fixed income portfolio with a focus on earning high levels of interest income. Primary personnel include Bryce Doty, Paul Jungquist and Michael Brilley.

	Sit	BBgBarc 1-3yr Govt
Adjusted Duration	2.60	1.9
Yield to Maturity	3.00	2.54
Average Quality	AAA	AAA
Average Coupon	6.5%	1.9%



Performance Return Calculations

Performance is calculated using Modified Dietz and for time periods with large cash flow (generally greater than 10% of portfolio value), Time Weighted Rates of Return (TWRR) methodologies. Monthly returns are geometrically linked and annualized for periods longer than one year.

Data Source

Verus is an independent third party consulting firm and calculates returns from best source book of record data. Returns calculated by Verus may deviate from those shown by the manager in part, but not limited to, differences in prices and market values reported by the custodian and manager, as well as significant cash flows into or out of an account. It is the responsibility of the manager and custodian to provide insight into the pricing methodologies and any difference in valuation.

Illiquid Alternatives

Due to the inability to receive final valuation prior to report production, closed end funds (including but are not limited to Real Estate, Hedge Funds, Private Equity, and Private Credit) performance is typically reported at a one-quarter lag. Valuation is reported at a one-quarter lag, adjusted for current quarter flow (cash flows are captured real time). Closed end fund performance is calculated using a time-weighted return methodology consistent with all portfolio and total fund performance calculations. For Private Markets, performance reports also include Verus-calculated multiples based on flows and valuations (e.g. DPI and TVPI) and manager-provided IRRs.

Manager Line Up

Manager	Inception Date	Data Source	Manager	Inception Date	Data Source
BlackRock Russell 1000 Index	4/20/2017	BlackRock	Long Wharf Fund IV	7/3/2013	Long Wharf
Jackson Square Partners	5/1/2005	State Street	Long Wharf Fund V	9/30/2016	Long Wharf
Robeco Boston Partners	6/1/1995	State Street	Invesco Real Estate II	11/26/2007	Invesco
Emerald Advisors	4/7/2003	State Street	Invesco Real Estate III	6/30/2013	Invesco
Ceredex	11/6/2011	State Street	Invesco Real Estate IV	6/30/2014	Invesco
Pyrford	4/25/2014	State Street	Oaktree REOF V	12/31/2011	Oaktree
William Blair	10/29/2010	William Blair	Oaktree REOF VI	9/30/2013	Oaktree
Artisan Partners	10/1/2012	SEI Trust	Oaktree REOF VII	4/1/2015	Oaktree
First Eagle	1/18/2011	State Street	Siguler Guff DREOF	1/25/2012	Siguler Guff
PIMCO RAE Emerging Markets	2/28/2017	State Street	Siguler Guff DREOF II	8/31/2013	Siguler Guff
TT Emerging Markets	7/27/2017	TT	Siguler Guff DREOF II Co-Inv	1/27/2016	Siguler Guff
AFL-CIO	6/30/1991	AFL-CIO	Paulson Real Estate Fund II	11/10/2013	State Street
Sit Short Duration	11/2/2016	State Street	Adams Street Partners	3/18/1996	Adams Street
DFA Short Credit	11/21/2016	State Street	Adams Street Partners II	1/16/2009	Adams Street
Insight Short Duration	11/18/2016	State Street	Adams Street Partners Venture	4/28/2017	Adams Street
BlackRock	4/20/2017	BlackRock	Adams Street Partners - BFP	1/18/1996	Adams Street
Torchlight II	9/30/2006	Torchlight	Adams Street Partners - Fund 5	9/21/2012	Adams Street
Torchlight III	12/31/2008	Torchlight	Bay Area Equity Fund	6/14/2004	DBL Investors
Torchlight IV	7/1/2012	Torchlight	Bay Area Equity Fund II	12/7/2009	DBL Investors
Torchlight V	7/1/2012	Torchlight	Carpenter Bancfund	1/31/2008	Carpenter Bancfund
Allianz Global Investors	4/25/2000	State Street	EIF US Power Fund I	11/26/2003	Ares Management
BlackRock Transition	11/1/2016	State Street	EIF US Power Fund II	8/16/2005	Ares Management
Wellington Real Total Return	2/26/2013	State Street	EIF US Power Fund III	5/30/2007	Ares Management
Aether Real Assets III	11/27/2013	Aether	EIF US Power Fund IV	11/28/2011	Ares Management
Commonfund	6/28/2013	Commonfund	EIF US Power Fund V	11/28/2016	Ares Management
Adelante	9/30/2001	State Street	Nogales	2/15/2004	Nogales
Cash	-	State Street	Paladin III	11/30/2007	Paladin
Angelo Gordon Realty Fund VIII	1/23/2012	Angelo Gordon	Ocean Avenue Fund II	6/11/2014	Ocean Avenue
Angelo Gordon Realty Fund IX	12/8/2014	Angelo Gordon	Ocean Avenue Fund III	4/15/2016	Ocean Avenue
Angelo Gordon Energy Credit Opp	9/24/2015	Angelo Gordon	Pathway	11/9/1998	Pathway
DLJ RECP III	6/23/2005	DLJ	Pathway 2008	12/26/2008	Pathway
DLJ RECP IV	2/11/2008	DLJ	Pathway 6	5/24/2011	Pathway

DLJ RECP V	7/1/2014	DLJ	Pathway 7	2/7/2013	Pathway
Wastewater Opp. Fund	12/8/2015	Wastewater	Siguler Guff CCCERA Opps	6/3/2014	Siguler Guff
LaSalle Income & Growth VI	7/16/2013	LaSalle	Siguler Guff Secondary Opps	11/30/2016	Siguler Guff
LaSalle Income & Growth VII	2/28/2017	LaSalle	Aether Real Assets IV	3/16/2016	Aether
Hearthstone II	6/17/1998	Hearthstone	StepStone CC Opportunities Fund	2/1/2018	Stepstone
Parametric Overlay	3/29/2017	State Street			

Policy & Custom Index Composition

Policy Index (4/1/2018 - present)	5% S&P 500, 13% MSCI EAFE, 11% MSCI Emerging Markets, 11% Cambridge Associates US Private Equity, 12% S&P/LSTA Leveraged Loan Index+2%, 5% NCREIF Property Index +2%, 4.0% NCREIF Property Index +4%, 1% Wilshire REIT, 3% MSCI ACWI, 2% BBgBarc US Aggrgate, 23% BBgBarc 1-3 Yr Gov/Credi, 3% BBgBarc US Treasury 7-10 Year TR, 7% HFRI Fund of Funds Composite Index
Policy Index (12/1/2016 - present)	22.9% Russell 3000, 11% MSCI ACWI ex-US (Gross), 10.9% MSCI ACWI (Net), 1% Wilshire REIT, 1.7% NCREIF Property Index, 6.8% NCREIF ODCE Index, 3.6% CPI +4%, 8.1% S&P 500 +4%, 1.7% ICE BofAML High Yield Master II +2%, 5.1% ICE BofAML High Yield Master II, 22.4% BBgBarc 1-3 Yr Gov/Credit, 1.6% 90-day T-Bills, 3.2% BBgBarc US Aggregate.
Policy Index (4/1/2012-11/30/2016)	27.7% Russell 3000, 10.6% MSCI ACWI ex-US (Gross), 12.3% MSCI ACWI (Net), 19.6% BBgBarc U.S. Aggregate, 5% ICE BofAML High Yield Master II, 4% BBgBarc Global Aggregate, 13.5% Real Estate Benchmark, 6.8% S&P 500 +4% (Lagged), 0.5% 91-Day T-Bills.
Custom Growth Benchmark (4/1/2018-Current)	7.5% S&P 500, 19.4% MSCI EAFE, 16.4% MSCI Emerging Markets, 16.4% Cambridge Associates US Private Equity, 17.9% S&P/LSTA Leveraged Loan Index+2%, 7.5% NCREIF Property Index +2%, 6.0% NCREIF Property Index +4%, 1.5% Wilshire REIT, 4.5% MSCI ACWI, 3% BBgBarc US Aggrgate.
Custom Growth Benchmark (Prior to 4/1/2018)	Weighted-average of the benchmarks of the sub-composites that make up the composite.
Custom Diversifying Benchmark (4/1/2018-Current)	30% BBgBarc US Treasury 7-10 Year TR, 70% HFRI Fund of Funds Composite Index
Custom Diversifying Benchmark (Prior to 4/1/2018)	Weighted-average of the benchmarks of the sub-composites that make up the composite.
Real Estate Benchmark (current)	11% Wilshire REIT, 18% NCREIF Property Index, 71% NCREIF ODCE Index.
Real Estate Benchmark (4/1/2012-11/30/2016)	40% Wilshire REIT, 50% NCREIF Property Index, 10% FTSE/EPRA NAREIT Developed ex-US.

Other Disclosures

All data prior to 12/31/2014 was provided by previous consultant.

Glossary

Allocation Effect: An attribution effect that describes the amount attributable to the managers' asset allocation decisions, relative to the benchmark.

Alpha: The excess return of a portfolio after adjusting for market risk. This excess return is attributable to the selection skill of the portfolio manager. Alpha is calculated as: Portfolio Return - [Risk-free Rate + Portfolio Beta x (Market Return - Risk-free Rate)].

Benchmark R-squared: Measures how well the Benchmark return series fits the manager's return series. The higher the Benchmark R-squared, the more appropriate the benchmark is for the manager.

Beta: A measure of systematic, or market risk; the part of risk in a portfolio or security that is attributable to general market movements. Beta is calculated by dividing the covariance of a security by the variance of the market.

Book-to-Market: The ratio of book value per share to market price per share. Growth managers typically have low book-to-market ratios while value managers typically have high book-to-market ratios.

Capture Ratio: A statistical measure of an investment manager's overall performance in up or down markets. The capture ratio is used to evaluate how well an investment manager performed relative to an index during periods when that index has risen (up market) or fallen (down market). The capture ratio is calculated by dividing the manager's returns by the returns of the index during the up/down market, and multiplying that factor by 100.

Correlation: A measure of the relative movement of returns of one security or asset class relative to another over time. A correlation of 1 means the returns of two securities move in lock step, a correlation of -1 means the returns of two securities move in the exact opposite direction over time. Correlation is used as a measure to help maximize the benefits of diversification when constructing an investment portfolio.

Excess Return: A measure of the difference in appreciation or depreciation in the price of an investment compared to its benchmark, over a given time period. This is usually expressed as a percentage and may be annualized over a number of years or represent a single period.

Information Ratio: A measure of a manager's ability to earn excess return without incurring additional risk. Information ratio is calculated as: excess return divided by tracking error.

Interaction Effect: An attribution effect that describes the portion of active management that is contributable to the cross interaction between the allocation and selection effect. This can also be explained as an effect that cannot be easily traced to a source.

Portfolio Turnover: The percentage of a portfolio that is sold and replaced (turned over) during a given time period. Low portfolio turnover is indicative of a buy and hold strategy while high portfolio turnover implies a more active form of management.

Price-to-Earnings Ratio (P/E): Also called the earnings multiplier, it is calculated by dividing the price of a company's stock into earnings per share. Growth managers typically hold stocks with high price-to-earnings ratios whereas value managers hold stocks with low price-to-earnings ratios.

R-Squared: Also called the coefficient of determination, it measures the amount of variation in one variable explained by variations in another, i.e., the goodness of fit to a benchmark. In the case of investments, the term is used to explain the amount of variation in a security or portfolio explained by movements in the market or the portfolio's benchmark.

Selection Effect: An attribution effect that describes the amount attributable to the managers' stock selection decisions, relative to the benchmark.

Sharpe Ratio: A measure of portfolio efficiency. The Sharpe Ratio indicates excess portfolio return for each unit of risk associated with achieving the excess return. The higher the Sharpe Ratio, the more efficient the portfolio. Sharpe ratio is calculated as: Portfolio Excess Return / Portfolio Standard Deviation.

Sortino Ratio: Measures the risk-adjusted return of an investment, portfolio, or strategy. It is a modification of the Sharpe Ratio, but penalizes only those returns falling below a specified benchmark. The Sortino Ratio uses downside deviation in the denominator rather than standard deviation, like the Sharpe Ratio.

Standard Deviation: A measure of volatility, or risk, inherent in a security or portfolio. The standard deviation of a series is a measure of the extent to which observations in the series differ from the arithmetic mean of the series. For example, if a security has an average annual rate of return of 10% and a standard deviation of 5%, then two-thirds of the time, one would expect to receive an annual rate of return between 5% and 15%.

Style Analysis: A return based analysis designed to identify combinations of passive investments to closely replicate the performance of funds

Style Map: A specialized form or scatter plot chart typically used to show where a Manager lies in relation to a set of style indices on a two-dimensional plane. This is simply a way of viewing the asset loadings in a different context. The coordinates are calculated by rescaling the asset loadings to range from -1 to 1 on each axis and are dependent on the Style Indices comprising the Map.

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Meeting Date
08/22/18
Agenda Item
#7b

Memorandum

Date: August 22, 2018
To: CCCERA Board of Retirement
From: Timothy Price, Chief Investment Officer
Subject: Investment Staff Report – Q2 2018

Overview

On a quarterly basis CCCERA's Board receives a report which details critical elements of CCCERA's Functionally Focused Portfolio's sub-portfolios. The purpose of the report is to highlight elements of the sub-portfolios which are good indicators to the Board of the program's efficient and effective operation.

Summary

CCCERA's Total Fund is performing as expected, exhibiting returns above expectations for the amount of risk taken. This is measured by the Sharpe Ratio (risk-adjusted return), and a comparison to the Simple Target Index. The Simple Target Index is the most basic index which could replicate CCCERA's Total Fund, and is made up of 63% MSCI ACWI, 25% Bloomberg 1-3 Year Gov/Credit, and 12% 3-Month Treasury Bills (please see the Total Fund pages in the appendix for additional details). CCCERA's portfolio is much more complex, especially as it relates to allocations to private equity, private credit, and real estate. CCCERA has been rewarded for implementing a more complex portfolio, and has outperformed the Simple Target Index over the trailing five years, while experiencing less risk (volatility). Details on performance relative to this index are included in the appendix. It is worth noting that CCCERA's Total Fund return is an aggregate of the performance of the Liquidity, Growth, and Risk Diversifying sub-portfolios.

1) Liquidity

The purpose of the liquidity program is to match four years of benefit payments with high credit quality, low duration assets. The liquidity sub-portfolio is made up of three fixed income managers, which all pursue a high quality, low duration investment approach. Through the second quarter of 2018, all managers held high quality portfolios (as measured by credit ratings), low duration portfolios. The average credit quality for the entire liquidity program is AA (AAA is the highest rating), and the duration is an aggregate 2.0 years, which is considered short duration. Additional details on the liquidity program managers are available in the appendix.

2) Growth

The Growth portfolio is designed to take advantage of capital appreciation and income opportunities globally. To achieve this, the Growth portfolio includes a variety of assets, from stocks and growth oriented bonds to private equity, real estate, and private credit. In the second quarter, CCCERA's Growth portfolio rose slightly, with strength in domestic markets being offset by weakness in international and emerging markets.

3) Risk Diversifying

The Risk Diversifying mandate holds assets that are expected to diversify the growth portfolio's volatility while offering moderate growth. The mandate as a whole seeks to be highly liquid, have a low beta to the growth market, and produce positive real returns. Throughout the second quarter, the Risk Diversifying mandate fulfilled most of these goals. The entire mandate is able to be liquidated within 30 days, meeting the requirement of high liquidity. The beta of the mandate to growth markets is approximately 0.1, which is very low and shows good diversification. Trailing real (net of inflation) returns over the past five years is -1.0%, which is below expectations. The addition of the Parametric Defensive Equity portfolio to the risk-diversifying sub-portfolio is expected to help long-term returns. Long term returns for mandates in the Risk Diversifying portfolio are expected to be between 4% and 8% on an annualized basis.

The Liquidity, Growth, and Risk Diversifying sub-portfolios are largely functioning well and within expectations. The product teams and asset managers are stable, and at this time we see few causes of organizational concern at our investment managers. CCCERA's Total Fund in aggregate is performing in line with expectations, having a higher return and a lower level of volatility compared to the Simple Target Index. Enclosed are additional details on CCCERA's Total Fund, sub-portfolios, and individual investment strategies.

CCCERA Portfolio Report Card

Below we have itemized those elements of each of CCCERA’s sub-portfolios and Total Fund which we believe the Board should pay particular attention to. Additional details on each of the sub-portfolios are available in the appendix.

Liquidity

Objective	Measurement	Current Period Data	Status
High Quality	Credit Quality	AA	Meeting Expectations
Low Risk	Duration	2.0 years	Meeting Expectations
Appropriately Sized	Months of Benefit Payments Invested	36 Months	Meeting Expectations

Growth

Objective	Measurement	Current Period Data	Status
Growth of Plan Assets	Absolute Returns	Trailing 5yr return of 9.6%	Meeting Expectations
	Benchmark Relative Returns	0.2% over ACWI over trailing 5 years	Below Expectations
Efficient Capital Deployment	Sharpe Ratio	CCCERA: 1.61 MSCI ACWI: 0.89 (over trailing 5 years)	Meeting Expectations

Risk Diversifying

Objective	Measurement	Current Period Data	Status
Offset Volatility in Growth Portfolio	Beta	0.1 over trailing 5 years	Meeting Expectations
Positive Real Returns	Returns	Trailing 5yr real return of -1.0%	Below Expectations
High Liquidity	% of Portfolio that can be liquidated within 90 days	100%	Meeting Expectations

Total Fund

Objective	Component/Measurement	Status
Store 4 Years of Benefit Payments	Liquidity Sub-portfolio	Meeting Expectations
Participate in Growth Opportunities	Growth Sub-portfolio	Meeting Expectations
Provide an offset to Growth volatility	Risk Diversifying Sub-portfolio	Meeting Expectations
Produce superior risk adjusted returns	Total Fund Sharpe Ratio	Meeting Expectations

Appendix – Liquidity Portfolio

Manager Reviews

Organizational Stability

	Portfolio Management Assessment	1 Year Product Asset Growth	1 Year Firm Asset Growth	Regulatory Action in Last Year?
Insight	Good	--	10%	N
Sit	Good	6%	1%	N
DFA	Good	12%	12%	N

Performance

	Portfolio Average Credit Quality	Portfolio Average Duration	Portfolio Average Coupon	1 Year Total Return
Insight	AA-	1.2	2.5	0.9%
Sit	AAA	2.6	6.5	0.5%
DFA	A+	2.8	2.8	-0.1%

Manager Notes:

Sit:

Mike Brilley, head of fixed income, will be retiring at the end of 2018. No expected impact as Mike played no role on CCCERA's account and will not be replaced.

Manager Theses:

The Liquidity Portfolio is a combination of three managers which work together to match four years of CCCERA's liabilities. The portfolio is refreshed every year during the annual funding plan.

Insight: Insight plays a completion role in the liquidity program, matching out liabilities with short duration government and corporate fixed income securities.

DFA: Dimensional Fund Advisors runs a strategy that focuses on obtaining fixed income exposures via the most liquid securities available. DFA contributes to the Liquidity Program by selling securities at regular intervals to pay a portion of CCCERA's monthly benefit payment.

Sit: Sit invests in high yielding government backed mortgages. The cash flow from these securities is harvested monthly to make up a portion of CCCERA's monthly benefit payment.

Appendix – Growth Portfolio

Manager Reviews

Organizational Stability

	Portfolio Management Assessment	1 Year Product Asset Growth	1 Year Firm Asset Growth	Regulatory Action in Last Year?
Boston Partners	Good	6%	6%	N
Jackson Square	Good	4%	1%	N
BlackRock Index Fund	Good	-10%	11%	N
Emerald Advisors	Good	15%	15%	N
Ceredex	Good	0%	-3%	N
Pyrford (BMO)	Good	17%	0%	N
William Blair	Good	1%	-12%	N
First Eagle	Good	2%	-1%	N
Artisan Global	Good	20%	4%	N
PIMCO/RAE EM	Good	18%	6%	N
TT EM	Good	182%	37%	N
Adelante	Good	-3%	-2%	N
Allianz	Good	5%	8%	N
Private Equity	Good	--	--	N
Private Credit	Good	--	--	N
Real Estate	Good	--	--	N

Performance

	Trailing 1 Year Return	Trailing 5 Year Return	Performance in Line with Expectations?
Boston Partners	11%	11%	Y
Jackson Square	19%	14%	Y
BlackRock Index Fund	15%	13%	Y
Emerald Advisors	24%	16%	Y
Ceredex	17%	13%	Y
Pyrford (BMO)	2%	5%	Y
William Blair	13%	8%	Y
First Eagle	6%	8%	Y
Artisan Global	16%	14%	Y
PIMCO/RAE EM	8%	6%	Y
TT EM	10%	10%	Y
Adelante	5%	9%	Y
Allianz	1%	5%	Y
	1Yr Premium	5 Year Premium	
Private Equity	-0.8%	3.5%	N
Private Credit	2%	0%	Y
Real Estate	7.5%	3.4%	Y

Manager Notes:

CommonFund:

Catherine Keating left the role of Commonfund CEO to join BNY Mellon's Wealth Management practice. Mark Anson (current CIO) has been appointed President and CEO of CommonFund. There is little expected impact to CCCERA's Natural Resources Funds-of-Funds exposure.

Emerald:

In July Emerald Asset Management and 1251 Capital Group announced that they agreed to form a partnership between Emerald and 1251 to position Emerald for future growth by enhancing the Emerald team and its line-up of investment products. Under the agreement, 1251 Capital Group will acquire a partnership stake in Emerald Asset Management, while its senior management will join Emerald's Board of Directors. Emerald's current executive and management team will continue to independently manage day-to-day operations and retain control of the investment process and function.

Paulson Real Estate:

Mike Barr and the real estate team have spun out of Paulson and established Cross Lake Partners. Cross Lake will assume management of CCCERA's real estate mandate which was formerly with Paulson.

LaSalle Real Estate:

Jim Hutchison will retire from portfolio manager role at the end of 2019, and that role will transition to Joe Munoz. Jim and Joe have worked as a team for years, so little direct impact is expected on existing investments. CCCERA Investment Staff will reevaluate Jim's contributions to deal sourcing when we look at future LaSalle funds.

PIMCO:

Rob Arnott is transitioning the title of CEO to Katy Sherrerd, President & COO. Katy was hired by Rob in 2006 as Head of Strategic Planning and Affiliate Relations and later moving to COO in 2009 and President in 2014 to oversee day-to-day operations and business management. This change is intended to formalize the shifts Research Affiliates have been making over the past several years, focusing Rob on research as opposed to day to day management of the firm. Rob will continue as Chairman of Research Affiliates and his portfolio management duties will not change.

Manager Theses:

The growth portfolio includes all managers in public and private equity, real estate, and private credit. These managers grow CCCERA's assets for future benefit payments (beyond the four years already covered by the Liquidity program).

Boston Partners: Large cap domestic equity which follows a value discipline. Boston Partners will buy out of favor companies and sell them when their intrinsic values are reflected in the market. Expected to outperform in flat to falling markets.

Jackson Square: Domestic equity large cap growth portfolio concentrated in companies with sustainable long-term growth characteristics. This portfolio should outperform in rapidly rising markets.

BlackRock Index Fund: Large cap domestic equity portfolio which should follow the Russell 1000 Index.

Emerald Advisors: Small cap growth equity seeking companies with high growth rates. Expected to produce strong returns in rising markets, and weak returns in falling markets.

Ceredex: Domestic equity small cap value portfolio of companies with dividend yields and low valuations. This portfolio should outperform flat markets.

Pyrford (BMO): International equity value portfolio of non-US companies with low valuations at the country and stock level. This portfolio should outperform in flat markets.

William Blair: International equity growth portfolio of non-US companies with high growth rates constructed from the security level. This portfolio should outperform in rapidly rising markets.

First Eagle: Global equity portfolio that is benchmark agnostic comprised of companies with low valuations.

Artisan Global Opportunities: Global equity portfolio of companies that is benchmark agnostic with accelerating profit cycles and a focus on capital allocation.

PIMCO/RAE Emerging Markets: Quantitative equity with a value orientation. This portfolio follows the fundamental indexing approach (ranking companies by metrics other than market capitalization), resulting in a diversified, low turnover portfolio. This portfolio underperforms in momentum driven markets.

TT International Emerging Markets: Concentrated, growth oriented manager which invests in small and mid-cap emerging market companies. TT employs both a top-down and a bottom-up research approach, and seeks to outperform by identifying companies that have a catalyst to drive future growth.

Private Equity: CCCERA invests in private equity to generate returns above those available in the public equity markets.

Private Credit: CCCERA invests in private credit to generate cash flow streams above those available in the public debt markets.

Real Estate: CCCERA invests in value-add, distressed, and opportunistic real estate to generate returns from the capital appreciation and cash flow associated with commercial real estate investment.

Adelante: Diversified portfolio of U.S. REITs with a focus on the underlying real estate assets. Adelante is a public market proxy of the core real estate market.

Allianz High Yield Fixed Income: Domestic high yield fixed income portfolio with a focus on security selection. Allianz will focus on the higher quality segment of the high yield universe. Allianz should provide a steady income stream, and provide downside protection in falling markets.

Appendix – Risk Diversifying Portfolio

Organizational Stability

	Portfolio Management Assessment	1 Year Product Asset Growth	1 Year Firm Asset Growth	Regulatory Action in Last Year?
AFL-CIO	Good	0%	0%	N
Wellington	Satisfactory	45%	5%	Y

Performance

	Trailing 1 Year Correlation to Growth	Trailing 3 Year Correlation to Growth	1 Year Return	5 Year Return	% of Portfolio Liquid in 30 Days
AFL-CIO	-0.3	-0.1	0%	3%	100%
Wellington	0.0	0.3	1%	-1%	100%

Manager Notes:

Wellington:

On May 12, 2017, the US Securities and Exchange Commission notified Wellington that it was opening an investigation into some aspects of Wellington’s private company investment activities. The investigation appears to be focused on private equity investments and associated valuation practices and is not related to the CCCERA Real Total Return portfolio.

Manager Theses:

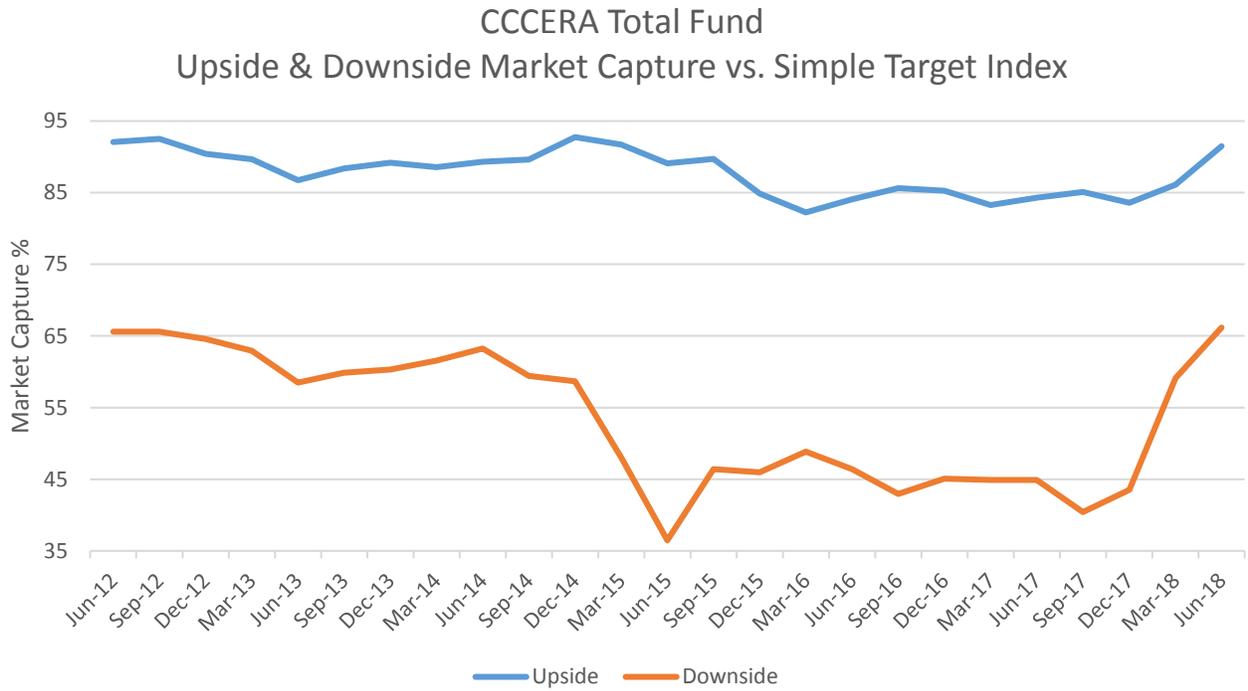
Managers in the risk diversifying allocation seek to have a low correlation with the growth portfolio, positive returns in flat and falling equity markets, and a high degree of liquidity. These managers work together to offset some of the risks in the growth portfolio.

AFL-CIO: Portfolio of domestic, high quality fixed income securities which are backed by commercial and residential mortgages.

Wellington: Multiple asset fund which tactically rotates between assets to produce returns.

Appendix Data – Total Fund

Rolling 3-Year Total Fund Upside/Downside Market Capture



*The composition of the Simple Target Index has mirrored changes in CCCERA’s asset allocation over time: from 2008 to 2012 the benchmark was 73% MSCI ACWI, 23% Bloomberg 1-3 Year Gov/Credit, and 4% 3-Month Treasury Bills. From 2012 to 2016 the composition was 74% MSCI ACWI, 18% Bloomberg 1-3 Year Gov/Credit, and 9% 3-Month Treasury Bills. From 2016 to 2017 the composition was 63% MSCI ACWI, 25% Bloomberg 1-3 Year Gov/Credit, and 12% 3-Month Treasury Bills, and from 2017 to present the composition is 61% MSCI ACWI, 27% Bloomberg 1-3 Year Gov/Credit, and 12% 3-Month Treasury Bills.

Total Fund Quarterly Attribution

	CCCERA Total Fund			Simple Target Index			Analysis		
	Allocation	Return	Return Contribution	Allocation	Return	Return Contribution	Allocation Difference	Return Difference	Total Effect
Liquidity	24%	0.3%	0.1%	27%	0.4%	0.1%	-4%	-0.1%	0.0%
Growth	71%	0.8%	0.6%	61%	0.5%	0.3%	10%	0.3%	0.2%
Risk Diversifying	6%	-0.5%	0.0%	12%	0.3%	0.0%	-6%	-0.8%	-0.1%
Total Fund	100%		0.6%	100%		0.5%	0%		0.1%

CCCERA Total Fund Performance vs. Simple Target Index

	One Year		Three Years		Five Years		Ten Years	
	CCCERA	STI	CCCERA	STI	CCCERA	STI	CCCERA	STI
Return	7.5	6.7	6.7	5.1	8.7	6.4	8.0	4.6
Volatility	4.4	5.3	5.3	7.1	5.1	7.0	8.9	11.8
Sharpe	1.4	1.0	1.2	0.6	1.6	0.9	0.9	0.4

The Simple Target Index is made up of 63% MSCI ACWI, 25% Bloomberg 1-3 Year Gov Credit, and 12% 3-Month Treasury Bill. This purpose of this index is to examine whether or not CCCERA is being rewarded for pursuing a more nuanced portfolio versus a very simple representative index.

CCCERA’s Total Fund has produced high risk adjusted returns over most trailing periods. Additionally, the CCCERA Portfolio has exceeded the Simple Target Index over all trailing periods. This would indicate that CCCERA has been rewarded for engaging in more complex investments which target outperformance versus investing passively in the market.

The Sharpe ratio is a measure of risk adjusted returns which shows the amount of return a portfolio earns above the risk free rate per unit of volatility. Over all trailing periods, the Total Fund has produced a high Sharpe ratio relative to the Simple Target Index, indicating that CCCERA is being favorably rewarded for the risk taken in the portfolio.



Meeting Date
08/22/18
Agenda Item
#8

Memorandum

Date: August 22, 2018
To: CCCERA Board of Retirement
From: Timothy Price, Chief Investment Officer
Subject: 2018 Liquidity Sub-portfolio Funding and Rebalancing

Overview

Every year, CCCERA receives the bulk of annual employer contributions in late July as employers take advantage of the CCCERA pre-payment discount policy. This creates a large influx of cash that is incorporated into our annual rebalancing, which both refreshes the Liquidity sub-portfolio with the next fourth year of benefit payments as well as provides an opportunity to rebalance the Growth and Diversifying sub-portfolios. A preview of these shifts was provided previously in our Annual Funding Plan memo.

CCCERA received its annual pre-payments of employer contributions in late July and used these proceeds in conjunction with four withdrawals from investment managers to rebalance the portfolio. Across the pre-payments and withdrawals CCCERA raised approximately \$700mm in cash, which was used to both fund the Liquidity Program for an additional year and fund the Parametric Defensive Equity portfolio. Manager reductions came exclusively from domestic equities. The reduction of domestic equity exposure, increase in risk diversifying, and funding of the liquidity program shifts CCCERA's portfolio towards the Phase 3 asset allocation which was approved by the Board on June 27, 2018 (BOR Resolution 2018-2).

For the domestic equity portfolio reductions, CCCERA Investment Staff solicited bids from CCCERA's transition manager pool for the partial redemption of the Emerald and Ceredex small cap portfolios, and the Boston Partners and Jackson Square large cap portfolios. CCCERA Investment Staff felt it was most time and cost effective to have Boston Partners and Jackson Square sell down their own portfolios, and use a transition manager for the small cap portfolios. CCCERA Investment Staff has maintained a constant dialogue with all managers subject to a full or partial redemption of their portfolios. Emerald, Ceredex, Boston Partners, and Jackson Square had sufficient time to prepare their portfolios for the redemption activity to coincide with the annual rebalancing and new mandate funding. During the month of July, when the bulk of the rebalancing occurred, equity markets rose and fixed income markets had small declines.

The following tables show the rebalancing trades which occurred between the end of July and early August, 2018. Funds were raised from the following sources:

Employer Pre-Payments	\$292	million
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Manager Withdrawals

Boston Partners	\$110	million
Jackson Square	\$110	million
Emerald Advisors	\$80	million
Ceredex	\$70	million
Cash	\$38	million
Total Cash Raised	\$700	million

Proceeds were invested with the following investment managers:

Insight	\$310	million
Sit	\$40	million
DFA	\$150	million
Parametric Defensive Equity	\$200	million
Total Invested	\$700	million

CCCERA Asset Allocation

Liquidity	June 30, 2018 Market Value	Phase 3 Target \$	AFP Increase/Decrease	August 1 MV Estimate	August 1, 2018 Total Fund %	Phase 3 Target	Over/(Under)
Insight	697,455,828	1,025,512,786	310,000,000	984,999,346	11.4%	12.0%	-0.6%
Sit	482,786,680	470,026,694	40,000,000	521,004,160	6.0%	5.5%	0.5%
Dimensional Fund Advisors	329,410,558	470,026,694	150,000,000	466,789,708	5.4%	5.5%	-0.1%
Total Liquidity	1,509,653,066	1,965,566,174	500,000,000	1,972,793,214	22.9%	23.0%	-0.1%

Growth

Domestic Equity

Boston Partners	395,079,843	256,378,197	(110,000,000)	301,576,243	3.5%	3.0%	0.5%
Jackson Square	423,687,946	256,378,197	(110,000,000)	329,649,004	3.8%	3.0%	0.8%
BlackRock Index Fund	123,396,474	85,459,399		127,652,996	1.5%	1.0%	0.5%
Emerald Advisors	310,233,552	170,918,798	(80,000,000)	236,941,838	2.7%	2.0%	0.7%
Ceredex	273,911,563	170,918,798	(70,000,000)	211,564,451	2.5%	2.0%	0.5%
Total Domestic Equity	1,526,309,378	940,053,388	(370,000,000)	1,207,384,532	14.0%	11.0%	3.0%

Global & International Equity

Pyrford (BMO)	443,155,210	470,026,694		456,521,946	5.3%	5.5%	-0.2%
William Blair	490,712,598	470,026,694		495,950,675	5.7%	5.5%	0.2%
First Eagle	360,330,728	341,837,595		365,018,686	4.2%	4.0%	0.2%
Artisan Global Opportunities	397,147,350	341,837,595		405,940,942	4.7%	4.0%	0.7%
PIMCO/RAE Emerging Markets	344,791,961	341,837,595		356,800,709	4.1%	4.0%	0.1%
TT Emerging Markets	323,528,055	341,837,595		331,301,642	3.8%	4.0%	-0.2%
Total Global & International Equity	2,359,665,903	2,307,403,769	0	2,411,534,600	28.0%	27.0%	1.0%

Private Equity

Private Credit

Real Estate - Value Add

Real Estate - Opportunistic & Distressed

Real Estate - REIT (Adelante)

High Yield (Allianz)

Risk Parity Managers

Total Other Growth Assets

856,237,000	854,593,989		856,237,000	9.9%	10.0%	-0.1%	
235,606,000	341,837,595		235,606,000	2.7%	4.0%	-1.3%	
160,874,000	384,567,295		160,874,000	1.9%	4.5%	-2.6%	
411,930,000	384,567,295		411,930,000	4.8%	4.5%	0.3%	
67,542,607	85,459,399		67,466,629	0.8%	1.0%	-0.2%	
346,773,913	170,918,798		348,421,276	4.0%	2.0%	2.0%	
0	427,296,994		0	0.0%	5.0%	-5.0%	
2,078,963,520	2,649,241,365	0	2,080,534,904	24.1%	31.0%	-6.9%	
Total Growth Assets	5,964,938,801	5,896,698,522	(370,000,000)	5,699,454,036	66.1%	69.0%	-2.9%

Risk Diversifying

AFL-CIO	317,519,384	299,107,896		315,872,780	3.7%	3.5%	0.2%
Parametric Defensive Equity	58,782	213,648,497	200,000,000	200,372,422	2.3%	2.5%	-0.2%
Wellington Real Total Return	187,389,994	170,918,798		187,389,994	2.2%	2.0%	0.2%
Total Risk Diversifying	504,968,160	683,675,191	200,000,000	703,635,196	8.2%	8.0%	0.2%

Cash and Overlay

Overlay (Parametric)	44,967,111	0		52,461,926	0.6%	0.0%	0.6%
Cash	229,662,770	0	(38,250,021)	197,526,098	2.3%	0.0%	2.3%
Total Cash and Overlay	274,629,881	0	(38,250,021)	249,988,024	2.9%	0.0%	2.9%

Employer Pre-payment

291,749,979

(291,749,979)

Total Fund	8,545,939,887	8,545,939,887	0	8,625,870,470	100%	100%	0%
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*Phase 3 targets and ranges reflect Phase 3 asset allocation targets accepted by the Board on June 27, 2018 (BOR Resolution 2018-2)



Meeting Date
08/22/18
Agenda Item
#9

MEMORANDUM

Date: August 22, 2018

To: CCCERA Board of Retirement

From: Timothy Price, Chief Investment Officer; Chih-chi Chu, Investment Analyst

Subject: Recommendation to commit to Invesco U.S. Value-Add Fund V

Recommendation

We recommend the Board make a capital commitment of \$75 million to Invesco U.S. Value-Add Real Estate Fund V. We have been evaluating Fund V for over a year in order to underwrite individual properties and the fund's strategy as the initial investments were made. As Fund V moves toward its final close by the end of 2018, Invesco's value-add team has assembled a pre-specified portfolio, representing close to 40% of Fund V's target size of \$1 billion. This pre-specified portfolio allows us to underwrite a large portion of the ultimate portfolio as well as provides the Invesco team additional time to patiently build the remainder of the portfolio.

This recommendation is based upon the following factors:

1. CCCERA remains constructive on the value-add real estate segment with a 5% target and over \$500 million available to commit;
2. Although the overall cap rate (yield) in the real estate market has declined, Fund V's current risk premium (difference between stabilized property yield and projected exit cap rate) from the pre-specified assets is still over 30%, double its preferred threshold of 15%.

CCCERA Investment Staff Research

Below is a summary of CCCERA Investment Staff’s due diligence for INVESCO Fund V. In this summary we have outlined main events, dates, and personnel involved.

Table: CCCERA Staff Due Diligence Summary on Invesco U.S. Value-Add Fund V

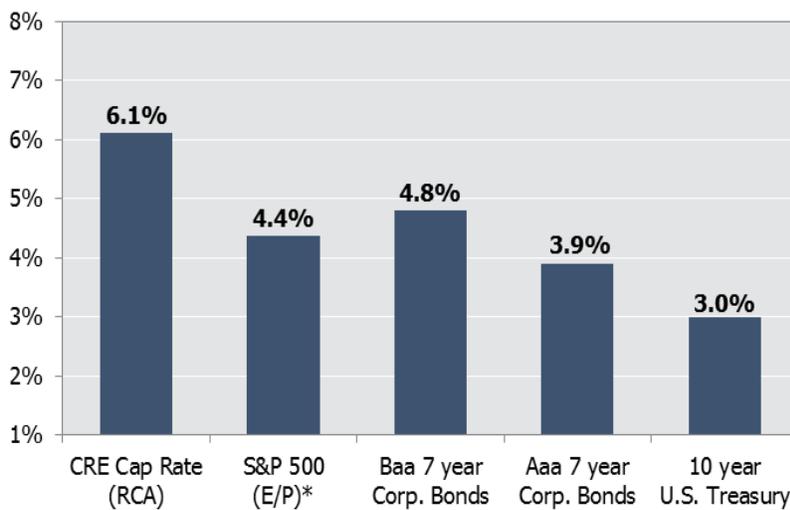
Event	Date	Location
Fund Introduction	4/2017	CCCERA
Pipeline Review	7/2017	CCCERA
On-Going Research	7/2017-7/2018	CCCERA
INVESCO On-Site	4/2018	INVESCO Dallas
Property Tour	6/2018	Bay Area
INVESCO On-Site	7/2018	INVESCO Dallas
Initial Legal Review	7/2018-8/2018	CCCERA
Investment Memo Production	8/2018	CCCERA

The summary of the due diligence is that despite today’s more fairly-valued real estate environment, Invesco is still able to source and close on compelling investment opportunities, mainly due to the local presence in the real estate markets it focuses on and its reputation from past executions on the properties it acquired.

With close to 40% of Fund V already pre-specified, the Invesco Value-Add team can afford to be very selective for the remainder of its investment period. At the target deal size, the indicative pace to deploy the remainder of Fund V would be one transaction per year, per office.

Additionally, although the general real estate market is reaching an equilibrium of demand and supply, the commercial real estate yield is still above other major asset classes in the capital market (see chart below).

Chart: Commercial Real Estate Yield v. Other Asset Classes



Source: Real Capital Analytics

CCCERA Value-Add Real Estate

CCCERA has a 5% target allocation to value-add real estate and an estimated July 31, 2018 market value of \$8.5 billion. This translates to a \$425 million target allocation to value-add real estate. CCCERA's current value-add real estate investments have a market value of approximately \$161 million, and our uncalled commitment are \$45 million. Given the lagged nature of investing in closed-end real estate, CCCERA historically over-committed 75% relative to the desired target in order to achieve the target allocation over time. Based on this analysis, the total amount currently available for CCCERA to commit to value-add real estate funds is approximately \$538 million. These figures are illustrated below:

Table: CCCERA's Availability to Commit to Value-Add Real Estate

	<u>Value (Millions)</u>
CCCERA Total Fund <i>as of 7/31/2018</i>	~ \$8,500
Value-Add Real Estate @ 5%	\$425
Plus 75% over-commitment	\$319
less	
Closed End Value-Add	\$161
Outstanding Commitment	\$45
Available for Value-Add Real Estate	\$538

CCCERA currently has three value-add real estate managers: Long Wharf, LaSalle, and Invesco. In addition to Invesco's Fund V, both LaSalle and Long Wharf are coming to the market for their next funds in the near future and those funds will be evaluated by CCCERA staff. We will also look to add additional value-add real estate franchises over the next few years in order to maintain a diversified platform.

CCCERA's Existing Investments in Invesco Real Estate

CCCERA has committed to every INVESCO Value-Add Real Estate Fund in the existing series. Fund I (2005) and II (2007) were impacted by the GFC (Great Financial Crisis) but are now fully liquidated. Funds III (2012) and IV (2014) are tracking well with results in line with expectations. Below is the summary table of all the funds' performance, followed by individual discussions on each fund:

Table: Investments Performance Summary of Invesco U.S. Value-Add Funds

Fund	Vintage Year	Fund Size	CCCERA Commitment	Stage	DPI	TVPI	Net IRR
Invesco U.S. Value-Add Fund IV	2014	\$759 million	\$35 million	Property Management	0.3x	1.2x	13.5%
Invesco U.S. Value-Add Fund III	2012	\$344 million	\$35 million	Harvesting	1.0x	1.4x	15%
Invesco U.S. Value-Add Fund II	2007	\$457 million	\$85 million (only \$70 million called)	Liquidated	1.3x	1.3x	6.8%
Invesco U.S. Value-Add Fund I	2005	\$320 million	\$50 million (only \$45 million called)	Liquidated	1.1x	1.1x	1.5%

Invesco U.S. Value-Add Fund IV

Fund IV has concluded its investment period and has had three realizations. The fund currently reports since inception returns of 19.4% (13.5% net) and 1.25x (1.18x net). Below is the performance breakdown of the realized portfolio and existing portfolio:

Table: Invesco U.S. Value-Add Fund IV Performance Summary

	No. of Deals	Equity Invested	Realized Proceeds	Current Fair MV	Gross Multiple	Gross IRR	Net IRR	Net Multiple
Realized	3	\$ 98M	\$149M	-----	1.5x	24%	-----	-----
Unrealized	17	\$468M	\$ 10M	\$546M	1.2x	13%	-----	-----
Total	20	\$566M	\$159M	\$546M	1.3x	19%	14%	1.2x

Fund IV's value creation is driven mostly by manufacturing substantial NOI (net operating income); the projected NOI upon exit of the fund is four times the NOI at acquisition. The leverage is currently 50%. There are no impaired assets in the fund at this time.

Invesco U.S. Value-Add Fund III

Fund III is 60% realized with four remaining assets, all of which are targeted to be sold by the end of this year. The fund currently reports since inception returns of 20.5% (14.8% net) and 1.57x (1.43x net). The performance breakdown of the realized portfolio and existing portfolio is shown on the following page.

Table: Invesco U.S. Value-Add Fund III Performance Summary

	No. of Deals	Equity Invested	Realized Proceeds	Current Fair MV	Gross Multiple	Gross IRR	Net IRR	Net Multiple
Realized	9	\$204M	\$343M	-----	1.7x	24%	-----	-----
Unrealized	4	\$111M	\$ 2M	\$159M	1.5x	33%	-----	-----
Total	13	\$315M	\$345M	\$159M	1.6x	21%	15%	1.4x

The maturity dates of the loans on the remaining four assets all surpass the expected exit time of the properties. Two of the four remaining assets may deliver IRRs below fund’s expectation but multiples still above 1x. The projected final fund return is 18% IRR and 1.6x multiple (gross).

Invesco U.S. Value-Add Funds I & II

Funds I & II are both liquidated. The final results are below expectations as Fund I had 1/6 of the equity invested in CMBS and both funds went through GFC (Great Financial Crisis). Below is the summary of the final results of both funds.

Table: Invesco U.S. Value-Add Fund I & II Performance Summary

Fund	Vintage Year	Fund Size	Fund IRR (net)	Fund Multiple (net)
Invesco U.S. Value-Add Fund II	2007	\$457 million	6.8%	1.3x
Invesco U.S. Value-Add Fund I	2005	\$320 million	1.5%	1.1x

Invesco U.S. Value-Add Fund V

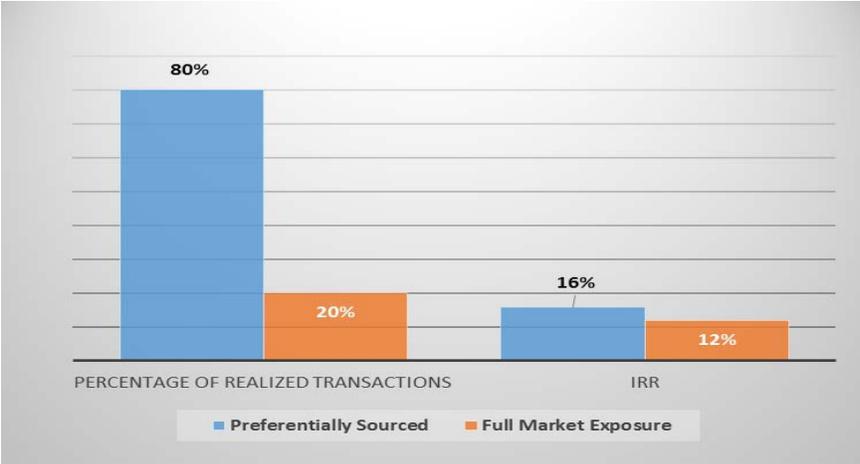
Invesco began fundraising for the U.S. Value-Add Fund V in 2017, with \$410 million raised to date. The current pipeline of commitments from US and Non-US limited partners will bring the fund to its target size of \$1 billion in total commitments. Although this target size is 33% higher than the previous fund, a large portion of Fund V was already pre-specified, leaving the value-add team \$600 million to commit during the next three years of the fund’s investment period. This investment pace translates into roughly equal to one deal per year per geographic region given value-add team’s U.S. footprint.

The pre-specified Fund V includes three closed deals totaling \$170 million of equity and another \$230 million in several deals in late stage diligence. If all pipeline deals are executed Fund V will be close to 40% invested by the final close, providing CCCERA good visibility on the portfolio as it takes shape.

Fund V seeks to generate return through preferential sourcing and executing on NOI (Net Operating Income) growth plans. Invesco Real Estate has a proven track record to support these two alpha engines of its U.S. Value-Add franchise.

On preferential sourcing, of the 151 realized value-add transactions, 80% of which is preferentially sourced (Invesco exclusive, not through broker or open bid process), and they have generated higher IRR than competitively sourced deals, as shown by the chart below:

Chart: Invesco U.S. Value-Add Realized Transactions Breakdown By Sourcing

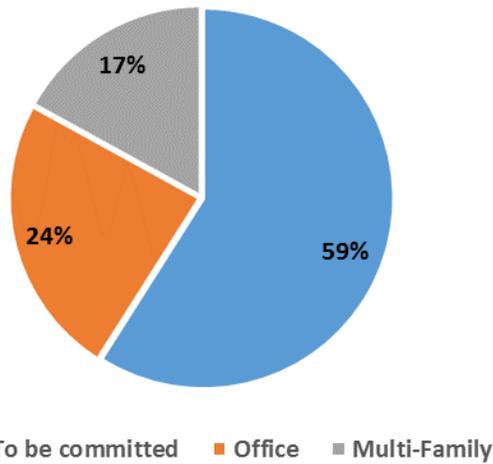
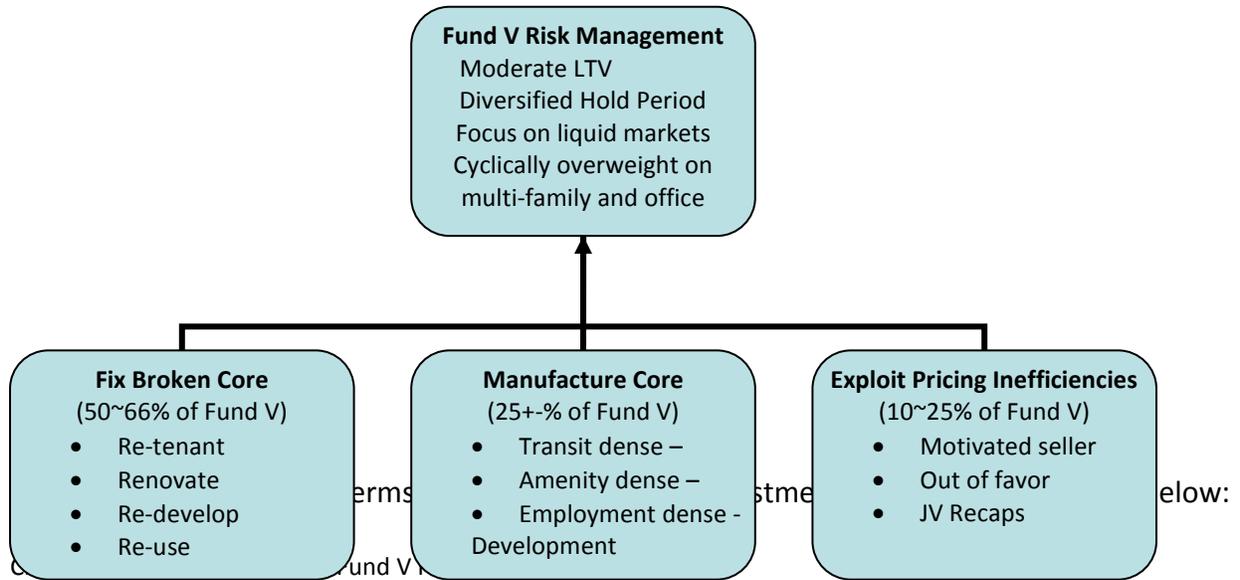


On executing the NOI growth plan, from Fund I to Fund IV the Value-Add team collectively have grown the NOI 2.3x, of which 77% is realized (not just projection). Below is the breakdown of the NOI by fund:

Chart: Invesco U.S. Value-Add Asset NOI Growth Breakdown by Fund

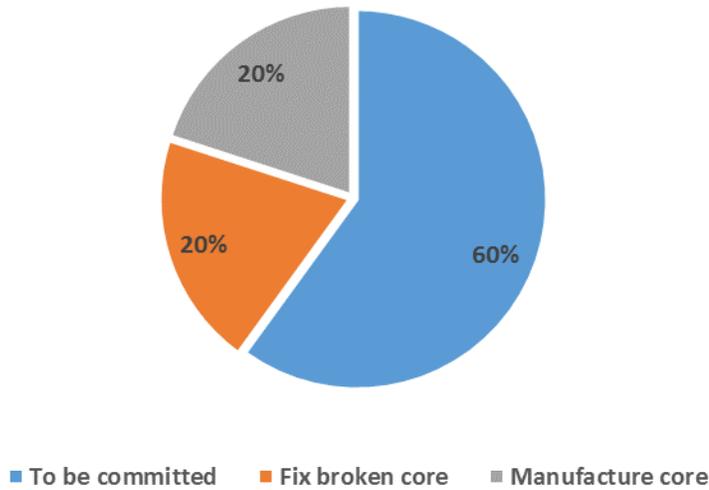


The investment themes will be consistent from those pursued in Fund IV: fix broken core assets, build to core, and exploit pricing inefficiencies. Below is the chart that further illustrates Fund V's investment themes and the risk mitigants during the current cycle:



As illustrated in the chart above, 24% of Fund V is currently allocated to office properties, with three located on the west coast and one in New York City; 17% is currently allocated to multi-family properties, with two properties located on the west coast and two on the east.

Chart: Invesco U.S. Value-add Fund V Strategy Exposure



As illustrated in the chart above, 20% of Fund V is currently allocated to “fix broken core” strategy, with all four properties in the office sector; 20% is currently allocated to “manufacture core”, with two properties in senior housing and two in multi-family.

All together, these pre-specified properties are projected to have stabilized yield of 6.76% (going in yield) and an exit cap rate of 5.06%, representing a 33% risk premium, which is double the Value-Add team’s risk premium threshold of 15% (see table below). All pre-specified deals are preferentially sourced deals.

Table: Risk premium of Invesco U.S. Value-Add Fund V Pre-specified Portfolio

	Stabilized Yield (A)	Exit Cap Rate (B)	Pre-specified Premium (C, calc. by $A/B - 1$)	Invesco Value-Add Premium Threshold (D)	Fund V pre-spec risk premium over threshold (C/D)
Fund V Pre-Specified Portfolio	6.76%	5.06%	34%	15%	2.3x

As for the use of leverage, the average property level leverage of the pre-specified portfolio is 60% LTV. Fund V remains the same as Fund IV, with leverage cap of 75% at the fund level without cross-collateralization.

The management team for Fund V is largely consistent from Fund IV. Jay Hurley continues to lead the Fund with Kevin Conroy as Associate Portfolio Manager. Additional key team members include:

Max Swango, Managing Director, Head of Global Client Portfolio Management
 Greg Kraus, Managing Director, Head of Acquisitions
 Scott Dennis, Managing Director, CEO of Invesco Real Estate
 Paul Michaels, Managing Director, Director of North America Direct Real Estate
 Bill Grubbs, Jr., Managing Director, Head of Funds Management

Risk Discussion

The next table displays the characteristics of closed end real estate funds with CCCERA’s representative managers. Value-Added funds target IRRs from high single digit to low-teens, while opportunity and distressed funds target returns in the mid-teens and above. Value-Added funds generally use lower leverage than opportunistic funds, depending on the type of investments and the debt availabilities in the market. The risk displayed here includes both financial risk and operating risk.

Table: Closed End Real Estate Risk Spectrum*

Strategy	CCCERA Manager	Investment Theme Example	Operating Risk	Financial Leverage	Target Return
Core	Adelante (REITS)	Commercial real estate with low vacancy in prime markets	Low	30-50%	Mid-to-High Single digit
Value-Added	Invesco, Long Wharf, LaSalle	Lease-Up	Medium	50-75%	High Single to Low Teens
Opportunistic	DLJ, Angelo Gordon	Development project	High	60% and above	Mid-Teens and Up
Distressed	Oaktree, Siguler Guff, Paulson	Recapitalization	Medium-High	0-75%	Mid-Teens and Up

*For illustration of overall industry, does not convey the exact risk and return guidelines of CCCERA’s managers.

For Invesco U.S. Real Estate Fund V, the investment risks may include (but not limit to):

- **Tenant Risk:** For office and multi-family renovation projects, existing tenants may choose to leave instead of paying increased rents after the renovation is complete. For retail, big box retailers going out of business may reduce retail centers’ appeal to other smaller tenants who rely on the traffic brought in by anchor tenants. Tenants’ taste may also change and deem the properties obsolete compared to newer developments.

- **Regional Economy Risk:** Some regions may be in high demand at the time of property acquisition due to cluster effects from certain industries (such as technology, energy). The relatively attractiveness of a particular region may decline during the hold period of the property and therefore reduce the tenant demand for the properties in the region.
- **Interest Rate Risk:** Rate increases, although anticipated, may impact capital markets and real estate values. Higher borrowing costs will also affect the profitability of the projects and the return of the fund.
- **Construction Risk:** Labor shortage and skills of construction labor as a result of shortage will increase the cost of the project and delay the delivery time to the market.

Summary of Key Terms of Invesco U.S. Value-Add Fund V

Fund V's economic terms remains consistent to Fund IV. Below is a summary of fund terms:

Target Return:	11%-14% Gross IRR to Limited Partners
Expected Size:	\$1 billion
GP Commitment:	\$25 million
Final Close:	December, 2018
Commitment Period:	3 years after the final close
Maturity:	Seven years from the final close with two 1-year extensions at LPAC discretion
Investment Restrictions:	25% Development Cap 10% Senior Housing Cap
Management Fee:	1.5% on Invested Equity
Key Person:	Two of Jay Hurley, Scott Dennis, Bill Grubbs, Greg Kraus, Paul Michaels, and Max Swango
Preferred Return:	9% compounded annual return to Limited Partners
Incentive Fee:	20%; 50% catch-up

Fee Projections of \$75 Million CCCERA Commitment to Fund V

<i>Net IRR Scenario</i>	<i>10%</i>	<i>12%</i>	<i>14%</i>
<i>Gross Economics to CCCERA</i>	\$103.4 million	\$110.8 million	\$118.6 million
<i>M'gmt Fees</i>	\$4.3 million	\$4.3 million	\$4.4 million
<i>Carried Interest</i>	---	\$2.9 million	\$7.3 million
<i>Net CCCERA Distribution</i>	\$24.1 million	\$28.6 million	\$32 million



Invesco U.S. Value-Add Fund V, L.P. **August 2018**

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Invesco Real Estate

Biographies



Max Swango

Mr. Swango is a Founding Partner and has been with Invesco Real Estate (IRE) since 1988. For the last 20 years he has run the investor side of IRE's business.

He spent the first 10 years with the firm in the Acquisitions group originating direct real estate investments that included both equity and debt across the risk/return spectrum. From 1995-1999, Mr. Swango oversaw the firm's West Coast investment activity from its San Francisco office.

Mr. Swango holds a Bachelor of Business Administration degree with a double major in Real Estate and Finance from The University of Texas - Austin.



Jay Hurley

Mr. Hurley joined Invesco Real Estate (IRE) in 1995, and he serves as the portfolio manager for IRE's series of US closed-end value-added strategies. He has 30+ years of real estate transactional and portfolio management experience encompassing a broad range of product types and investment strategies. He spent the first five years with IRE in the firm's Acquisition Group originating, evaluating, negotiating and closing core and value-added investments nationally. Additionally, he has previously held positions as the firm's Director of Dispositions and Director of Underwriting. He currently co-chairs IRE's Investment Strategy Group and is a long-standing member of the firm's Investment Committee and North American Direct Executive Committee.

Mr. Hurley is a full member of the Urban Land Institute (ULI). He received a Bachelor of Science degree in Civil Engineering from The University of Texas at Austin and a Master of Business Administration degree from Southern Methodist University.



Greg Kraus

Mr. Kraus joined Invesco Real Estate (IRE) in 2000 where he directs IRE's Acquisition Group. In addition, Mr. Kraus serves on IRE's Investment Committee, North American Executive Committee and Direct Management Committee. Since joining IRE, Mr. Kraus has served in both a portfolio management and acquisition role with the firm.

Prior to joining IRE, Mr. Kraus was affiliated with the Harberg-Masinter Company, Crescent Real Estate Equities, the L&B Group and its predecessor company Lehndorff USA, Ltd., Hall Financial Group and Southland Financial Corporation.

Mr. Kraus holds a Bachelor of Business Administration degree from Southern Methodist University. He has 35+ years of real estate experience.

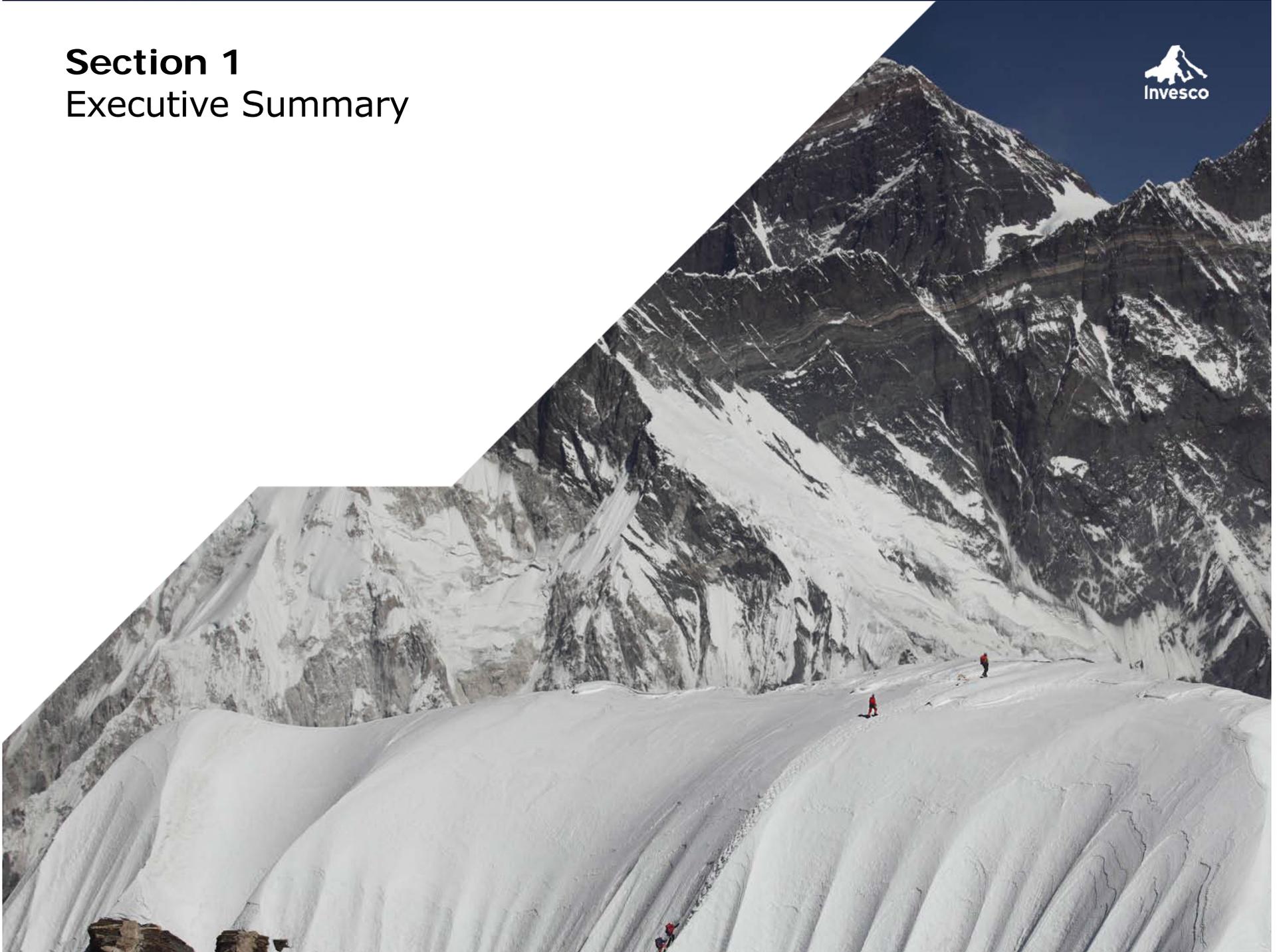
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Section 1

Executive Summary



Invesco Real Estate

Executive Summary



- Exclusive focus on real estate investment management.
- Scale:
 - \$65.3 BN of AUM
 - 489 employees worldwide
- Investing across the risk/return spectrum
- Stable team



Jefferson Marketplace | Apartment | Washington DC, US



Southside | Retail | London, UK



77 King Street | Office | Sydney, Australia

Invesco US Value Add Fund V ("VF V")

Continuation of Invesco Real Estate's ("IRE") Flagship Series



Fund Summary

- ~\$800 million closed / in active LP process
- \$1 billion hard cap
- Final Close in December 2018
- ~40% Pre-specified Portfolio
- Pre-specified Portfolio estimated returns of 16% IRR and 1.8 EM(gross)



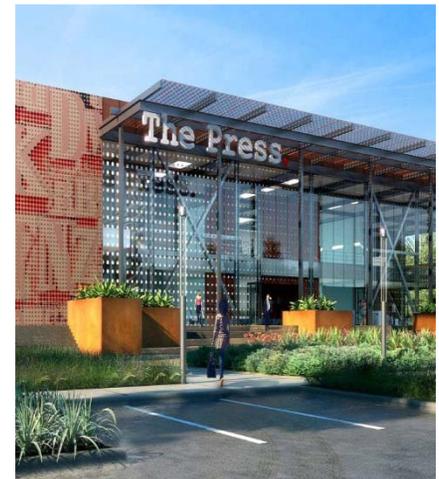
888 Broadway | New York, NY



Alexan Fashion Valley | San Diego, CA



Harbor Chase Fairfax | Washington, DC



The Press | Orange County, CA

Source: Invesco Real Estate. See Value-Add Summary slide for further detail. Photographs/renderings shown are of Funds' potential pre-specified investments and are included for illustrative purposes only and do not constitute investment advice or a recommendation. Performance was not a criteria for selection. Photographs are used with permission. Estimates stated are based on Invesco Real Estate's current underwriting, however, there is no guarantee that the estimated returns will be realized.

Section 2

Firm Overview



Invesco Real Estate

As of June 30, 2018



\$65.3 Billion Under Management

489 Employees Worldwide; 21 Offices; 16 Countries



North American Direct

- \$31.2 Billion
- Since 1983

Global Securities

- \$17.1 Billion
- Since 1988

European Direct

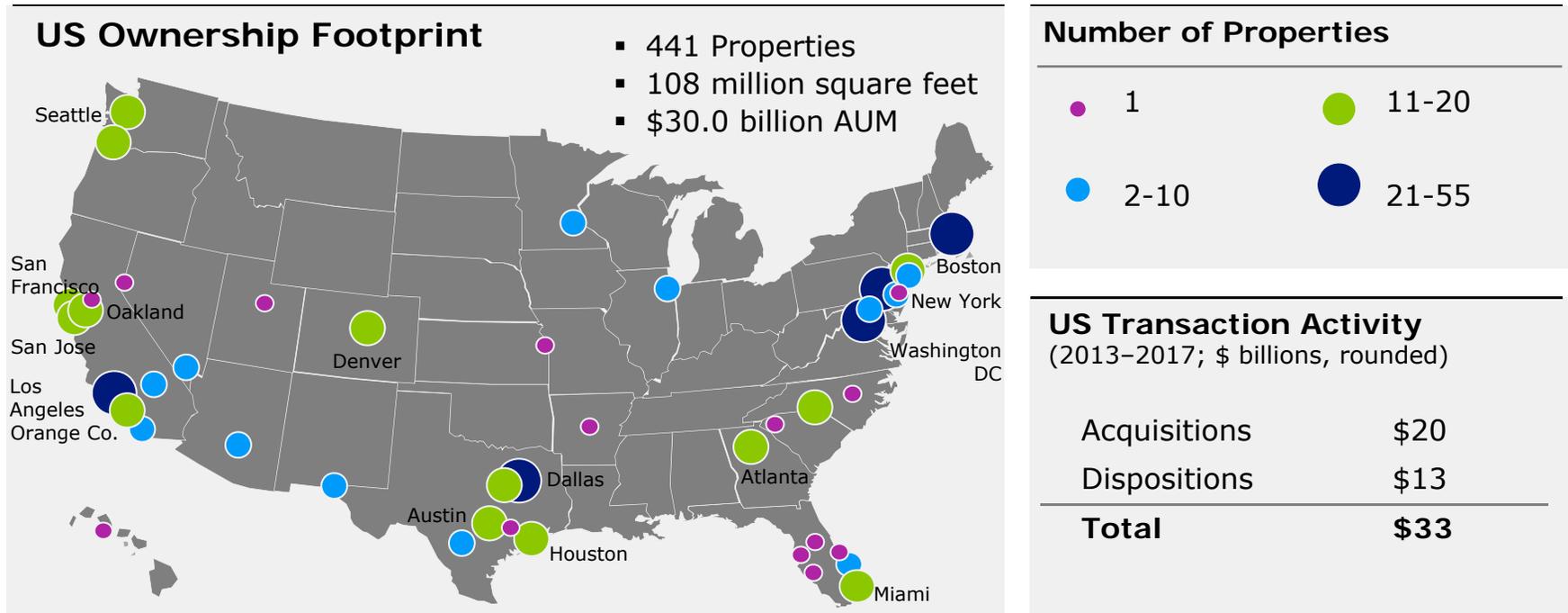
- \$10.9 Billion
- Since 1996

Asian Direct

- \$6.1 Billion
- Since 2006

US Real Estate Platform

Has Resulted in Specific Advantages vs. Peers



Fund Series Benefits

- Creates sourcing advantages
- Ability to attract and retain talent

Performance Summary

Invesco's 26-Year Value-Add Summary



Investment	Vintage Year	Gross Cap	Equity Raised	# of Inv.	IRR*		Equity Multiple*		% Realized
					Gross	Net	Gross	Net	
Invesco Value-Add Separate Accounts	1992-2018	\$8,996	\$5,020	142	15.4%	12.5%	1.4x	1.4x	69%
Invesco Real Estate Fund	2005	\$891	\$320	15	3.2%	1.6%	1.2x	1.1x	100%
Invesco Real Estate Fund II, LP	2007	\$1,074	\$457	16	8.1%	6.7%	1.4x	1.3x	100%
Invesco Real Estate Fund III, LP	2012	\$845	\$344	13	18.1%	14.4%	1.6x	1.4x	60%
Invesco US Value-Add Fund IV, LP	2014	\$1,823	\$759	22	16.6%	13.1%	1.6x	1.5x	13%
Invesco US Value-Add Fund V, LP	2017	\$840	\$410	6	16.0%	13.8%	1.8x	1.7x	0%
Value-Add Totals		\$14,469	\$7,310	214	14.7%	12.0%	1.5x	1.4x	

All figures in millions

*IRR and Equity Multiple performance shown is combination of realized and unrealized (estimated) returns as of March 31, 2018.

Source: Invesco Real Estate unaudited results. The above presentation reflects our historical Value-Add performance results, earned in both separate accounts and fund vehicles spanning many market cycles. Past performance is not indicative of future results and historical market conditions may not be comparable to current market conditions.

Contra Costa County Employee's Retirement Association



Cash Flows

Year End	Pre-2016	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
VF I (\$50MM)⁽¹⁾											
Contribution	(\$46.2)	\$0.0	\$0.0								
Distribution	\$43.7	\$6.5	\$0.1								
VF I Annual Net Invested	(\$2.6)	\$0.0	\$0.0								
VF II (\$85MM)⁽²⁾											
Contribution	(\$78.2)	\$0.0	\$0.0								
Distribution	\$86.7	\$15.2	\$0.0								
VF II Annual Net Invested	\$0.0	\$0.0	\$0.0								
VF III (\$35MM)⁽³⁾											
Contribution	(\$30.5)	(\$0.2)	(\$1.8)	\$0.0	\$0.0						
Distribution	\$21.0	\$1.5	\$10.5	\$17.5	\$0.0						
VF III Annual Net Invested	(\$9.5)	(\$8.2)	\$0.0	\$0.0	\$0.0						
VF IV (\$35MM)⁽³⁾											
Contribution	(\$4.2)	(\$11.9)	(\$8.4)	(\$4.2)	(\$3.9)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Distribution	\$0.0	\$2.8	\$4.8	\$6.3	\$6.3	\$13.9	\$11.1	\$6.9	\$0.0	\$0.0	\$0.0
VF IV Annual Net Invested	(\$4.2)	(\$13.3)	(\$16.9)	(\$14.8)	(\$12.3)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
VF V (\$75MM)⁽⁴⁾											
Contribution	\$0.0	\$0.0	\$0.0	\$0.0	(\$22.5)	(\$15.0)	(\$15.0)	(\$18.8)	\$0.0	\$0.0	\$0.0
Distribution	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$3.8	\$21.0	\$22.5	\$22.5	\$22.5	\$21.8
VF V Annual Net Invested	\$0.0	\$0.0	\$0.0	\$0.0	(\$22.5)	(\$33.8)	(\$27.8)	(\$24.0)	(\$1.5)	\$0.0	\$0.0
Cumulative Annual Net Invested	(16.2)	(21.4)	(16.9)	(14.8)	(34.8)	(33.8)	(27.8)	(24.0)	(1.5)	0.0	0.0

Source: Invesco Real Estate as of August 2018. 2018-2025 amounts are estimates only and subject to change.

(1) The Fund was fully liquidated and dissolved in August 2017. (2) The Fund has liquidated all of its investments and the final sale proceeds were distributed in 4Q 2016. The Fund is in the process of winding down and Investor may receive a residual, immaterial distribution following wind down. Liquidation and dissolution estimated to be completed by December 2018. (3) This is a high level estimate based on anticipated acquisition and disposition activity. (4) Hypothetical timing of contributions and distributions for new fund.

Section 3

Investment Environment



Investment Environment



- **Real estate fundamentals are good.**

- Occupancies, growing NOI, reasonable supply

- **Healthy capital markets**

- Strong demand for core

- **Selective attractive opportunities**

- Differentiated office
- Senior housing
- Multi-family



888 Broadway | Office | New York, NY



Harbor Chase Potomac | Senior Housing | Washington DC



Hanover Diridon | Multi-Family | San Jose, CA

Pre-Specified Portfolio

Investments Have Kept Pace with Capital Commitments



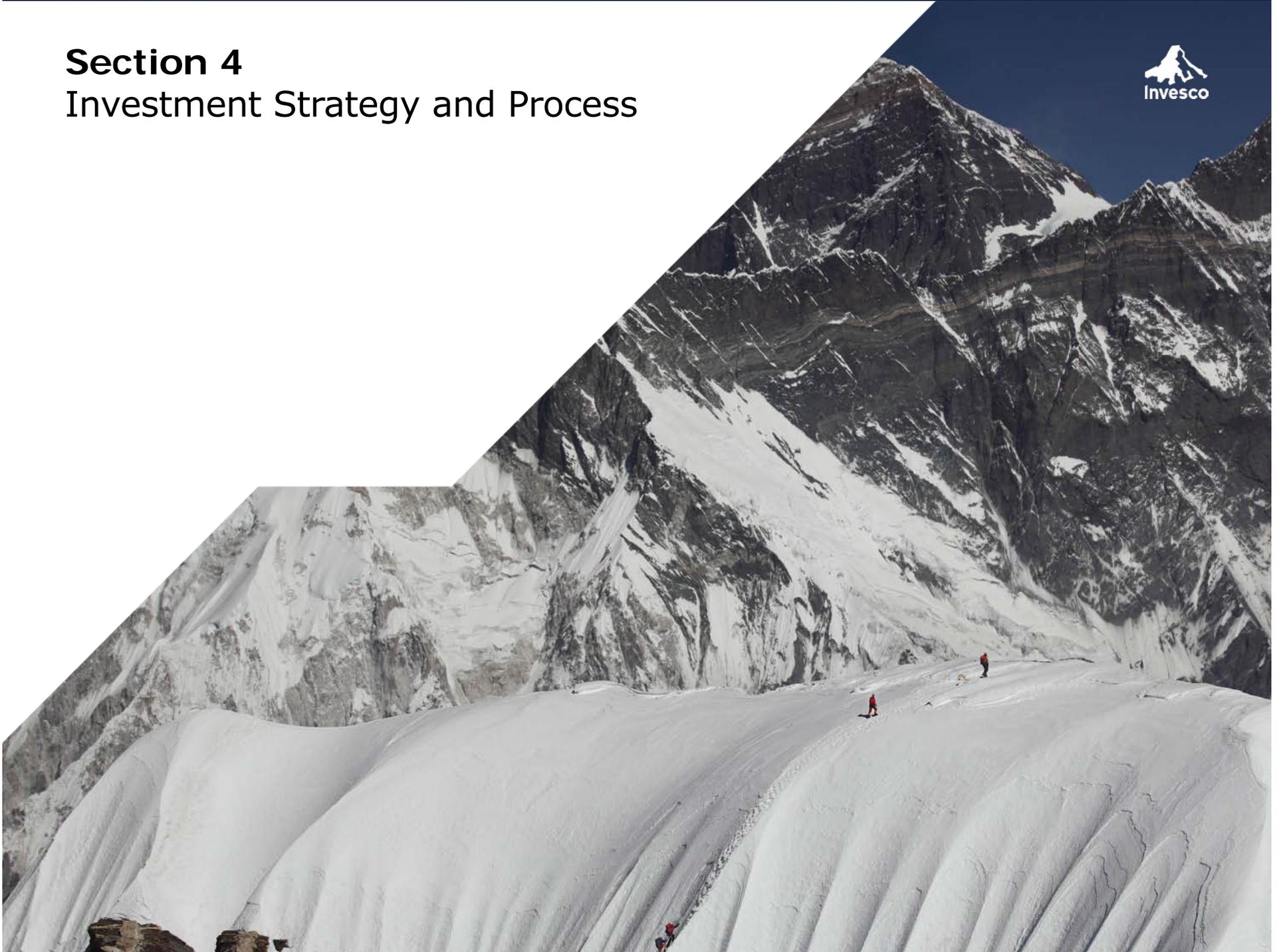
Investment (MSA)	Property Type (Strategy)	Status	Fund Equity Commitment		Target Returns		Stab'd Yield	Sourcing
			\$	% of Fund	IRR	EM		
HELD (UNREALIZED)								
ALEXAN FASHION VALLEY San Diego, CA	MULTI-FAMILY (Development)	Closed	\$45	5%	14%	1.6x	5.11%	Off-market
THE PRESS Orange County, CA	OFFICE (Re-Positioning)	Closed	\$93	11%	14%	1.8x	6.45%	Limited
888 BROADWAY New York, NY	OFFICE (Re-Tenancing)	Closed	\$33	4%	18%	1.5x	6.88%	Off-market
CAMPUS DRIVE San Francisco, CA	OFFICE (Re-Tenancing)	Closed	\$36	4%	22%	1.5x	N/A	Off-market
SUBTOTAL/WTD AVG.			\$207	25%	16%	1.7x	6.18%	-
ALLOCATED (IN DUE DILIGENCE)								
HARBOR CHASE FAIRFAX Washington, DC	MF/SR. HOUSING (Development)	In Due Diligence	\$29	3%	20%	2.2x	9.25%	Off-market
HANOVER DIRIDON San Jose, CA	MULTI-FAMILY (Development)	In Due Diligence	\$49	6%	14%	1.6x	5.21%	Off-market
HARBOR CHASE POTOMAC Washington, DC	MF/SR. HOUSING (Development)	In Due Diligence	\$43	5%	19%	2.2x	9.13%	Off-market
SUBTOTAL/WTD AVG.			\$121	14%	17%	2.0x	7.57%	-
TOTALS			\$328	39%	16%	1.8x	6.76%	-

(\$ in millions) Fund is "neutral" on investment strategy weightings and employs a best relative value approach

It is not known whether investments in due diligence will be acquired by the Fund. Information is presented for illustrative purposes only.

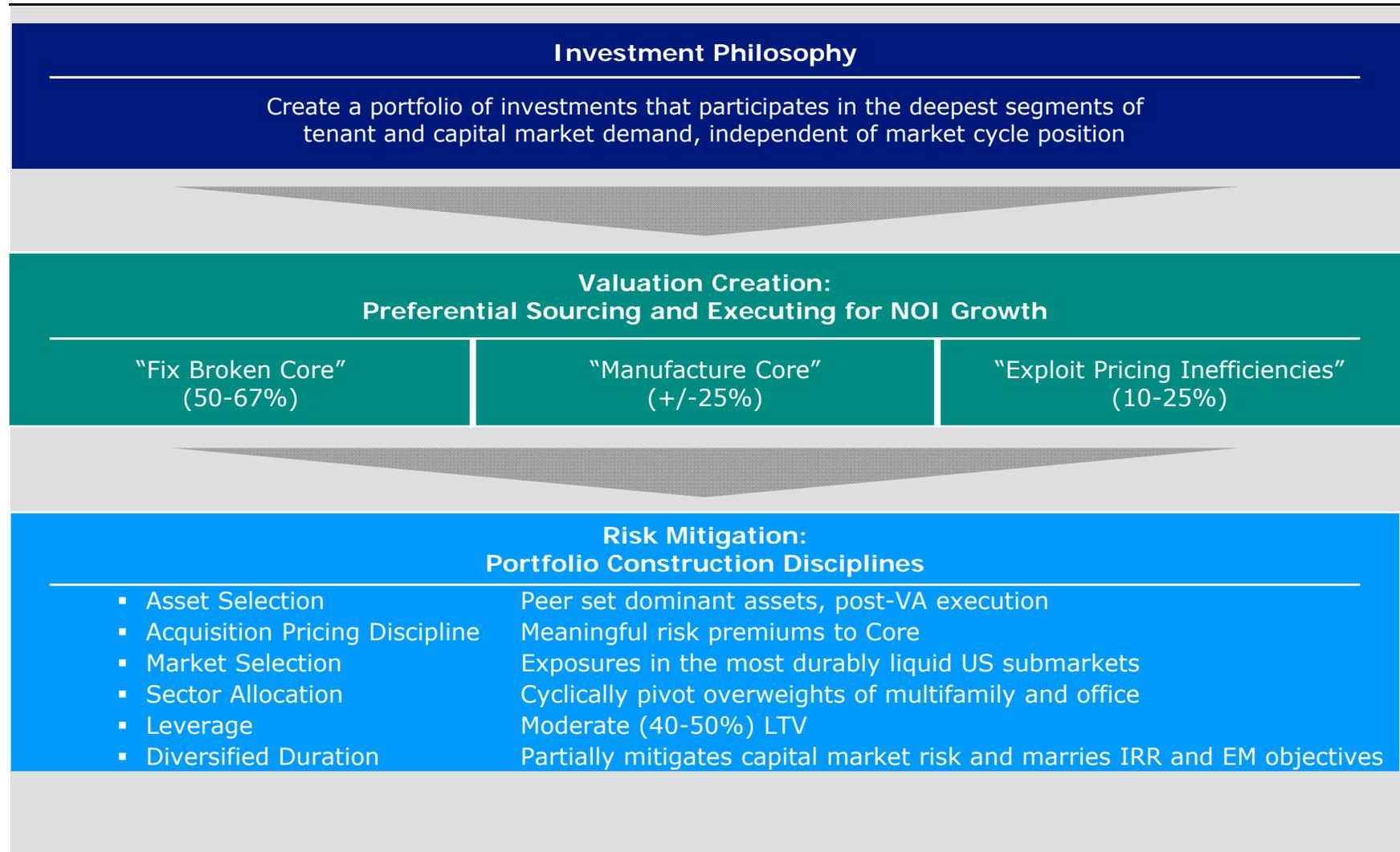
Section 4

Investment Strategy and Process



Strategic Value-Added Investing

How do you design a cyclically-durable approach to the space



US Real Estate Platform

Fund and Investment Teams



Portfolio Management Team

Jay Hurley, Portfolio Manager
Kevin Conroy, Associate Portfolio Manager
Courtney Popelka, Director of Fund Operations

Investment Sourcing Team Experience

	Years Experience	Years with IRE
Greg Kraus	36	18
Robert Deckey	33	2
Ron Miller	31	8
Josh Siegel	25	10
Chris Cole	23	12
Pete Cassiano	19	7
Casey Griffis	17	*
Yorick Starr	16	1
Rob Taylor	15	5
Charlie Rose	15	1
Alex Seals	15	*
Rohullah Sharifi	14	5
Chase Bolding	11	7
Mason Gilmore	8	4
Tucker Wincele	8	4
Team Average	19	19

Underwriting Team Experience

	Years Experience	Years with IRE
Chris Schmidt	23	18
Amy White	18	6
Janice Wildman	30	1
Steve Cobbs	21	4
Evan Sherman	11	4
Gabe Gonzalez	9	*
Ryne Niner	8	4
Drew Tappan	8	1
Sebastian Baeza	6	1
Britton Wells	6	4
Akbar Dosani	6	*
Colby Everett	5	1
Andrew Lane	5	2
Tip O'Donnell	5	1
David Chen	4	2
Lindsay Hochberg	3	1
Rachel Cleak	2	*
Amanda Gray	2	*
Team Average	10	10

Financing & Disposition Team Experience

	Years Experience	Years with IRE
Jason Geer	27	20
Heather Douglass	22	5
Sarah Gray	36	20
Teresa Zien	18	**
Stephanie Holder	12	10
Team Average	23	23

Closing Services Team Experience

	Years Experience	Years with IRE
Ron Ragsdale	35	28
Sandy Evans	27	24
Scott Ballard	28	17
Jody Tomlinson	23	4
Scott Wyatt	22	12
Christy Foster	21	*
Laurie Reinhold	18	18
Jon Dooley	17	11
Susan Mitchell	16	7
Brooke Butcher	9	2
Team Average	22	22

Asset Management Team Experience

	Years Experience	Years with IRE
Michael Kirby	34	25
Bill Brown	40	18
Duncan Walker	37	19
Sam Gillespie	36	2
Cain Kirk, CPM	35	21
Art Fong	34	9
Tom Hurst	34	15
John Kiernan	31	12
Dave Laner	28	18
Paul Nelson	28	20
Lesley Lisser	26	6
Jim Gillen	22	19
Jenny Gillaspy	21	*
Chris Cleghorn	17	11
Kevin Pirozzoli	15	6
Ian Carpe	14	4
Jackson Lapin	14	4
Perry Chudnoff	13	8
Tammy Park	13	5
Paul Lee	12	*
Jaime Kelley	10	9
David Wiggins	8	4
Vince Accurso	6	2
Shannon Aquino	6	1
Team Average	22	22

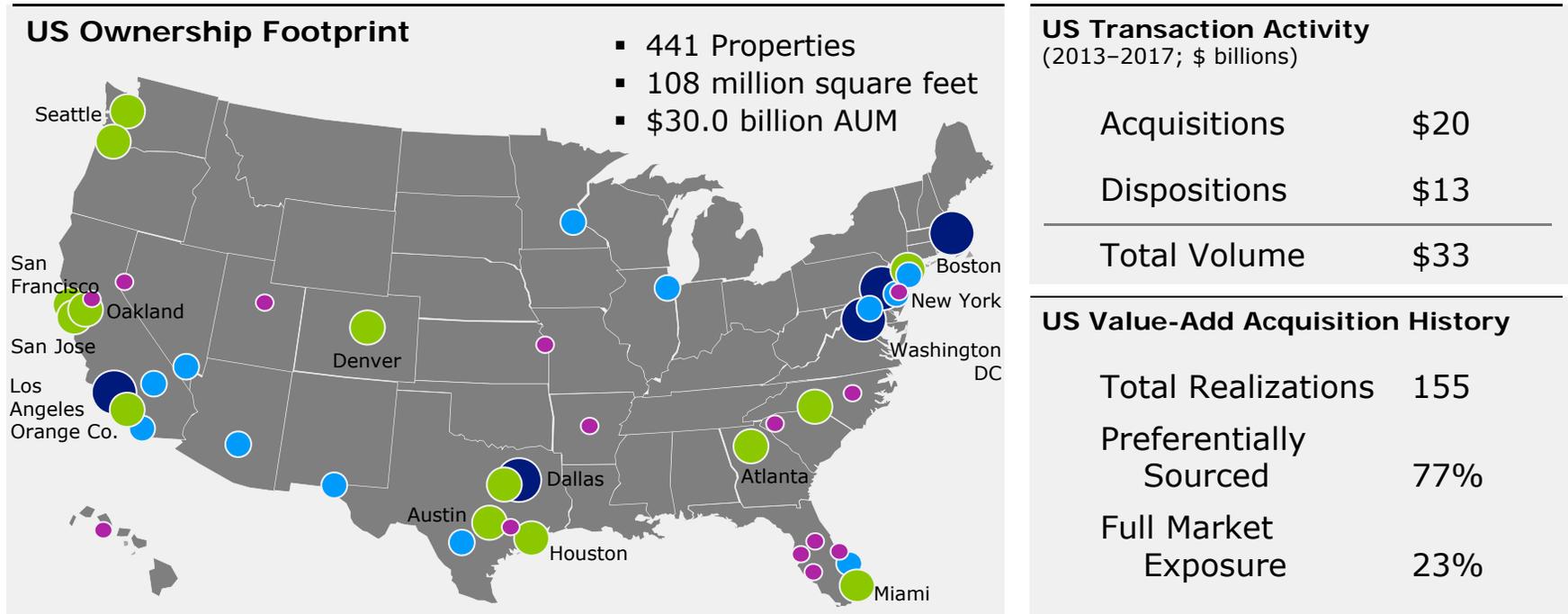
As of July 2018

*Joined Invesco Real Estate in 2018.

17 **Joined Invesco Real Estate in 4Q2017.

US Real Estate Platform

Has Resulted in Specific Advantages vs. Peers in the Value Add Space



Fund Series Benefits

- Highly visible platform with certainty of close reputation
- Creates sourcing advantages in primary markets with the most durable liquidity
- National tenant relationships (Facebook, Whole Foods, etc.)
- Operating leverage/underwriting insights
- Highly competitive debt pricing and structuring flexibility
- Ability to attract and retain talent

Number of Properties ● 1 ● 2-10 ● 11-20 ● 21-55

US Value Added Performance

Creating Core Assets in Highly Liquid Markets



Key Performance Metrics

- 26 years without interruption
- \$14 billion of gross capitalization
- 214 investments
- 14.7% IRR on realized and unrealized (estimated) returns (gross, levered)
- 14.4% IRR on realized investments (gross, levered)
- Rigorous performance back-testing

Historic Exposures¹

Multi-family	44%	Industrial	16%
Office	26%	Retail	10%
		Other	5%



3001 Washington Blvd | Washington, DC



Broadstone at Harbor Beach | Ft. Lauderdale, FL

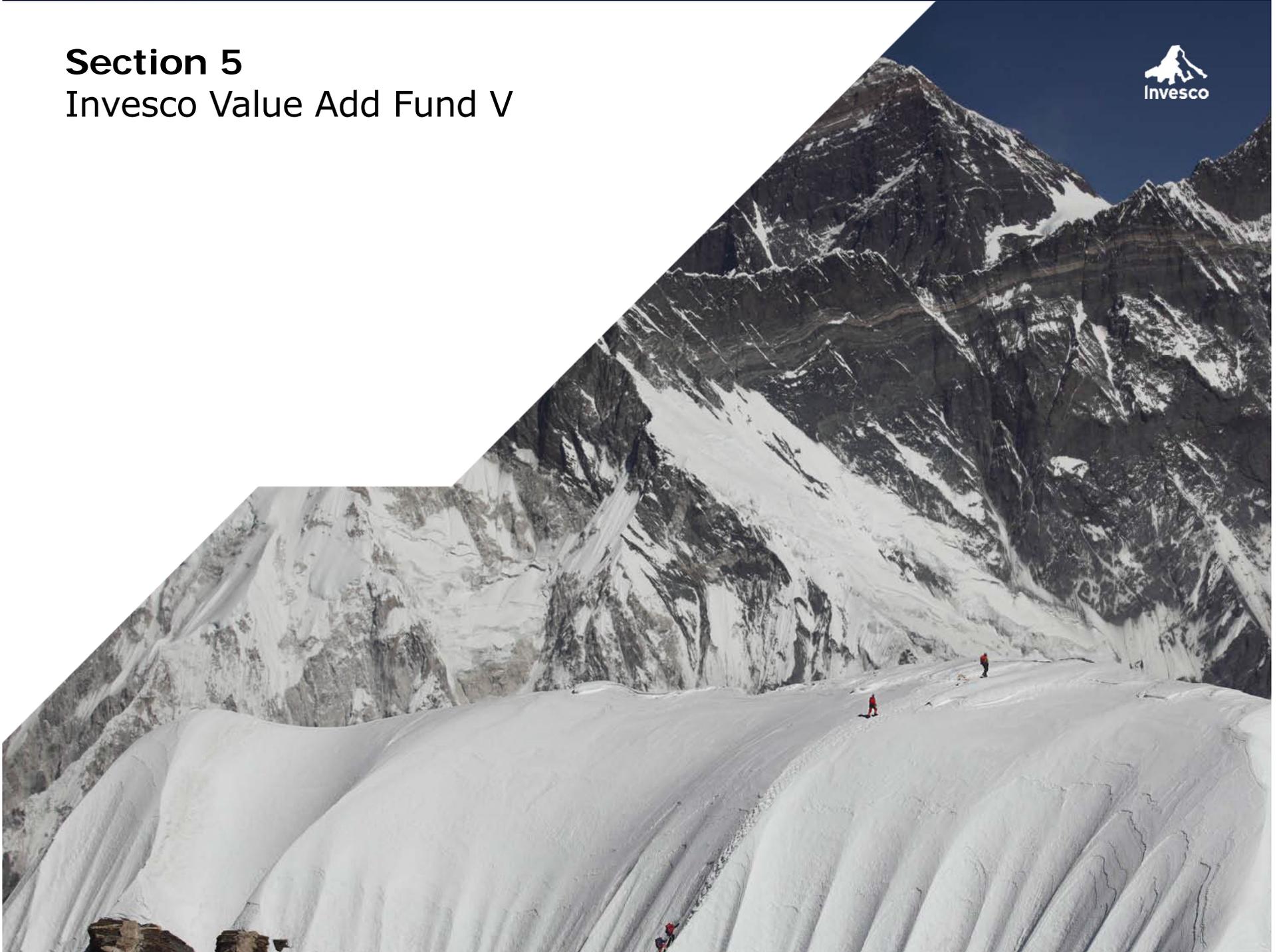


Soho House | New York, NY

¹⁹ Source: Invesco Real Estate as of 1Q2018. Past performance is not indicative of future results. Performance was not a criteria for selection, and the photographs are provided for illustrative purposes only and do not constitute investment advice or a recommendation. ¹May not add to 100% due to rounding.

Section 5

Invesco Value Add Fund V



Terms and Timeline



Targeted Fund Size:	\$800 million - \$1 billion
Target Return Range (levered/gross)*:	11-14% IRR
GP Commitment:	\$25 Million
Minimum LP Commitment:	\$10 Million
Initial Close:	July 2017
Final Close:	December 2018
Initial Fund Life:	7 years from Final Closing
Extensions:	Two; 1-year extensions (LPAC discretion)
Investment Period:	July 2021
Leverage (LTV):	Maximum 60% at Fund-Level / 75% on Individual Investments
Management Fee:	1.5% on Invested Equity
Preferred Return:	9%
Incentive Fee (Portfolio Test):	20%; 50% catch-up



Coppins Well |
Seattle, WA



116 New Montgomery |
San Francisco, CA



Vineyards at Old Town |
Temecula (Riverside), CA

*This is a target return based on current economic condition and other factors. There is no guarantee that the return objective can be achieved.

Investors should not rely solely on the information above to make any investment decision. Please see PPM for more complete information.

Invesco US Value Add Fund V

Commitments Summary



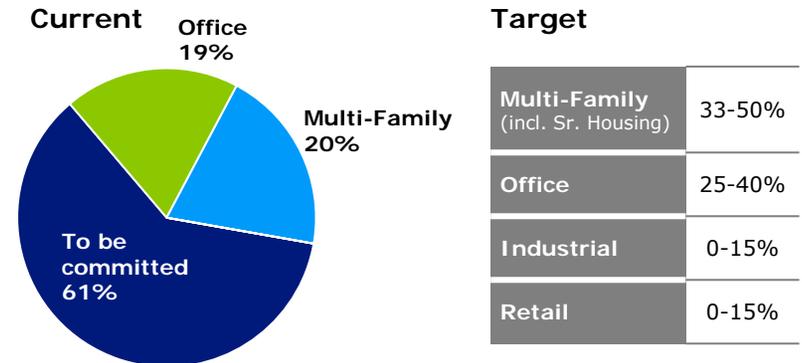
Investor Type	Commitments (USD)
US Foundation	\$40 million
US Insurance Company	\$15 million
US Public Pension	\$50 million
US Insurance Company	\$30 million
US Public Pension	\$30 million
US Public Pension	\$10 million
US Foundation	\$15 million
US Corporate Plan	\$25 million
US Public Pension	\$30 million
US Taft Hartley	\$15 million
US Public Pension	\$150 million
Closed Commitments	\$410 million
Non-US Sovereign Wealth Fund	\$100 million
US Public Pension	\$75 million
US Public Pension	\$50 million
Non-US Sovereign Wealth Fund	\$150 million
US Public Pension	\$25 million
US Corporate Plan	\$25 million
In Progress	\$425 million
	\$835 million

Pre-Specified Portfolio

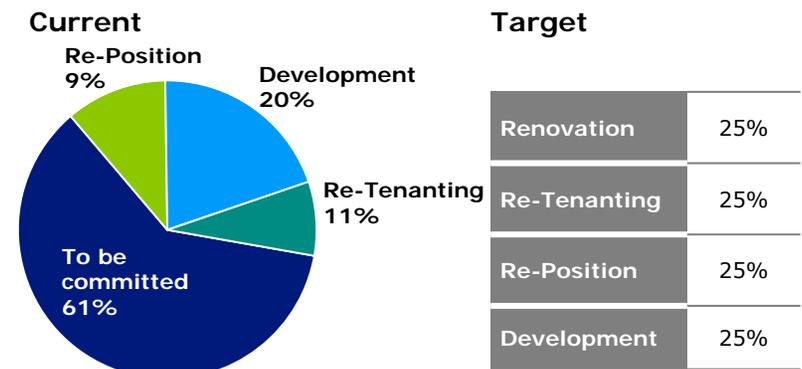
Initial Portfolio Construction of +/-40% of Target Equity Raise



Sector Allocation (%)



Investment Strategy (%) ⁽¹⁾



(\$ in millions) ⁽¹⁾ Fund is "neutral" on investment strategy weightings and employs a best relative value approach

23 It is not known whether investments in due diligence will be acquired by the Fund. Information is presented for illustrative purposes only. Figures are estimates and are as of July 2018 and are SUBJECT TO CHANGE.

Appendix

Invesco Value Fund Composites



Invesco Value Fund III Composite

Schedule of investment performance



Composite Gross-of-Fees Returns								Composite Statistics at Year End							
Year	Income Return	Capital Return	Total Return	Net-of-Fees		Gross SI-IRR	Net SI-IRR	Total Committed Capital (USD Million)	Paid-In Capital (USD Million)	Cumulative Distributions (USD Million)	Number of Portfolios	Composite Assets (USD Million)	External Appraisal % of Composite Assets	Total Firm Assets (USD Billion)	Non-Real Estate % of Composite Assets
				Total Return	Total Return										
2017	0.3%	-3.3%	-3.0%	-3.2%		21.0%	15.2%	343.73	314.60	321.11	1	128.87	100.0%	660.3	0.0%
2016	0.5%	24.1%	24.7%	18.5%		24.7%	18.3%	343.73	298.08	218.84	1	220.26	70.9%	599.4	0.0%
2015	2.9%	15.3%	18.6%	13.9%		24.8%	18.3%	343.73	296.04	204.22	1	198.36	83.8%	575.1	0.0%
2014	1.4%	27.9%	29.6%	22.1%		28.4%	21.1%	343.73	203.99	0.00	1	281.27	82.0%	584.9	0.0%
2013	-0.4%	36.5%	36.0%	26.7%		25.6%	18.7%	343.73	138.19	0.00	1	165.74	67.6%	572.8	0.0%
2012 YTD	-1.9%	3.5%	1.6%	0.7%		1.5%	0.7%	343.73	74.51	0.00	1	75.03	8.8%	497.1	0.0%

Annualized Returns as of December 31, 2017					TVPI Multiple	DPI Multiple	PIC Multiple	RVPI Multiple	
3 Year	1.2%	11.5%	12.8%	9.3%	2017	1.43	1.02	0.92	0.41
5 Year	0.9%	19.3%	20.4%	15.1%	2016	1.47	0.73	0.87	0.74
7 Year	N/A	N/A	N/A	N/A	2015	1.36	0.69	0.86	0.67
10 Year	N/A	N/A	N/A	N/A	2014	1.38	0.00	0.59	1.38
Since Inception	0.5%	17.6%	18.1%	13.4%	2013	1.20	0.00	0.40	1.20
					2012	1.01	0.00	0.22	1.01

All data as of December 31, 2017.

Invesco Worldwide has prepared and presented this report in compliance with the Global Investment Performance Standards (GIPS®).

25 The Composite creation date is January 2013 and the Since Inception returns are as of May 2012.



Invesco Value Fund III Composite

Performance notes

Compliance Statement

Invesco Worldwide claims compliance with the Global Investment Performance Standards (GIPS®) and has prepared and presented this report in compliance with the GIPS standards. Invesco Worldwide has been independently verified for the periods 1st January 2003 through 31st December 2017. The legacy firms that constitute Invesco Worldwide have been verified since 2001 or earlier. Verification assesses whether (1) the firm has complied with all the composite construction requirements of the GIPS standards on a firm-wide basis and (2) the firm's policies are designed to calculate and present performance in compliance with GIPS standards. Verification does not ensure the accuracy of any specific composite presentation.

The Firm

Invesco Worldwide ("The Firm") manages a broad array of investment strategies around the world. The Firm comprises U.S.-based Invesco Advisers, Inc. (excluding Unit Investment Trusts) and all wholly owned Invesco firms outside of North America (excluding Invesco India and Source Investment Management Limited). All entities within the Firm are directly or indirectly owned by Invesco Ltd. Invesco Canada Ltd. is also a GIPS-compliant firm whose assets are managed by a subsidiary of Invesco Ltd.

Invesco Senior Secured Management, Inc., Invesco Private Capital, Inc., and Invesco Capital Management LLC are affiliates of the Firm. Each is an SEC-registered investment adviser and is marketed as a separate entity.

Invesco Great Wall Fund Management Co. Ltd is a fund management company established under China Securities Regulatory Commission's approval, and its assets are excluded from total Firm assets.

The Composite

The Invesco Value Add Fund III Composite is constructed using all fund investments. The composite is constructed of assets with a value add strategy and the Fund's vintage year is 2012. The composite vintage year is defined as the year in which the Fund received its first equity contribution. The Firm's list of composite descriptions is available upon request.

Description of Discretion

Portfolios are considered discretionary if Invesco has sole or primary responsibility for major investment decisions. Major decisions may include portfolio strategy, purchases, sales, investment structuring, financing, capital improvements and operating budgets. Investors rarely delegate complete investment discretion to managers for real estate investments, but in many cases the constraints imposed do not inhibit the manager's investment policy or decision making to any significant extent. Therefore, the required client approval of major decisions does not preclude classification of a real estate portfolio as discretionary. Acceptance of primary responsibility by Invesco may be inferred if a portion of Invesco's compensation is tied to performance or Invesco's success is assessed based on comparison of its performance to an industry benchmark. Portfolios are considered nondiscretionary if client imposed investment limitations and restrictions hinder or prohibit application of Invesco's desired investment strategy.

Valuation

Internal values are developed by Invesco's valuation department on a periodic (annual, quarterly or "significant event") basis to be used: (1) to value the asset to market in quarters where no external valuation is performed (2) in reporting to clients, consultants and for general business management purposes. Value is primarily derived from the income approach; therefore internal sources are accessed to provide adequate detail in developing the cash flows, including: Underwriting, Research, Asset Management and Acquisitions. In addition to internal sources of information, external data such as Market Cycles, Property Considerations and Alternative Investments information is employed in determining the inputs for each assumption in the cash flow and rates of capitalization. Comparable sales are also considered in the valuation process. Further, each asset is valued externally at least once every 36 months unless otherwise more frequently required by the respective investment management agreement. The policies for valuing portfolios, calculating performance and preparing compliant presentations are available upon request.

Basis of Accounting

All portfolios in the composite are reported on a fair value basis in accordance with authoritative guidance in conformity with accounting principles generally accepted in the United States of America.

Calculation of Performance Returns

Returns are calculated in accordance with the Investment Level methodology as prescribed by the National Council of Real Estate Investment Fiduciaries (NCREIF). Component returns are calculated separately using chain-linked time-weighted rates of return. Quarterly returns are geometrically linked in arriving at annual returns. Further, IRR calculations are included based on quarterly cash flows.

Investment Management Fees

Gross of fee performance results are presented net of execution or transaction costs and before investment management and GP incentive fees. Investment management fees are equal to 0.90%-1.50% of Limited Partners' aggregate invested equity. The incentive fee is calculated based on the Fund's waterfall and (to the extent earned) paid at Fund redemption.

Benchmark

We have determined no such relevant benchmark exists. Due to the nature of closed-end real estate funds, we believe any presentation of widely accepted real estate benchmarks such as NPI or NFI-ODCE would be misleading. This was determined as Invesco Real Estate's closed-end real estate funds are very specific in mandate, objective and strategy. Further complicating benchmarking, we present IRRs as of a point in time and corresponding benchmark data is not available.

Invesco Value Fund IV Composite

Schedule of investment performance



Composite Gross-of-Fees Returns								Composite Statistics at Year End						
Year	Income Return	Capital Return	Total Return	Net-of-Fees Total Return	Gross SI-IRR	Net SI-IRR	Total Committed Capital (USD Million)	Paid-In Capital (USD Million)	Cumulative Distributions (USD Million)	Number of Portfolios	Composite Assets (USD Million)	External Appraisal % of Composite Assets	Total Firm Assets (USD Billion)	Non-Real Estate % of Composite Assets
2017	1.9%	14.1%	16.2%	12.4%	20.2%	14.8%	759.00	521.82	162.73	1	445.27	91.2%	660.3	0.0%
2016	-0.3%	17.3%	16.9%	12.3%	24.4%	17.2%	759.00	342.23	59.88	1	319.22	66.5%	599.4	0.0%
2015 YTD	-2.5%	25.1%	22.2%	16.2%	21.5%	15.1%	759.00	88.42	0.00	1	101.80	51.7%	575.1	0.0%

Annualized Returns as of December 31, 2017

3 Year	N/A	N/A	N/A	N/A
5 Year	N/A	N/A	N/A	N/A
7 Year	N/A	N/A	N/A	N/A
10 Year	N/A	N/A	N/A	N/A
Since Inception	-0.4%	14.1%	16.2%	12.4%

	TVPI Multiple	DPI Multiple	PIC Multiple	RVPI Multiple
2017	1.17	0.31	0.69	0.85
2016	1.11	0.17	0.45	0.93
2015	1.15	0.00	0.12	1.15

All data as of December 31, 2017.

Invesco Worldwide has prepared and presented this report in compliance with the Global Investment Performance Standards (GIPS®).

27 The Composite creation date is May 2015 and the Since Inception returns are as of May 2015.



Invesco Value Fund IV Composite

Performance notes

Compliance Statement

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The Composite

The Invesco Value Add Fund IV Composite is constructed using all fund investments. The composite is constructed of assets with a value add strategy and the Fund's vintage year is 2015. The composite vintage year is defined as the year in which the Fund received its first equity contribution. The Firm's list of composite descriptions is available upon request.

Description of Discretion

Portfolios are considered discretionary if Invesco has sole or primary responsibility for major investment decisions. Major decisions may include portfolio strategy, purchases, sales, investment structuring, financing, capital improvements and operating budgets. Investors rarely delegate complete investment discretion to managers for real estate investments, but in many cases the constraints imposed do not inhibit the manager's investment policy or decision making to any significant extent. Therefore, the required client approval of major decisions does not preclude classification of a real estate portfolio as discretionary. Acceptance of primary responsibility by Invesco may be inferred if a portion of Invesco's compensation is tied to performance or Invesco's success is assessed based on comparison of its performance to an industry benchmark. Portfolios are considered nondiscretionary if client imposed investment limitations and restrictions hinder or prohibit application of Invesco's desired investment strategy.

Valuation

Internal values are developed by Invesco's valuation department on a periodic (annual, quarterly or "significant event") basis to be used: (1) to value the asset to market in quarters where no external valuation is performed (2) in reporting to clients, consultants and for general business management purposes. Value is primarily derived from the income approach; therefore internal sources are accessed to provide adequate detail in developing the cash flows, including: Underwriting, Research, Asset Management and Acquisitions. In addition to internal sources of information, external data such as Market Cycles, Property Considerations and Alternative Investments information is employed in determining the inputs for each assumption in the cash flow and rates of capitalization. Comparable sales are also considered in the valuation process. Further, each asset is valued externally at least once every 36 months unless otherwise more frequently required by the respective investment management agreement. The policies for valuing portfolios, calculating performance and preparing compliant presentations are available upon request.

Basis of Accounting

All portfolios in the composite are reported on a fair value basis in accordance with authoritative guidance in conformity with accounting principles generally accepted in the United States of America.

Calculation of Performance Returns

Returns are calculated in accordance with the Investment Level methodology as prescribed by the National Council of Real Estate Investment Fiduciaries (NCREIF). Component returns are calculated separately using chain-linked time-weighted rates of return. Quarterly returns are geometrically linked in arriving at annual returns. Further, IRR calculations are included based on quarterly cash flows.

Investment Management Fees

Gross of fee performance results are presented net of execution or transaction costs and before investment management and GP incentive fees. Investment management fees are equal to 1.00%-1.50% of Limited Partners' aggregate invested equity. The incentive fee is calculated based on the Fund's waterfall and (to the extent earned) paid at Fund redemption.

Benchmark

We have determined no such relevant benchmark exists. Due to the nature of closed-end real estate funds, we believe any presentation of widely accepted real estate benchmarks such as NPI or NFI-ODCE would be misleading. This was determined as Invesco Real Estate's closed-end real estate funds are very specific in mandate, objective and strategy. Further complicating benchmarking, we present IRRs as of a point in time and corresponding benchmark data is not available.

Invesco U.S. Value-Add Fund V, L.P.

Disclosures



This document is for existing institutional investor use with Contra Costa County Employees' Retirement Association. This presentation must be preceded or accompanied by the Invesco U.S. Value-Add Fund V, L.P. Private Placement Memorandum (PPM).

All material presented is compiled from sources believed to be reliable and current, but accuracy cannot be guaranteed. This is not to be construed as an offer to buy or sell any financial instruments. It is not our intention to state, indicate or imply in any manner that current or past results are indicative of future profitability or expectations. The opinions expressed herein are based on current market conditions and are subject to change without notice. As with all investments there are associated inherent risks. For complete information on the Invesco U.S. Value-Add Fund V, L.P., please refer to the PPM. It will contain all material information in respect of any securities offered thereby and any decision to invest in such securities should be made solely in reliance upon such PPM. For important information on risks associated with the Invesco U.S. Value-Add Fund V, L.P., see the "Risk Factors and Conflicts of Interest" section of the PPM, which begins on page 47 to page 67.

Furthermore, this document does not constitute an offer or solicitation in any jurisdiction in which such an offer or solicitation is not authorized or to any person to whom it is unlawful to make such an offer or solicitation. This document does not take into account individual objectives, taxation position or financial needs and should not be relied upon as the sole factor in an investment making decision. Nor does this constitute a recommendation of the suitability of any investment strategy for a particular investor.

Investment returns and principal value will fluctuate (this may partly be the result of exchange rate fluctuations) so that when redeemed, an investor may not get back the full amount invested. Current tax levels and reliefs may change. Depending on individual circumstances, this may affect investment returns. If investors are unsure if this fund is suitable for them, they should seek advice from an advisor. In the event of any inconsistency between this document and the PPM, the PPM will govern. Invesco makes no representation or warranty, expressed or implied, regarding any prospective investor's legal, tax or accounting treatment of the matters described herein, and Invesco is not responsible for providing legal, regulatory or accounting advice to any prospective investor.

Forward Looking Statement Disclosure

These materials may contain statements that are not purely historical in nature but are "forward-looking statements." These include, among other things, projections, forecasts, estimates of income, yield or return, future performance targets, sample or pro forma portfolio structures or portfolio composition, scenario analysis, specific investment strategies and proposed or pro forma levels of diversification or sector investment. These forward-looking statements can be identified by the use of forward looking terminology such as "may," "will," "should," "expect," "anticipate," "project," "estimate," "intend," "continue," "target," "believe," the negatives thereof, other variations thereon or comparable terminology. Forward looking statements are based upon certain assumptions, some of which are described herein. Actual events are difficult to predict, are beyond the Issuer's control, and may substantially differ from those assumed. All forward-looking statements included herein are based on information available on the date hereof and Invesco assumes no duty to update any forward-looking statement. Some important factors which could cause actual results to differ materially from those in any forward-looking statements include, among others, the actual composition of the portfolio of Underlying Assets, any defaults to the Underlying Assets, the timing of any defaults and subsequent recoveries, changes in interest rates, and any weakening of the specific obligations included in the portfolio of Underlying Assets. Other detailed risk factors are also described in the Private Placement Memorandum. Accordingly, there can be no assurance that estimated returns or projections can be realized, that forward-looking statements will materialize or that actual returns or results will not be materially lower than those presented.

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US 8966 - 08/2018

Contra Costa County Employees' Retirement Association

Actuarial Valuation and Review
As of December 31, 2017



Meeting Date
8/22/2018
Agenda Item
#11

This report has been prepared at the request of the Board of Retirement to assist in administering the Fund. This valuation report may not otherwise be copied or reproduced in any form without the consent of the Board of Retirement and may only be provided to other parties in its entirety, unless expressly authorized by Segal. The measurements shown in this actuarial valuation may not be applicable for other purposes.

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August 16, 2018

*Board of Retirement
Contra Costa County Employees' Retirement Association
1335 Willow Way, Suite 221
Concord, CA 94520*

Dear Board Members:

We are pleased to submit this Actuarial Valuation and Review as of December 31, 2017. It summarizes the actuarial data used in the valuation, establishes the funding requirements for the fiscal year beginning July 1, 2019 and analyzes the preceding year's experience.

This report was prepared in accordance with generally accepted actuarial principles and practices at the request of the Board to assist in administering the Plan. The census information on which our calculations were based was prepared by CCCERA and the financial information was provided by the Retirement Association. That assistance is gratefully acknowledged.

The measurements shown in this actuarial valuation may not be applicable for other purposes. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period); and changes in plan provisions or applicable law.

The actuarial calculations were completed under the supervision of John Monroe, ASA, MAAA, Enrolled Actuary. 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. To the best of our knowledge, the information supplied in the actuarial valuation is complete and accurate. Further, in our opinion, the assumptions as approved by the Board are reasonably related to the experience of and the expectations for the Plan.

We look forward to reviewing this report at your next meeting and to answering any questions.

Sincerely,

Segal Consulting, a Member of The Segal Group, Inc.

By:

*Paul Angelo, FSA, EA, MAAA, FCA
Senior Vice President & Actuary*

*John Monroe, ASA, EA, MAAA
Vice President & Actuary*

EK/bbf

SECTION 1

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SECTION 1: Valuation Summary for the Contra Costa County Employees' Retirement Association

PURPOSE AND SCOPE

This report has been prepared by Segal Consulting to present a valuation of the Contra Costa County Employees' Retirement Association (CCCERA) as of December 31, 2017. The valuation was performed to determine whether the assets and contributions are sufficient to provide the prescribed benefits. The contribution rate requirements presented in this report are based on:

- The benefit provisions of the Retirement Association, as administered by the Board;
- The characteristics of covered active members, terminated members, and retired members and beneficiaries as of December 31, 2017, provided by CCCERA;
- The assets of the Plan as of December 31, 2017, provided by CCCERA;
- Economic assumptions regarding future salary increases and investment earnings adopted by the Board for the December 31, 2017 valuation; and
- Other actuarial assumptions, regarding employee terminations, retirement, death, etc. adopted by the Board for the December 31, 2017 valuation.

One of the general goals of an actuarial valuation is to establish contributions that fully fund the system's liabilities, and that, as a percentage of payroll, remain as level as possible for each generation of active members. Annual actuarial valuations measure the progress toward this goal, as well as test the adequacy of the contribution rates.

In preparing this valuation, we have employed generally accepted actuarial methods and assumptions to evaluate the Association's assets, liabilities and future contribution requirements. Our calculations are based upon member data and financial information provided to us by the Association's staff. This information has not been audited by us, but it has been reviewed and found to be reasonably consistent, both internally and with prior years' information.

SECTION 1: Valuation Summary for the Contra Costa County Employees' Retirement Association

Ref: Pgs. 71 - 84

The contribution requirements are determined as a percentage of payroll. The Association's employer rates provide for both normal cost and a contribution to amortize any unfunded or overfunded actuarial accrued liabilities. In 2008, the Board elected to amortize the remaining balance of the Association's unfunded actuarial accrued liability (UAAL) through December 31, 2007 over a decreasing 15-year period with 5 years remaining as of December 31, 2017. Any change in the UAAL that arises at each valuation after December 31, 2007 is amortized over its own separate declining 18-year period.

Ref: Pgs. 85 - 86

Effective with the December 31, 2013 valuation, any change in UAAL that arises due to plan amendments is amortized over its own declining 10-year period (with the exception of a change due to retirement incentives, which is to be funded in full upon adoption of the incentive). Note that a graphical projection of the UAAL amortization bases and payments has been included as a new Exhibit K.

We recommend that the rates calculated in this report be adopted by the Board for the fiscal year that extends from July 1, 2019 through June 30, 2020.

SIGNIFICANT ISSUES IN VALUATION YEAR

The following key findings were the result of this actuarial valuation:

*Ref: Pg. 36
Ref: Pg. 70*

➤ The ratio of the valuation value of assets to the actuarial accrued liability increased from 86.5% to 88.5% while the ratio of the market value of assets to the actuarial accrued liability also increased from 84.6% to 90.8%. The Association's UAAL (which is based on the valuation value of assets) has decreased from \$1.2 billion to \$1.1 billion. This decrease is due to an investment return on actuarial value (i.e. after smoothing) greater than the 7.00% assumed rate, actual contributions greater than expected, and a retirement gain on actives all offset to some degree by higher than expected individual salary increases, higher than expected COLA increases for retirees and beneficiaries, and a mortality loss on retirees and beneficiaries. A reconciliation of the Association's UAAL is provided in Section 3, Exhibit I.

Ref: Pg. 33

➤ The average employer rate calculated in this valuation (excluding any employer subvention of member rates or member subvention of employer rates) has decreased from 38.08% of payroll to 36.07% of payroll. This decrease is due to an investment return on actuarial value (i.e. after smoothing) greater than the 7.00% assumed rate, actual contributions greater than expected, amortizing the prior year's UAAL over a greater than expected projected total payroll and a retirement gain on actives all offset to some degree by higher than expected individual salary increases, a higher than expected COLA increases for retirees and beneficiaries and a mortality loss on retirees and beneficiaries. A complete reconciliation of the Association's aggregate employer rate is provided in Section 2, Subsection D (see Chart 15).

SECTION 1: Valuation Summary for the Contra Costa County Employees' Retirement Association

Ref: Pgs. 21 - 32

- Separate employer contribution rates are shown in Chart 14 for members with membership dates before January 1, 2013 (non-PEPRA members) and on or after January 1, 2013 (PEPRA members). However, the average employer contribution rates shown on page v are based on all members regardless of their membership date. A detailed schedule of the employer contribution rates is provided in Section 2, Subsection D, Chart 14.

Ref: Pg. 34

- The average member rate calculated in this valuation has decreased from 12.08% of payroll to 12.03% of payroll. A complete reconciliation of the Association's aggregate member rate is provided in Section 2, Subsection D (see Chart 16). The detailed member rates are provided in Appendix A and B of this report. They are shown by cost group.

Ref: Pg. 5

- The total unrecognized net investment gain as of December 31, 2017 is about \$195 million as compared to an unrecognized net investment loss of \$184 million in the previous valuation. The net investment gain of \$195 million will be recognized in the determination of the actuarial value of assets for funding purposes in the next few years as shown in the footnote in Chart 7.
- The net deferred gains of \$195 million represent about 2.3% of the market value of assets. Unless offset by future investment losses or other unfavorable experience, the recognition of the \$195 million market gains is expected to have an impact on the Association's future funded ratio and contribution rate requirements. This potential impact may be illustrated as follows:
 - If the net deferred gains were recognized immediately in the valuation value of assets, the funded percentage would increase from 88.5% to 90.6%.

For comparison purposes, if all the deferred losses in the December 31, 2016 valuation had been recognized immediately in the December 31, 2016 valuation, the funded percentage would have decreased from 86.5% to 84.4%.
 - If the net deferred gains were recognized immediately in the valuation value of assets, the average employer contribution rate would decrease from 36.1% to about 34.3% of payroll.

For comparison purposes, if all the deferred losses in the December 31, 2016 valuation had been recognized immediately in the December 31, 2016 valuation, the average employer contribution rate would have increased from 38.1% to 39.9% of payroll.
- The actuarial valuation report as of December 31, 2017 is based on financial information as of that date. Changes in the assets subsequent to that date, to the extent that they exist, are not reflected. Declines in asset values will increase the actuarial cost of the plan, while increases will decrease the actuarial cost of the plan.

SECTION 1: Valuation Summary for the Contra Costa County Employees' Retirement Association

- This valuation reflects the \$30,000 and \$294,000 additional contributions made by Local Agency Formation Commission (LAFCO) and San Ramon Valley Fire Department, respectively, towards their UAAL. Based on CCCERA's funding policy, these amounts will be amortized as a level percent of pay (credit) over a period of eighteen years beginning with the December 31, 2017 valuation to reduce their associated employer UAAL contributions.

Impact of Future Experience on Contribution Rates

Future contribution requirements may differ from those determined in the valuation because of:

- Differences between actual experience and anticipated experience;
- Changes in actuarial assumptions or methods;
- Changes in statutory provisions; and
- Differences between the contribution rates determined by the valuation and those adopted by the Board.

SECTION 1: Valuation Summary for the Contra Costa County Employees' Retirement Association

Summary of Key Valuation Results

	December 31, 2017		December 31, 2016	
		Estimated		Estimated
Average Employer Contribution Rates ⁽¹⁾ :	Total Rate	Annual Amount	Total Rate	Annual Amount
General				
Cost Group #1 – County and Small Districts (Tier 1 and 4)	31.10%	\$7,606,008	32.24%	\$7,255,727
Cost Group #2 – County and Small Districts (Tier 3 and 5)	26.36%	165,290,829	27.79%	158,011,177
Cost Group #3 – Central Contra Costa Sanitary District	49.57%	17,028,036	51.06%	16,647,933
Cost Group #4 – Contra Costa Housing Authority	41.91%	2,339,998	41.39%	2,292,585
Cost Group #5 – Contra Costa County Fire Protection District	31.82%	1,637,209	32.30%	1,373,964
Cost Group #6 – Small Districts (Non-Enhanced Tier 1 and 4)	16.59%	141,096	28.88%	231,953
Safety				
Cost Group #7 – County (Tier A and D)	71.94%	43,932,485	75.62%	45,850,943
Cost Group #8 – Contra Costa and East Fire Protection Districts	75.59%	26,986,544	77.06%	26,794,496
Cost Group #9 – County (Tier C and E)	62.56%	22,115,804	67.42%	17,836,505
Cost Group #10 – Moraga-Orinda Fire District	69.74%	5,127,677	70.26%	4,947,214
Cost Group #11 – San Ramon Valley Fire District	75.25%	16,211,133	80.73%	15,490,933
Cost Group #12 – Rodeo-Hercules Fire Protection District	92.28%	2,022,595	96.93%	2,012,833
All Employers combined	36.07%	\$310,439,414	38.08%	\$298,746,263
Average Member Contribution Rates⁽¹⁾:		Estimated		Estimated
General	Total Rate	Annual Amount	Total Rate	Annual Amount
Cost Group #1 – County and Small Districts (Tier 1 and 4)	10.89%	\$2,663,749	10.78%	\$2,425,734
Cost Group #2 – County and Small Districts (Tier 3 and 5)	10.76%	67,468,539	10.84%	61,630,010
Cost Group #3 – Central Contra Costa Sanitary District	11.45%	3,932,967	11.56%	3,769,197
Cost Group #4 – Contra Costa Housing Authority	11.70%	653,190	11.57%	640,888
Cost Group #5 – Contra Costa County Fire Protection District	11.08%	570,022	10.99%	467,521
Cost Group #6 – Small Districts (Non-Enhanced Tier 1 and 4)	13.31%	113,227	13.55%	108,839
Safety				
Cost Group #7 – County (Tier A and D)	17.92%	10,943,567	17.83%	10,810,732
Cost Group #8 – Contra Costa and East Fire Protection Districts	17.54%	6,261,431	17.12%	5,953,027
Cost Group #9 – County (Tier C and E)	16.20%	5,727,117	16.08%	4,253,979
Cost Group #10 – Moraga-Orinda Fire District	17.26%	1,269,068	17.14%	1,206,917
Cost Group #11 – San Ramon Valley Fire District	16.75%	3,608,279	16.63%	3,190,924
Cost Group #12 – Rodeo-Hercules Fire Protection District	15.52%	340,150	15.44%	320,617
All Categories Combined	12.03%	\$103,551,307	12.08%	\$94,778,385

⁽¹⁾ Based on projected payroll as of each valuation date shown. These rates do not include any employer subvention of member contributions or any member subvention of employer contributions. The rates shown are averages based on all members regardless of their membership date.

Note: Pages 19 and 20 contain a summary that shows which employers are in each cost group.

SECTION 1: Valuation Summary for the Contra Costa County Employees' Retirement Association

Summary of Key Valuation Results (continued)

	December 31, 2017	December 31, 2016
Funded Status:		
Actuarial accrued liability (AAL)	\$9,239,246,920	\$8,794,434,139
Valuation value of assets (VVA)	\$8,179,891,191	\$7,606,997,530
Market value of assets (MVA)	\$8,390,581,049	\$7,438,519,504
Funded percentage on VVA basis (VVA/AAL)	88.5%	86.5%
Funded percentage on MVA basis (MVA/AAL)	90.8%	84.6%
Unfunded Actuarial Accrued Liability (UAAL) on VVA basis	\$1,059,355,729	\$1,187,436,609
Unfunded Actuarial Accrued Liability (UAAL) on MVA basis	\$848,665,871	\$1,355,914,635
Summary of Financial Data:		
Market value of assets	\$8,390,581,049	\$7,438,519,504
Return on market value of assets	13.31%	7.10%
Actuarial value of assets	\$8,195,516,541	\$7,622,351,103
Return on actuarial value of assets	8.00%	7.04%
Valuation value of assets	\$8,179,891,191	\$7,606,997,530
Return on valuation value of assets	8.00%	7.04%
Key Assumptions:		
Interest rate	7.00%	7.00%
Inflation rate	2.75%	2.75%
Across the board salary increase	0.50%	0.50%

SECTION 1: Valuation Summary for the Contra Costa County Employees' Retirement Association

Summary of Key Valuation Demographic Data

	December 31, 2017	December 31, 2016	Change from Prior Year
Active Members:			
Number of members	10,038	9,848	1.9%
Average age	46.0	45.9	0.1
Average service	9.8	9.9	-0.1
Projected total payroll (compensation)	\$860,624,613	\$784,412,260	9.7%
Average projected payroll	\$85,737	\$79,652	7.6%
Retired Member and Beneficiaries:			
Number of members:			
Service retired	6,973	6,825	2.2%
Disability retired	896	905	-1.0%
Beneficiaries	1,398	1,370	2.0%
Total	9,267	9,100	1.8%
Average age	70.3	70.0	0.3
Average Monthly Benefit	\$3,892	\$3,799	2.4%
Vested Terminated Members:			
Number of terminated vested members ⁽¹⁾	3,327	3,089	7.7%
Average age	46.5	46.6	-0.1

⁽¹⁾ Includes 1,696 terminated members with member contributions on deposit as of December 31, 2017 and 1,543 as of December 31, 2016.

SECTION 1: Valuation Summary for the Contra Costa County Employees' Retirement Association

Important Information about Actuarial Valuations

An actuarial valuation is a budgeting tool with respect to the financing of future projected obligations of a pension plan. It is an estimated forecast – the actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.

In order to prepare an actuarial valuation, Segal Consulting (“Segal”) relies on a number of input items. These include:

- **Plan of benefits** Plan provisions define the rules that will be used to determine benefit payments, and those rules, or the interpretation of them, may change over time. It is important to keep Segal informed with respect to plan provisions and administrative procedures, and to review the plan description in this report to confirm that Segal has correctly interpreted the plan of benefits.
- **Participant data** An actuarial valuation for a plan is based on data provided to the actuary by the Association. Segal does not audit such data for completeness or accuracy, other than reviewing it for obvious inconsistencies compared to prior data and other information that appears unreasonable. It is important for Segal to receive the best possible data and to be informed about any known incomplete or inaccurate data.
- **Assets** This valuation is based on the market value of assets as of the valuation date, as provided by the Association.
- **Actuarial assumptions** In preparing an actuarial valuation, Segal projects the benefits to be paid to existing plan participants for the rest of their lives and the lives of their beneficiaries. This projection requires actuarial assumptions as to the probability of death, disability, withdrawal, and retirement of each participant for each year. In addition, the benefits projected to be paid for each of those events in each future year reflect actuarial assumptions as to salary increases and cost-of-living adjustments. The projected benefits are then discounted to a present value, based on the assumed rate of return that is expected to be achieved on the plan’s assets. There is a reasonable range for each assumption used in the projection and the results may vary materially based on which assumptions are selected. It is important for any user of an actuarial valuation to understand this concept. Actuarial assumptions are periodically reviewed to ensure that future valuations reflect emerging plan experience. While future changes in actuarial assumptions may have a significant impact on the reported results, that does not mean that the previous assumptions were unreasonable.

The user of Segal’s actuarial valuation (or other actuarial calculations) should keep the following in mind:

- The valuation is prepared at the request of the CCCERA. Segal is not responsible for the use or misuse of its report, particularly by any other party.

SECTION 1: Valuation Summary for the Contra Costa County Employees' Retirement Association

- An actuarial valuation is a measurement of the plan's assets and liabilities at a specific date. Accordingly, except where otherwise noted, Segal did not perform an analysis of the potential range of future financial measures. The actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.
- If CCCERA is aware of any event or trend that was not considered in this valuation that may materially change the results of the valuation, Segal should be advised, so that we can evaluate it.
- Segal does not provide investment, legal, accounting, or tax advice. Segal's valuation is based on our understanding of applicable guidance in these areas and of the plan's provisions, but they may be subject to alternative interpretations. The Board should look to their other advisors for expertise in these areas.

As Segal Consulting has no discretionary authority with respect to the management or assets of CCCERA, it is not a fiduciary in its capacity as actuaries and consultants with respect to CCCERA.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

A. MEMBER DATA

The Actuarial Valuation and Review considers the number and demographics of covered members, including active members, vested terminated members, retired members and beneficiaries.

This section presents a summary of significant statistical data on these member groups.

More detailed information for this valuation year and the preceding valuation can be found in Section 3, Exhibits A, B, C and D.

A historical perspective of how the member population has changed over the past ten valuations can be seen in this chart.

CHART 1
Member Population: 2008 – 2017

Year Ended December 31	Active Members	Vested Terminated Members ⁽¹⁾	Retired Members and Beneficiaries	Ratio of Non-Actives to Actives
2008	9,385	2,153	7,012	0.98
2009	8,938	2,209	7,292	1.06
2010	8,811	2,231	7,559	1.11
2011	8,629	2,214	8,085	1.19
2012	8,640	2,288	8,517	1.25
2013	9,124	2,345	8,625	1.20
2014	9,159	2,647	8,871	1.26
2015	9,642	2,790	9,068	1.23
2016	9,848	3,089	9,100	1.24
2017	10,038	3,327	9,267	1.25

⁽¹⁾ Includes members who terminate and leave accumulated contributions on deposit.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

Active Members

Plan costs are affected by the age, years of service and payroll of active members. In this year's valuation, there are 10,038 active members with an average age of 46.0, average years of service of 9.8 years and average payroll of \$85,737. The 9,848 active members in the prior valuation had an average age of 45.9, average service of 9.9 years and average payroll of \$79,652.

Among the active members, there were none with unknown age or service information.

Inactive Members

In this year's valuation, there were 3,327 members with a vested right to a deferred or immediate vested benefit or entitled to a return of their employee contributions versus 3,089 in the prior valuation.

These graphs show a distribution of active members by age and by years of service.

CHART 2
Distribution of Active Members by Age as of December 31, 2017

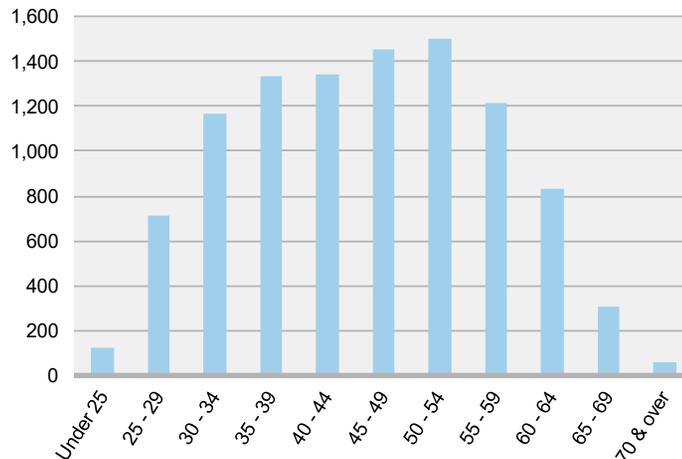
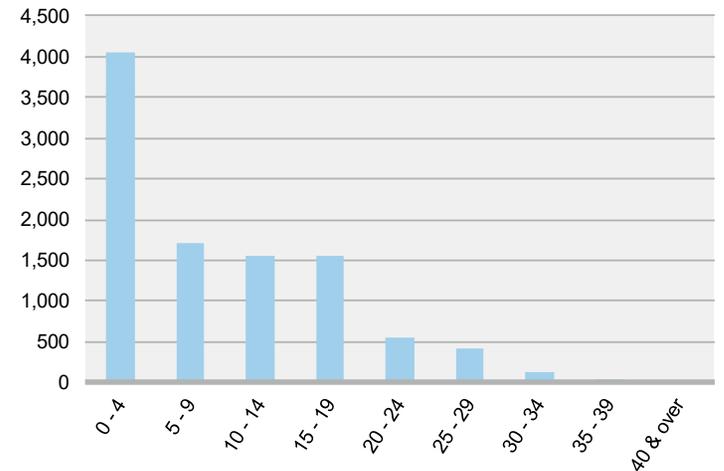


CHART 3
Distribution of Active Members by Years of Service as of December 31, 2017



SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

Retired Members and Beneficiaries

As of December 31, 2017, 7,869 retired members and 1,398 beneficiaries were receiving total monthly benefits of \$36,067,626. For comparison, in the previous valuation, there were 7,730 retired members and 1,370 beneficiaries receiving monthly benefits of \$34,574,919.

These graphs show a distribution of the current retired members and beneficiaries based on their monthly amount and age, by type of pension.

CHART 4
Distribution of Retired Members and Beneficiaries by Type and by Monthly Amount as of December 31, 2017

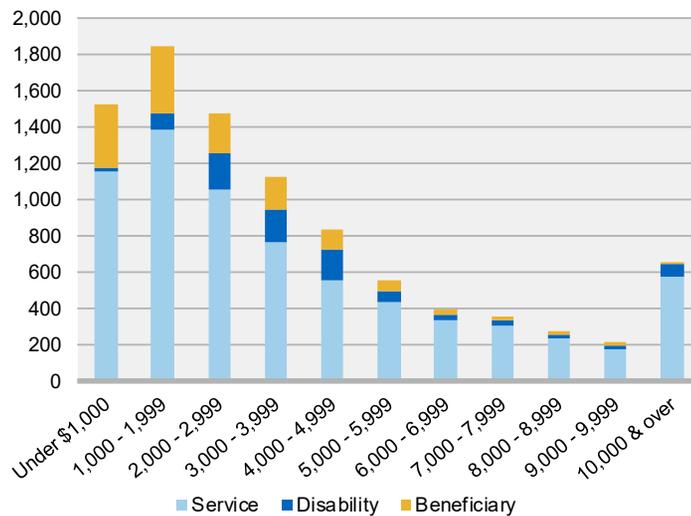
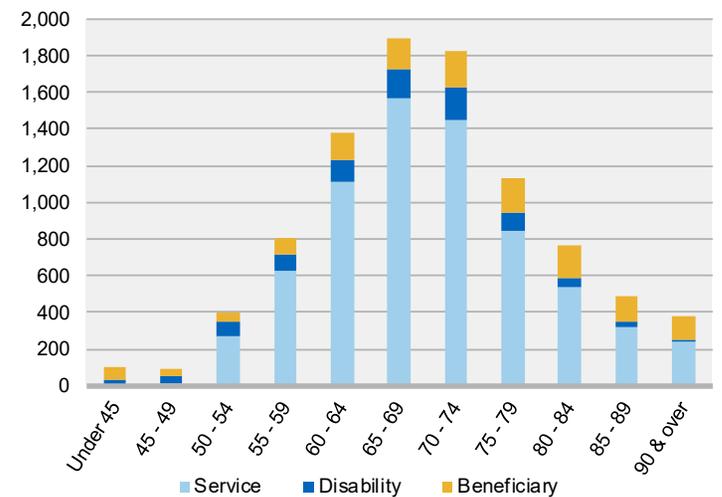


CHART 5
Distribution of Retired Members and Beneficiaries by Type and by Age as of December 31, 2017



SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

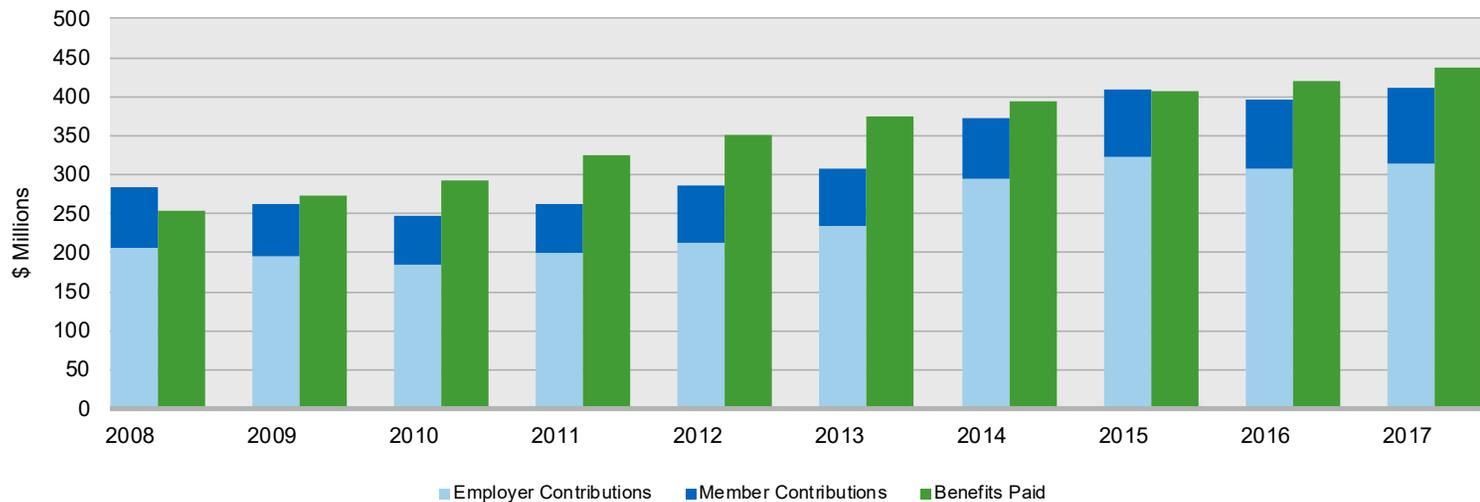
B. FINANCIAL INFORMATION

Retirement plan funding anticipates that, over the long term, both contributions (less administrative expenses) and investment earnings (less investment fees) will be needed to cover benefit payments. Retirement plan assets change as a result of the net impact of these income and expense components.

Additional financial information, including a summary of these transactions for the valuation year, is presented in Section 3, Exhibits E and F.

The chart depicts two components of changes in the actuarial value of assets over the last ten years. The first bar represents increases in assets due to contributions during each year while the second bar details the decreases due to benefit payments. UAAL prepayments of \$7.0 million are included for 2013, \$5.0 million for 2014, \$2.5 million for 2015 and \$0.3 million for 2017.

CHART 6
Comparison of Contributions with Benefits for Years Ended December 31, 2008 - 2017



SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

CHART 7

Determination of Actuarial and Valuation Value of Assets for Year Ended December 31, 2017

The chart shows the determination of the actuarial and valuation value of assets as of the valuation date.

Six Month Period		Total Actual Market Return (net)	Expected Market Return (net)	Investment Gain (Loss)	Deferred Factor	Deferred Return
From	To					
7/2012	12/2012	371,057,645	205,350,894	165,706,751	0.0	\$0
1/2013	6/2013	281,608,945	218,386,047	63,222,898	0.0	0
7/2013	12/2013	588,758,958	227,909,702	360,849,256	0.1	36,084,926
1/2014	6/2014	347,257,106	249,636,410	97,620,696	0.2	19,524,139
7/2014	12/2014	125,727,585	241,361,743	(115,634,158)	0.3	(34,690,247)
1/2015	6/2015	207,439,920	246,283,585	(38,843,665)	0.4	(15,537,466)
7/2015	12/2015	(142,612,600)	253,672,471	(396,285,071)	0.5	(198,142,535)
1/2016	6/2016	297,615,324	239,907,822	57,707,502	0.6	34,624,501
7/2016	12/2016	196,258,919	249,584,567	(53,325,648)	0.7	(37,327,954)
1/2017	6/2017	488,764,245	255,728,819	233,035,426	0.8	186,428,341
7/2017	12/2017	498,651,736	271,873,066	226,778,670	0.9	<u>204,100,803</u>
1. Total Deferred Return ⁽¹⁾						\$195,064,508
2. Market Value of Assets						8,390,581,049
3. Actuarial Value of Assets (Item 2 – Item 1)						8,195,516,541
4. Actuarial Value as Percentage of Market Value (Item 3 / Item 2)						97.7%
5. Non-valuation Reserves and Designations:						
a. Post Retirement Death Benefit						\$15,625,350
b. Statutory Contingency						0
c. Additional One Percent Contingency						0
d. Unrestricted Designation						<u>0</u>
e. Total						\$15,625,350
6. Valuation Value of Assets (Item 3 – Item 5e)						<u>\$8,179,891,191</u>

⁽¹⁾ Deferred return recognized in each of the next 5 years:

(a) Amount recognized during 2018	\$38,295,677
(b) Amount recognized during 2019	(5,749,973)
(c) Amount recognized during 2020	53,210,683
(d) Amount recognized during 2021	86,630,254
(e) Amount recognized during 2022	<u>22,677,867</u>
(f) Subtotal	\$195,064,508

Note: Results may not add due to rounding.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

CHART 8

Allocation of Valuation Value of Assets as of December 31, 2017

The calculation of the valuation value of assets from December 31, 2016 to December 31, 2017 by cost groups is provided below.

		General					
		Cost Groups #1 and #2 General County and Small Districts	Cost Group #3 Central Contra Costa Sanitary District	Cost Group #4 Contra Costa Housing Authority	Cost Group #5 Contra Costa County Fire Protection District	Cost Group #6 Small Districts (General Non-Enhanced)	Terminated Employers
1	Allocated Valuation Value of Assets As of Beginning of Plan Year	\$4,254,074,626	\$291,526,301	\$49,792,725	\$45,956,528	\$6,316,233	\$56,628,197
2	Contributions: ⁽¹⁾						
a.	Total Member Contributions	64,742,096	3,888,695	561,028	504,943	101,870	1,114
b.	Employer Contributions - Excludes POB and other Special Contributions	172,954,953	17,880,152	2,150,337	1,415,239	205,766	0
c.	Employer Contributions - Special (POB, Termination, etc.)	30,000	0	0	0	0	1,089,680
d.	Total Contributions	237,727,049	21,768,847	2,711,365	1,920,182	307,636	1,090,794
3	Total Payments Excluding Post- Retirement Death	241,313,683	19,149,964	2,986,805	2,976,578	337,884	5,519,623
4	Administrative Expenses ⁽²⁾	6,891,481	380,175	64,586	49,602	9,366	0
5	Subtotal (Item 1 + 2d - 3 - 4)	4,243,596,511	293,765,009	49,452,699	44,850,530	6,276,619	52,199,368
6	Weighted Average Fund Balance	4,248,835,566	292,645,655	49,622,712	45,403,529	6,296,426	54,255,704
7	Earnings Allocated in Proportion to Item 6	340,082,517	23,423,752	3,971,869	3,634,160	503,974	4,342,700
8	Allocated Valuation Value of Assets As of End of Plan Year (Item 5 + 7)	\$4,583,679,028	\$317,188,761	\$53,424,568	\$48,484,690	\$6,780,593	\$56,542,068

(1) Employer contributions include "member subvention of employer contributions" and exclude "employer subvention of member contributions".

(2) Allocated based on expected administrative expenses from the prior valuation.

Note: Results may not add due to rounding.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

CHART 8 (continued)

Allocation of Valuation Value of Assets as of December 31, 2017

		Safety					
		Cost Groups #7 & 9 Safety County	Cost Group #8 Contra Costa & East Fire Protection Districts	Cost Group #10 Moraga-Orinda Fire District	Cost Group #11 San Ramon Valley Fire District	Cost Group #12 Rodeo-Hercules Fire Protection District	Total
1	Allocated Valuation Value of Assets As of Beginning of Plan Year	\$1,555,112,518	\$835,842,053	\$151,638,626	\$330,679,992	\$29,429,731	\$7,606,997,530
2	Contributions: ⁽¹⁾						
a.	Total Member Contributions	15,980,753	6,039,791	1,248,975	3,081,669	315,972	96,466,906
b.	Employer Contributions - Excludes POB and other Special Contributions	67,344,168	27,412,834	5,058,510	16,915,097	2,085,825	313,422,881
c.	Employer Contributions – Special (POB, Termination, etc.)	0	0	0	294,000	0	1,413,680
d.	Total Contributions	83,324,921	33,452,625	6,307,485	20,290,766	2,401,797	411,303,467
3	Total Payments Excluding Post- Retirement Death	83,095,375	55,078,932	9,616,657	14,827,305	1,838,482	436,741,288
4	Administrative Expenses ⁽²⁾	1,015,424	405,440	82,103	223,726	24,212	9,146,115
5	Subtotal (Item 1 + 2d – 3 – 4)	1,554,326,640	813,810,306	148,247,351	335,919,727	29,968,834	7,572,413,594
6	Weighted Average Fund Balance	1,554,719,579	824,826,180	149,942,989	333,299,860	29,699,283	7,589,547,483
7	Earnings Allocated in Proportion to Item 6	124,441,848	66,020,198	12,001,639	26,677,769	2,377,171	607,477,597
8	Allocated Valuation Value of Assets As of End of Plan Year (Item 5 + 7)	\$1,678,768,488	\$879,830,504	\$160,248,990	\$362,597,496	\$32,346,005	\$8,179,891,191

⁽¹⁾ Employer contributions include "member subvention of employer contributions" and exclude "employer subvention of member contributions".

⁽²⁾ Allocated based on expected administrative expenses from the prior valuation.

Note: Results may not add due to rounding.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

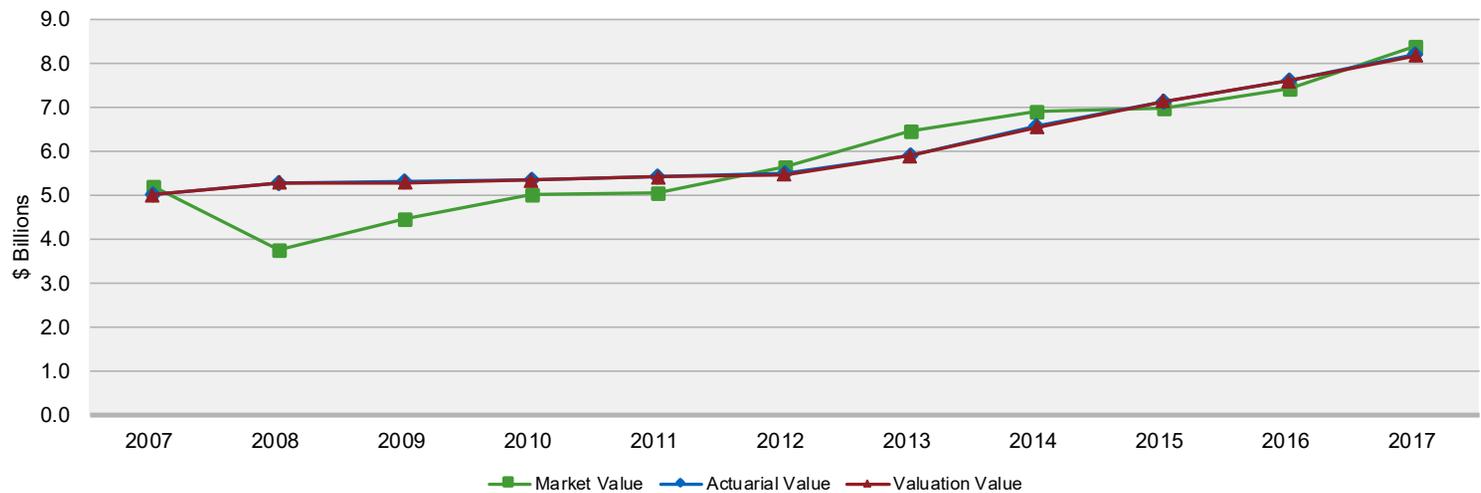
The market value, actuarial value and valuation value of assets are representations of the Plan's financial status. As investment gains and losses are gradually taken into account, the actuarial value of assets tracks the market value of assets, but with less volatility. The valuation value of assets is the actuarial value, excluding any non-valuation reserves.

The valuation value of assets is significant because CCCERA's liabilities are compared to this measure of its assets to determine what portion, if any, remains unfunded. Amortization of the unfunded liability is an important element in determining the contribution requirement.

This chart shows the change in the relative values of market value, actuarial value and valuation value of assets over the past ten years.

CHART 9

Relative Values of Market Value, Actuarial Value and Valuation Value of Assets for Years Ended December 31, 2007 – 2017



SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

C. ACTUARIAL EXPERIENCE

To calculate the required contribution, assumptions are made about future events that affect the amount and timing of benefits to be paid and assets to be accumulated. Each year actual experience is measured against the assumptions. If overall experience is more favorable than anticipated (an actuarial gain), the contribution requirement will decrease from the previous year. On the other hand, the contribution requirement will increase if overall actuarial experience is less favorable than expected (an actuarial loss).

Taking account of experience gains or losses in one year without making a change in assumptions reflects the belief that the single year's experience was a short-term development and that, over the long term, experience will

return to the original assumptions. For contribution requirements to remain stable, assumptions should approximate experience.

If assumptions are changed, the contribution requirement is adjusted to take into account a change in experience anticipated for all future years.

The total experience gain was \$40.6 million, a gain of \$76.2 million from investments, a gain of \$17.9 million from contribution experience and a loss of \$53.6 million from all other sources. A discussion of the major components of the actuarial experience is on the following pages.

This chart provides a summary of the actuarial experience during the past year.

CHART 10
Actuarial Experience for Year Ended December 31, 2017

1. Net gain/(loss) from investments ⁽¹⁾	\$76,209,273
2. Net gain/(loss) from contribution experience	17,933,150
3. Net gain/(loss) from other experience ⁽²⁾	<u>(53,561,701)</u>
4. Net experience gain/(loss): (1) + (2) + (3)	<u>\$40,580,722</u>

⁽¹⁾ Details in Chart 11

⁽²⁾ See Section 3, Exhibit I. Does not include the effect of plan or assumption changes, if any.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

Investment Rate of Return

A major component of projected asset growth is the assumed rate of return. The assumed return should represent the expected long-term rate of return, based on CCCERA's investment policy. For valuation purposes, the assumed rate of return on the actuarial value of assets during 2017 was 7.00% (based on the December 31, 2016 actuarial valuation). The actual rate of return on the actuarial value for the 2017 Plan Year was 8.00%.

The market value return reflects the entire impact of the investment performance during the current year and ignores returns from prior years.

The actuarial and valuation value returns reflect the fact that investment gains and losses are gradually taken into account. This is because these returns reflect only a portion of the investment gain or loss from the current year as well as portions of the gains and losses from prior years in accordance with the Board's asset valuation method.

Since the actual return for the year was greater than the assumed return, the Plan experienced an actuarial gain on the actuarial and valuation value of assets during the year ended December 31, 2017.

This chart shows the gain/(loss) due to investment experience.

CHART 11

Investment Experience for Year Ended December 31, 2017 – Market Value, Actuarial Value and Valuation Value of Assets

	Market Value	Actuarial Value	Valuation Value
1. Actual return	\$987,415,981	\$608,519,874	\$607,477,597
2. Average value of assets	7,420,684,208	7,604,515,807	7,589,547,483
3. Actual rate of return: (1) ÷ (2)	13.31%	8.00%	8.00%
4. Assumed rate of return	7.00%	7.00%	7.00%
5. Expected return: (2) x (4)	519,447,895	532,316,106	531,268,324
6. Actuarial gain/(loss): (1) – (5)	<u>\$467,968,086</u>	<u>\$76,203,768</u>	<u>\$76,209,273</u>

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

Because actuarial planning is long term, it is useful to see how the assumed investment rate of return has followed actual experience over time. The chart below shows the rates of return on an actuarial, valuation and market value basis for the last ten years.

CHART 12

Investment Return – Valuation Value, Actuarial Value and Market Value: 2008 – 2017

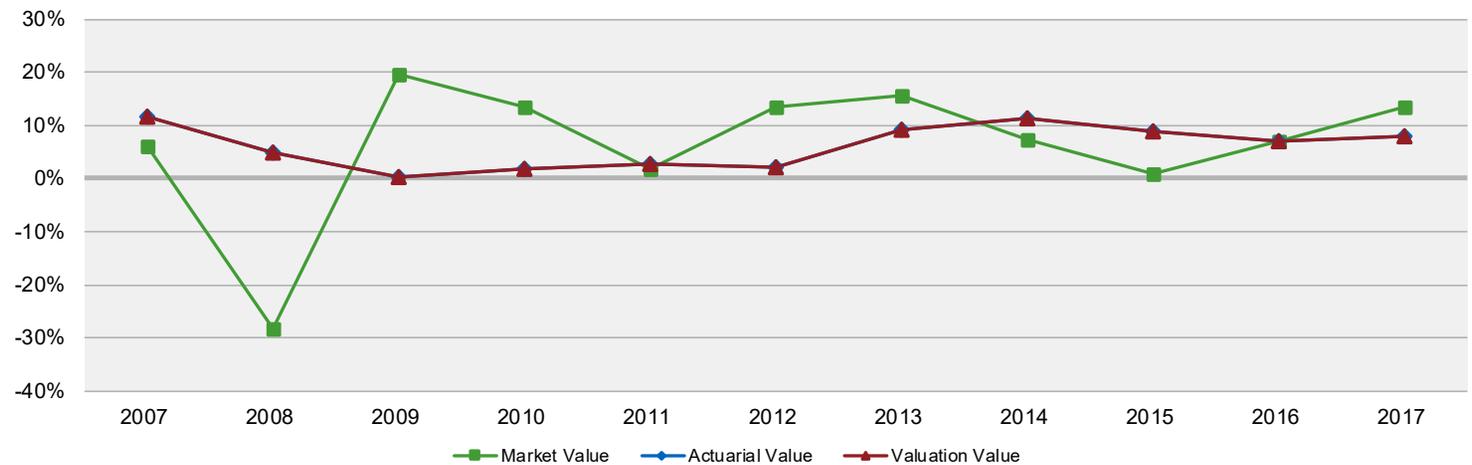
Year Ended December 31	Market Value Investment Return		Actuarial Value Investment Return		Valuation Value Investment Return	
	Amount	Percent	Amount	Percent	Amount	Percent
2008	\$(1,477,705,765)	(28.35%)	\$238,397,117	4.73%	\$237,402,129	4.72%
2009	736,956,891	19.68%	18,226,933	0.34%	17,021,116	0.32%
2010	594,637,090	13.35%	95,918,913	1.82%	94,835,030	1.80%
2011	88,042,268	1.76%	148,058,548	2.78%	146,988,614	2.77%
2012	668,138,997	13.31%	121,921,302	2.25%	120,826,177	2.24%
2013	870,984,744	15.50%	492,503,802	9.01%	491,324,308	9.02%
2014	473,522,261	7.35%	673,040,867	11.39%	671,957,212	11.40%
2015	65,495,657	0.95%	577,199,123	8.78%	576,151,245	8.79%
2016	493,874,242	7.10%	502,352,173	7.04%	501,328,149	7.04%
2017	987,415,981	13.31%	608,519,874	8.00%	607,477,597	8.00%
Five-Year Average Return		8.67%		8.73%		8.73%
Ten-Year Average Return		6.17%		5.88%		5.88%

Note: Each year's yield is weighted by the average asset value in that year.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

Subsection B described the actuarial asset valuation method that gradually takes into account fluctuations in the market value rate of return. The effect of this is to stabilize the actuarial rate of return, which contributes to leveling pension plan costs.

CHART 13
Market, Actuarial and Valuation Value Rates of Return for Years Ended December 31, 2007 - 2017



SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

Other Experience

There are other differences between the expected and the actual experience that appear when the new valuation is compared with the projections from the previous valuation.

These include:

- the extent of turnover among the participants,
- retirement experience (earlier or later than expected),
- mortality (more or fewer deaths than expected),
- the number of disability retirements,
- salary increases different than assumed, and
- COLA increases for retirees different than assumed.

The net loss from this other experience for the year ended December 31, 2017 amounted to \$53.6 million, which was 0.6% of the actuarial accrued liability. This loss is mainly the result of higher than expected individual salary increases and higher than expected COLA increases. See Exhibit I for a detailed development of the Unfunded Actuarial Accrued Liability.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

D. RECOMMENDED CONTRIBUTION

Employer contributions consist of two components:

Normal Cost

The annual contribution rate that, if paid annually from a member's first year of membership through the year of retirement, would accumulate to the amount necessary to fully fund the member's retirement-related benefits. Accumulation includes annual crediting of interest at the assumed investment earning rate. The contribution rate is expressed as a level percentage of the member's compensation.

Contribution to the Unfunded Actuarial Accrued Liability (UAAL)

The annual contribution rate that, if paid annually over the UAAL amortization period, would accumulate to the amount necessary to fully fund the UAAL. Accumulation includes annual crediting of interest at the assumed investment earning rate. The contribution (or rate credit in the case of a negative UAAL) is calculated to remain as a level percentage of future active member payroll (including payroll for new members as they enter the Association) assuming a constant number of active members. In order to remain as a level percentage of payroll, amortization payments (credits) are scheduled to increase at the combined annual inflation and "across the board" salary increase rate of 3.25% along with expected payroll. The remaining balance of the December 31, 2007 UAAL is being amortized over a 5-year declining period as of December 31, 2017. Any change in the UAAL that arises at each valuation after December 31, 2007 is amortized over its own separate declining 18-year period. Effective with the December 31, 2013 valuation, any change in the UAAL that arises due to plan amendments is amortized over its own declining 10-year period (with the exception of a change due to retirement incentives, which is to be funded in full upon adoption of the incentive).

Employer Contribution Rates

The current and recommended employer contribution rates are shown in Chart 14. County contribution rates also include the Superior Court.

The PEPRA Tier 4 (2% COLA) in Cost Group #1 continues to not have any actual members as of December 31, 2017. The contribution rates for this cost group have been developed based on generally the same methodology used to estimate contribution rates for all of the PEPRA tiers in the December 31, 2012 valuation. We have assumed in this valuation that the demographic profiles (e.g., entry age, composition of male versus female, etc.) for this cost group can be approximated by the data profiles of current active members with membership dates on and after January 1, 2011.

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The amortization cost for the UAAL has been expressed as a percentage of total future payroll, including members with membership dates on or after January 1, 2013. This has been done in order to continue the open group level percent of payroll amortization methodology for the UAAL associated with members with membership dates before January 1, 2013. It is also consistent with the methodology applied when Safety Tier C was implemented.

The employer contribution rates shown in Chart 14 are the aggregate rates before reflecting the under and over \$350 of monthly compensation contribution provisions for members integrated with Social Security. The detailed contribution rates reflecting these provisions will be provided in the contribution rate packet that goes to the Board of Supervisors.

Member Contributions Non-PEPRA Members

Articles 6 and 6.8 of the 1937 Act define the methodology to be used in the calculation of member basic contribution rates for non-PEPRA General and Safety members, respectively. The basic contribution rate is determined as that percentage of compensation which if paid annually from a member's first year of membership through the prescribed retirement age would accumulate to the amount necessary to fund a prescribed annuity.

The annuity is equal to:

- 1/120 of one year Final Average Salary per year of service at age 55 for General Tier 1 and Tier 3 Non-enhanced members
- 1/100 of one year Final Average Salary per year of service at age 50 for Safety Tier A Non-enhanced members
- 1/120 of one year Final Average Salary per year of service at age 60 for General Tier 1 and Tier 3 Enhanced members
- 1/100 of one year Final Average Salary per year of service at age 50 for Safety Tier A Enhanced
- 1/100 of three year Final Average Salary per year of service at age 50 for Safety Tier C Enhanced members

Member contributions are accumulated at an annual interest rate adopted annually by the Board. Note that recently negotiated MOU's for County General members no longer include the 50% employer subvention of the members' basic contributions. Districts pay varying portions, of the members' basic contributions on a

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

nonrefundable basis. Members also pay 50% of the cost-of-living benefit. For most Safety Tier A employers, Safety members also subvent a portion of the employer rate, currently up to 9% of compensation (depending on their MOU). Chart 14 does not include any employer subvention of member contributions or any member subvention of employer contributions.

Effective with the December 31, 2014 valuation, for determining the cost of the total benefit (i.e., basic and COLA components), the leave cashout assumptions are recognized in the valuation as an employer and member cost. Prior to the December 31, 2014 valuation, for determining the cost of the basic benefit (i.e., non-COLA component), the leave cashout assumptions were recognized in the valuation only as an employer cost and did not affect member contribution rates. In other words, the leave cashout assumptions were only used in establishing COLA member contribution rates.

As a result of including the leave cashout assumptions in the basic member rates for the members of each specific cost group, the COLA member rates are no longer pooled across all members of the same tier. This results in twelve different sets of member contribution rates for each specific cost group.

The age specific contribution rates are provided in Appendix A.

PEPRA Members

Pursuant to Section 7522.30(a) of the Government Code, PEPRA members are required to contribute at least 50% of the Normal Cost rate. We have assumed that exactly 50% of the Normal Cost would be paid by PEPRA members. In addition, we have calculated the total Normal Cost rate for the PEPRA tiers to the nearest one-fiftieth of one percent (i.e., the nearest even one-hundredth) as that will allow the Normal Cost rate to be shared exactly 50:50 without going beyond two decimal places.

Member contribution rates are provided in Appendix B.

Administrative Expense

The Board adopted an explicit administrative expense assumption effective with the December 31, 2015 actuarial valuation. The explicit administrative expense assumption is based on the prior year actual administration expenses, expressed as a percent of actual payroll for that year. For the 2017 calendar year the actual administrative expenses were \$9,146,115 and actual payroll was \$809,960,088. This results in an administrative expense load of 1.13% of payroll for the December 31,

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

2017 valuation. This is an increase from the 1.12% assumption determined in the prior valuation.

The explicit assumption is allocated to both the employers and members based on the portions of the total Normal Cost rate (before expenses) for the employers and members. This results in an administrative expense load allocation as shown in the table below.

	Average Normal Cost Rates		
	<u>Before Administrative Expense</u>	<u>Weighting</u>	<u>Total Loading</u>
Employer	16.09%	58.19%	0.66%
Member	11.56%	<u>41.81%</u>	<u>0.47%</u>
		100.00%	1.13%

Under this approach, the employer Normal Cost rate is then increased by the same percent of payroll as the member rate with the remaining employer loading allocated to the employer UAAL rate. This is done to maintain a 50/50 sharing of Normal Cost for those in the PEPRA tiers. The table below shows this allocation.

Allocation of Administrative Expense Load as % of Payroll

Addition to Employer Basic Normal Cost Rate	0.47%
Addition to Employer Basic UAAL Rate	0.19%
Addition to Member Basic Rate	<u>0.47%</u>
Total Addition to Contribution Rates	1.13%

The administrative expense load is added to the Basic rates for employers and members.

Cost Sharing Adjustments

Starting with the December 31, 2009 Actuarial Valuation, the Board took action to depool CCCERA's assets, liabilities and normal cost by employer when determining employer contribution rates. The Board action included a review of experience back to December 31, 2002. This did not involve recalculation of any employer rates prior to December 31, 2009. However, it did involve reflecting the separate experience of the employers in each individual cost group back from December 31, 2002 through December 31, 2009. The cost groups are detailed on pages 19 and 20. In addition, the Board action called for a discontinuation of certain cost sharing adjustments for both member and employer contribution rates for General Tier 1 and Safety Tier A. Even under the depooling structure, there are a few remaining cost sharing arrangements.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

Here is a summary of the cost sharing arrangements that were implemented in the December 31, 2009 Actuarial Valuation:

- Smaller employers (less than 50 active members as of December 31, 2009) were pooled with the applicable County tier. Safety members from the East Contra Costa Fire Protection District were pooled with Safety members of the Contra Costa County Fire Protection District.
- Due to a statutory requirement, the Superior Court was pooled with the County regardless of how many members the Court has.
- UAAL costs are pooled between Cost Group #1 and Cost Group #2 which represent General County and Small Districts. UAAL costs are also pooled for Cost Groups #7 and #9 which are Safety County tiers.

Other Adjustments

Other adjustments made in the determination of rates are as follows:

- Adjustments are made to some UAAL amounts for the County, the Contra Costa County Fire Protection District (CCCFPD), the Moraga-Orinda Fire District (Moraga), First 5 – Children & Families Commission (First Five) and Local Agency Formation Commission (LAFCO) to account for Pension Obligation Bonds (POBs) and any other special contributions that they previously made. These adjustments serve to reduce the UAAL contribution rate for these employers. The outstanding balances of these adjustments as of December 31, 2017 are as follows:

	<u>County General</u>	<u>Moraga General</u>	<u>First Five General</u>	<u>LAFCO General</u>	<u>CCCFPD Safety</u>
Basic	\$144,963,375	\$255,285	\$561,613	\$22,405	\$41,609,731
COL	\$116,160,609	\$148,165	\$424,815	\$8,412	\$31,733,443

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

Summary of Cost Groups and Employers

GENERAL

Cost Group	Employer Name	Benefit Structure	Special Adjustment
(1)	County General	Tier 1 Enhanced/PEPRA Tier 4	Yes
	Local Agency Formation Commission	Tier 1 Enhanced/PEPRA Tier 4	Yes
	Contra Costa Mosquito and Vector Control District	Tier 1 Enhanced/PEPRA Tier 4	
	Bethel Island Municipal District (Non-Integrated)	Tier 1 Enhanced/PEPRA Tier 4	
	First 5-Children & Families Commission	Tier 1 Enhanced/PEPRA Tier 4	Yes
	Contra Costa County Employees' Retirement Association	Tier 1 Enhanced/PEPRA Tier 4	
	Superior Court	Tier 1 Enhanced/PEPRA Tier 4	Yes
	East Contra Costa Fire Protection District (Non-Integrated)	Tier 1 Enhanced/PEPRA Tier 4	
	Moraga-Orinda Fire District (Non-Integrated)	Tier 1 Enhanced/PEPRA Tier 4	Yes
	Rodeo-Hercules Fire Protection District (Non-Integrated)	Tier 1 Enhanced/PEPRA Tier 4	
San Ramon Valley Fire District (Non-Integrated)	Tier 1 Enhanced/PEPRA Tier 4		
(2)	County General	Tier 3 Enhanced/PEPRA Tier 5	Yes
	In-Home Supportive Services Authority	Tier 3 Enhanced/PEPRA Tier 5	
	Contra Costa Mosquito and Vector Control District	Tier 3 Enhanced/PEPRA Tier 5	
	Superior Court	Tier 3 Enhanced/PEPRA Tier 5	Yes
(3)	Central Contra Costa Sanitary District (Non-Integrated)	Tier 1 Enhanced/PEPRA Tier 4	
(4)	Contra Costa Housing Authority	Tier 1 Enhanced/PEPRA Tier 4	
(5)	Contra Costa County Fire Protection District (Non-Integrated)	Tier 1 Enhanced/PEPRA Tier 4	
(6)	Rodeo Sanitary District	Tier 1 Non-Enhanced/PEPRA Tier 4	
	Byron Brentwood Cemetery	Tier 1 Non-Enhanced/PEPRA Tier 4	

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

Summary of Cost Groups and Employers (continued)

SAFETY

Cost Group	Employer Name	Benefit Structure	Special Adjustment
(7)	County Safety	Tier A Enhanced/PEPRA Tier D	
(8)	Contra Costa County Fire Protection District East Contra Costa Fire Protection District	Tier A Enhanced/PEPRA Tier D/E Tier A Enhanced/PEPRA Tier D	Yes
(9)	County Safety	Tier C Enhanced/PEPRA Tier E (Members hired on or after January 1, 2007)	
(10)	Moraga-Orinda Fire District	Tier A Enhanced/PEPRA Tier D	
(11)	San Ramon Valley Fire District	Tier A Enhanced/PEPRA Tier D	
(12)	Rodeo-Hercules Fire Protection District	Tier A Non-Enhanced/PEPRA Tier D	

A special adjustment is made for employers that have a remaining balance of a Pension Obligation Bond or any other special contributions as described on page 18.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

CHART 14

Components of Current and Recommended Employer Contribution Rates

Cost Group #1	December 31, 2017 (Recommended Rates for FY 19-20) ⁽¹⁾				December 31, 2016 (Recommended Rates for FY 18-19) ⁽²⁾			
	Basic	COLA	Total	Estimated Annual Amount	Basic	COLA	Total	Estimated Annual Amount
County General Tier 1 w/Courts								
Normal Cost	12.35%	3.55%	15.90%	\$1,874,629	12.35%	3.55%	15.90%	\$1,856,159
UAAL	<u>10.71%</u>	<u>1.65%</u>	<u>12.36%</u>	<u>1,457,259</u>	<u>11.44%</u>	<u>1.99%</u>	<u>13.43%</u>	<u>1,567,813</u>
Total Contributions	23.06%	5.20%	28.26%	\$3,331,888	23.79%	5.54%	29.33%	\$3,423,972
	Payroll = \$11,790,121				Payroll = \$11,673,958			
Cost Group #1								
District General Tier 1 w/o POB								
Normal Cost	12.35%	3.55%	15.90%	\$1,082,621	12.35%	3.55%	15.90%	\$1,024,719
UAAL	<u>15.79%</u>	<u>5.72%</u>	<u>21.51%</u>	<u>1,464,602</u>	<u>16.86%</u>	<u>6.33%</u>	<u>23.19%</u>	<u>1,494,543</u>
Total Contributions	28.14%	9.27%	37.41%	\$2,547,223	29.21%	9.88%	39.09%	\$2,519,262
	Payroll = \$6,808,935				Payroll = \$6,444,772			
Cost Group #1								
District General Tier 1 w/ POB (Moraga)								
Normal Cost	12.35%	3.55%	15.90%	\$89,206	12.35%	3.55%	15.90%	\$84,808
UAAL	<u>8.47%</u>	<u>1.48%</u>	<u>9.95%</u>	<u>55,824</u>	<u>7.73%</u>	<u>1.04%</u>	<u>8.77%</u>	<u>46,778</u>
Total Contributions	20.82%	5.03%	25.85%	\$145,030	20.08%	4.59%	24.67%	\$131,586
	Payroll = \$561,043				Payroll = \$533,382			
Cost Group #1								
District General Tier 1 w/ UAAL Prepayment (First Five)								
Normal Cost	12.35%	3.55%	15.90%	\$238,733	12.35%	3.55%	15.90%	\$277,000
UAAL	<u>10.56%</u>	<u>1.76%</u>	<u>12.32%</u>	<u>184,980</u>	<u>10.91%</u>	<u>1.82%</u>	<u>12.73%</u>	<u>221,775</u>
Total Contributions	22.91%	5.31%	28.22%	\$423,713	23.26%	5.37%	28.63%	\$498,775
	Payroll = \$1,501,463				Payroll = \$1,742,141			

⁽¹⁾ The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.47% and 0.19% of payroll, respectively.

⁽²⁾ The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.46% and 0.20% of payroll, respectively.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

CHART 14 (continued)

Components of Current and Recommended Employer Contribution Rates

Cost Group #1	December 31, 2017 (Recommended Rates for FY 19-20) ⁽¹⁾				December 31, 2016 (Recommended Rates for FY 18-19) ⁽²⁾			
	Basic	COLA	Total	Estimated Annual Amount	Basic	COLA	Total	Estimated Annual Amount
District General Tier 1 w/ UAAL Prepayment (LAFCO)								
Normal Cost	12.35%	3.55%	15.90%	\$36,570	12.35%	3.55%	15.90%	\$35,578
UAAL	<u>15.04%</u>	<u>5.44%</u>	<u>20.48%</u>	<u>47,104</u>	<u>16.86%</u>	<u>6.33%</u>	<u>23.19%</u>	<u>51,890</u>
Total Contributions	27.39%	8.99%	36.38%	\$83,674	29.21%	9.88%	39.09%	\$87,468
	Payroll = \$230,000				Payroll = \$223,762			
Cost Group #1								
County General Tier 4 (3% COLA) w/ Courts								
Normal Cost	8.95%	3.01%	11.96%	\$0	8.67%	2.94%	11.61%	\$0
UAAL	<u>10.71%</u>	<u>1.65%</u>	<u>12.36%</u>	<u>0</u>	<u>11.44%</u>	<u>1.99%</u>	<u>13.43%</u>	<u>0</u>
Total Contributions	19.66%	4.66%	24.32%	\$0	20.11%	4.93%	25.04%	\$0
	Payroll = \$0				Payroll = \$0			
Cost Group #1								
District General Tier 4 (3% COLA) w/o POB								
Normal Cost	8.95%	3.01%	11.96%	\$277,255	8.67%	2.94%	11.61%	\$154,073
UAAL	<u>15.79%</u>	<u>5.72%</u>	<u>21.51%</u>	<u>498,642</u>	<u>16.86%</u>	<u>6.33%</u>	<u>23.19%</u>	<u>307,749</u>
Total Contributions	24.74%	8.73%	33.47%	\$775,897	25.53%	9.27%	34.80%	\$461,822
	Payroll = \$2,318,188				Payroll = \$1,327,075			
Cost Group #1								
District General Tier 4 (3% COLA) w/ POB (Moraga)								
Normal Cost	8.95%	3.01%	11.96%	\$25,744	8.67%	2.94%	11.61%	\$8,062
UAAL	<u>8.47%</u>	<u>1.48%</u>	<u>9.95%</u>	<u>21,417</u>	<u>7.73%</u>	<u>1.04%</u>	<u>8.77%</u>	<u>6,090</u>
Total Contributions	17.42%	4.49%	21.91%	\$47,161	16.40%	3.98%	20.38%	\$14,152
	Payroll = \$215,247				Payroll = \$69,443			

⁽¹⁾ The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.47% and 0.19% of payroll, respectively.

⁽²⁾ The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.46% and 0.20% of payroll, respectively.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

CHART 14 (continued)

Components of Current and Recommended Employer Contribution Rates

Cost Group #1	December 31, 2017 (Recommended Rates for FY 19-20) ⁽¹⁾				December 31, 2016 (Recommended Rates for FY 18-19) ⁽²⁾			
	Basic	COLA	Total	Estimated Annual Amount	Basic	COLA	Total	Estimated Annual Amount
District General Tier 4 (3% COLA) with UAAL Prepayment (First Five)								
Normal Cost	8.95%	3.01%	11.96%	\$123,847	8.67%	2.94%	11.61%	\$56,614
UAAL	<u>10.56%</u>	<u>1.76%</u>	<u>12.32%</u>	<u>127,575</u>	<u>10.91%</u>	<u>1.82%</u>	<u>12.73%</u>	<u>62,076</u>
Total Contributions	19.51%	4.77%	24.28%	\$251,422	19.58%	4.76%	24.34%	\$118,690
	Payroll = \$1,035,511				Payroll = \$487,635			
Cost Group #1								
District General Tier 4 (3% COLA) with UAAL Prepayment (LAFCO)								
Normal Cost	8.95%	3.01%	11.96%	\$0	8.67%	2.94%	11.61%	\$0
UAAL	<u>15.04%</u>	<u>5.44%</u>	<u>20.48%</u>	<u>0</u>	<u>16.86%</u>	<u>6.33%</u>	<u>23.19%</u>	<u>0</u>
Total Contributions	23.99%	8.45%	32.44%	\$0	25.53%	9.27%	34.80%	\$0
	Payroll = \$0				Payroll = \$0			
Cost Group #1								
County General Tier 4 (2% COLA) w/ Courts								
Normal Cost	8.80%	2.02%	10.82%	\$0	8.83%	2.04%	10.87%	\$0
UAAL	<u>10.71%</u>	<u>1.65%</u>	<u>12.36%</u>	<u>0</u>	<u>11.44%</u>	<u>1.99%</u>	<u>13.43%</u>	<u>0</u>
Total Contributions	19.51%	3.67%	23.18%	\$0	20.27%	4.03%	24.30%	\$0
	Payroll = \$0				Payroll = \$0			

⁽¹⁾ The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.47% and 0.19% of payroll, respectively.

⁽²⁾ The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.46% and 0.20% of payroll, respectively.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

CHART 14 (continued)

Components of Current and Recommended Employer Contribution Rates

Cost Group #2	December 31, 2017 (Recommended Rates for FY 19-20) ⁽¹⁾				December 31, 2016 (Recommended Rates for FY 18-19) ⁽²⁾			
	Basic	COLA	Total	Estimated Annual Amount	Basic	COLA	Total	Estimated Annual Amount
County General Tier 3 w/ Courts								
Normal Cost	12.31%	3.43%	15.74%	\$65,050,705	12.28%	3.42%	15.70%	\$64,625,796
UAAL	<u>10.71%</u>	<u>1.65%</u>	<u>12.36%</u>	<u>51,081,748</u>	<u>11.44%</u>	<u>1.99%</u>	<u>13.43%</u>	<u>55,281,811</u>
Total Contributions	23.02%	5.08%	28.10%	\$116,132,453	23.72%	5.41%	29.13%	\$119,907,607
	Payroll = \$413,282,751				Payroll = \$411,629,272			
Cost Group #2								
District General Tier 3 w/o POB								
Normal Cost	12.31%	3.43%	15.74%	\$508,194	12.28%	3.42%	15.70%	\$489,780
UAAL	<u>15.79%</u>	<u>5.72%</u>	<u>21.51%</u>	<u>694,489</u>	<u>16.86%</u>	<u>6.33%</u>	<u>23.19%</u>	<u>723,440</u>
Total Contributions	28.10%	9.15%	37.25%	\$1,202,683	29.14%	9.75%	38.89%	\$1,213,220
	Payroll = \$3,228,680				Payroll = \$3,119,619			
Cost Group #2								
County General Tier 5 (3%/4% COLA) w/ Courts								
Normal Cost	8.42%	2.79%	11.21%	\$6,476,314	8.39%	2.78%	11.17%	\$6,430,765
UAAL	<u>10.71%</u>	<u>1.65%</u>	<u>12.36%</u>	<u>7,140,700</u>	<u>11.44%</u>	<u>1.99%</u>	<u>13.43%</u>	<u>7,731,887</u>
Total Contributions	19.13%	4.44%	23.57%	\$13,617,014	19.83%	4.77%	24.60%	\$14,162,652
	Payroll = \$57,772,653				Payroll = \$57,571,759			

⁽¹⁾ The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.47% and 0.19% of payroll, respectively.

⁽²⁾ The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.46% and 0.20% of payroll, respectively.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

CHART 14 (continued)

Components of Current and Recommended Employer Contribution Rates

Cost Group #2	December 31, 2017 (Recommended Rates for FY 19-20) ⁽¹⁾				December 31, 2016 (Recommended Rates for FY 18-19) ⁽²⁾			
	Basic	COLA	Total	Estimated Annual Amount	Basic	COLA	Total	Estimated Annual Amount
District General Tier 5 (3%/4% COLA) w/o POB								
Normal Cost	8.42%	2.79%	11.21%	\$58,359	8.39%	2.78%	11.17%	\$27,371
UAAL	<u>15.79%</u>	<u>5.72%</u>	<u>21.51%</u>	<u>111,980</u>	<u>16.86%</u>	<u>6.33%</u>	<u>23.19%</u>	<u>56,826</u>
Total Contributions	24.21%	8.51%	32.72%	\$170,339	25.25%	9.11%	34.36%	\$84,197
	Payroll = \$520,596				Payroll = \$245,044			
County General Tier 5 (2% COLA) w/ Courts								
Normal Cost	8.20%	1.87%	10.07%	\$15,302,813	8.25%	1.89%	10.14%	\$9,709,443
UAAL	<u>10.71%</u>	<u>1.65%</u>	<u>12.36%</u>	<u>18,782,797</u>	<u>11.44%</u>	<u>1.99%</u>	<u>13.43%</u>	<u>12,859,746</u>
Total Contributions	18.91%	3.52%	22.43%	\$34,085,610	19.69%	3.88%	23.57%	\$22,569,189
	Payroll = \$151,964,380				Payroll = \$95,753,877			
District General Tier 5 (2% COLA) w/o POB								
Normal Cost	8.20%	1.87%	10.07%	\$26,380	8.25%	1.89%	10.14%	\$22,608
UAAL	<u>15.79%</u>	<u>5.72%</u>	<u>21.51%</u>	<u>56,350</u>	<u>16.86%</u>	<u>6.33%</u>	<u>23.19%</u>	<u>51,704</u>
Total Contributions	23.99%	7.59%	31.58%	\$82,730	25.11%	8.22%	33.33%	\$74,312
	Payroll = \$261,971				Payroll = \$222,957			

⁽¹⁾ The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.47% and 0.19% of payroll, respectively.

⁽²⁾ The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.46% and 0.20% of payroll, respectively.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

CHART 14 (continued)

Components of Current and Recommended Employer Contribution Rates

Cost Group #3	December 31, 2017 (Recommended Rates for FY 19-20) ⁽¹⁾				December 31, 2016 (Recommended Rates for FY 18-19) ⁽²⁾			
	Basic	COLA	Total	Estimated Annual Amount	Basic	COLA	Total	Estimated Annual Amount
CCCSD General Tier 1								
Normal Cost	13.30%	3.88%	17.18%	\$4,947,250	13.45%	3.91%	17.36%	\$4,951,527
UAAL	<u>22.99%</u>	<u>10.43%</u>	<u>33.42%</u>	<u>9,623,812</u>	<u>23.91%</u>	<u>10.56%</u>	<u>34.47%</u>	<u>9,831,747</u>
Total Contributions	36.29%	14.31%	50.60%	\$14,571,062	37.36%	14.47%	51.83%	\$14,783,274
	Payroll = \$28,796,566				Payroll = \$28,522,620			
Cost Group #3								
CCCSD General Tier 4 (3% COLA)								
Normal Cost	8.03%	2.80%	10.83%	\$601,334	8.32%	2.88%	11.20%	\$457,284
UAAL	<u>22.99%</u>	<u>10.43%</u>	<u>33.42%</u>	<u>1,855,640</u>	<u>23.91%</u>	<u>10.56%</u>	<u>34.47%</u>	<u>1,407,375</u>
Total Contributions	31.02%	13.23%	44.25%	\$2,456,974	32.23%	13.44%	45.67%	\$1,864,659
	Payroll = \$5,552,483				Payroll = \$4,082,897			
Cost Group #4								
Contra Costa Housing Authority General Tier 1								
Normal Cost	13.24%	3.74%	16.98%	\$694,627	13.38%	3.76%	17.14%	\$723,575
UAAL	<u>16.36%</u>	<u>9.71%</u>	<u>26.07%</u>	<u>1,066,486</u>	<u>16.10%</u>	<u>9.29%</u>	<u>25.39%</u>	<u>1,071,854</u>
Total Contributions	29.60%	13.45%	43.05%	\$1,761,113	29.48%	13.05%	42.53%	\$1,795,429
	Payroll = \$4,090,854				Payroll = \$4,221,560			
Cost Group #4								
Contra Costa Housing Authority General Tier 4 (3% COLA)								
Normal Cost	9.49%	3.24%	12.73%	\$189,928	9.21%	3.13%	12.34%	\$162,600
UAAL	<u>16.36%</u>	<u>9.71%</u>	<u>26.07%</u>	<u>388,957</u>	<u>16.10%</u>	<u>9.29%</u>	<u>25.39%</u>	<u>334,556</u>
Total Contributions	25.85%	12.95%	38.80%	\$578,885	25.31%	12.42%	37.73%	\$497,156
	Payroll = \$1,491,972				Payroll = \$1,317,669			

(1) The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.47% and 0.19% of payroll, respectively.

(2) The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.46% and 0.20% of payroll, respectively.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

CHART 14 (continued)

Components of Current and Recommended Employer Contribution Rates

Cost Group #5	December 31, 2017 (Recommended Rates for FY 19-20) ⁽¹⁾				December 31, 2016 (Recommended Rates for FY 18-19) ⁽²⁾			
	Basic	COLA	Total	Estimated Annual Amount	Basic	COLA	Total	Estimated Annual Amount
CCCYPD General Tier 1								
Normal Cost	12.27%	3.52%	15.79%	\$606,975	12.25%	3.53%	15.78%	\$543,052
UAAL	<u>10.12%</u>	<u>6.84%</u>	<u>16.96%</u>	<u>651,951</u>	<u>10.77%</u>	<u>6.49%</u>	<u>17.26%</u>	<u>593,984</u>
Total Contributions	22.39%	10.36%	32.75%	\$1,258,926	23.02%	10.02%	33.04%	\$1,137,036
	Payroll = \$3,844,050				Payroll = \$3,441,393			
Cost Group #5								
CCCYPD General Tier 4 (3% COLA)								
Normal Cost	11.44%	3.90%	15.34%	\$25,753	11.24%	3.86%	15.10%	\$16,406
UAAL	<u>10.12%</u>	<u>6.84%</u>	<u>16.96%</u>	<u>28,473</u>	<u>10.77%</u>	<u>6.49%</u>	<u>17.26%</u>	<u>18,753</u>
Total Contributions	21.56%	10.74%	32.30%	\$54,226	22.01%	10.35%	32.36%	\$35,159
	Payroll = \$167,881				Payroll = \$108,649			
Cost Group #5								
CCCYPD General Tier 4 (2% COLA)								
Normal Cost	9.46%	2.19%	11.65%	\$131,956	9.25%	2.15%	11.40%	\$80,257
UAAL	<u>10.12%</u>	<u>6.84%</u>	<u>16.96%</u>	<u>192,101</u>	<u>10.77%</u>	<u>6.49%</u>	<u>17.26%</u>	<u>121,512</u>
Total Contributions	19.58%	9.03%	28.61%	\$324,057	20.02%	8.64%	28.66%	\$201,769
	Payroll = \$1,132,669				Payroll = \$704,009			

⁽¹⁾ The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.47% and 0.19% of payroll, respectively.

⁽²⁾ The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.46% and 0.20% of payroll, respectively.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

CHART 14 (continued)

Components of Current and Recommended Employer Contribution Rates

Cost Group #6	December 31, 2017 (Recommended Rates for FY 19-20) ⁽¹⁾				December 31, 2016 (Recommended Rates for FY 18-19) ⁽²⁾			
	Basic	COLA	Total	Estimated Annual Amount	Basic	COLA	Total	Estimated Annual Amount
Non-Enhanced District General Tier 1								
Normal Cost	13.27%	3.95%	17.22%	\$114,214	12.82%	3.84%	16.66%	\$109,747
UAAL	<u>0.19%</u>	<u>0.00%</u>	<u>0.19%</u>	<u>1,260</u>	<u>12.43%</u>	<u>(0.06%)</u>	<u>12.37%</u>	<u>81,487</u>
Total Contributions	13.46%	3.95%	17.41%	\$115,474	25.25%	3.78%	29.03%	\$191,234
	Payroll = \$663,261				Payroll = \$658,747			
Cost Group #6								
Non-Enhanced District General Tier 4 (3% COLA)								
Normal Cost	10.01%	3.47%	13.48%	\$25,266	11.96%	3.85%	15.81%	\$22,845
UAAL	<u>0.19%</u>	<u>0.00%</u>	<u>0.19%</u>	<u>356</u>	<u>12.43%</u>	<u>(0.06%)</u>	<u>12.37%</u>	<u>17,874</u>
Total Contributions	10.20%	3.47%	13.67%	\$25,622	24.39%	3.79%	28.18%	\$40,719
	Payroll = \$187,433				Payroll = \$144,494			
Cost Group #7								
County Safety Tier A								
Normal Cost	23.00%	7.35%	30.35%	\$17,463,315	22.91%	7.31%	30.22%	\$17,367,909
UAAL	<u>22.59%</u>	<u>19.54%</u>	<u>42.13%</u>	<u>24,241,498</u>	<u>25.44%</u>	<u>20.43%</u>	<u>45.87%</u>	<u>26,362,210</u>
Total Contributions	45.59%	26.89%	72.48%	\$41,704,813	48.35%	27.74%	76.09%	\$43,730,119
	Payroll = \$57,539,752				Payroll = \$57,471,572			
Cost Group #7								
County Safety Tier D								
Normal Cost	14.86%	6.13%	20.99%	\$740,793	15.04%	6.19%	21.23%	\$671,015
UAAL	<u>22.59%</u>	<u>19.54%</u>	<u>42.13%</u>	<u>1,486,879</u>	<u>25.44%</u>	<u>20.43%</u>	<u>45.87%</u>	<u>1,449,809</u>
Total Contributions	37.45%	25.67%	63.12%	\$2,227,672	40.48%	26.62%	67.10%	\$2,120,824
	Payroll = \$3,529,264				Payroll = \$3,160,691			

(1) The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.47% and 0.19% of payroll, respectively.

(2) The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.46% and 0.20% of payroll, respectively.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

CHART 14 (continued)

Components of Current and Recommended Employer Contribution Rates

Cost Group #8	December 31, 2017 (Recommended Rates for FY 19-20) ⁽¹⁾				December 31, 2016 (Recommended Rates for FY 18-19) ⁽²⁾			
	Basic	COLA	Total	Estimated Annual Amount	Basic	COLA	Total	Estimated Annual Amount
CCCYPD Safety Tier A								
Normal Cost	22.60%	7.30%	29.90%	\$8,634,767	22.01%	7.12%	29.13%	\$8,289,271
UAAL	<u>14.63%</u>	<u>28.36%</u>	<u>42.99%</u>	<u>12,415,004</u>	<u>17.31%</u>	<u>27.22%</u>	<u>44.53%</u>	<u>12,671,515</u>
Total Contributions	37.23%	35.66%	72.89%	\$21,049,771	39.32%	34.34%	73.66%	\$20,960,786
	Payroll = \$28,878,819				Payroll = \$28,456,131			
East CCCYPD Safety Tier A								
Normal Cost	22.60%	7.30%	29.90%	\$767,350	22.01%	7.12%	29.13%	\$825,079
UAAL	<u>42.84%</u>	<u>49.87%</u>	<u>92.71%</u>	<u>2,379,297</u>	<u>45.64%</u>	<u>48.83%</u>	<u>94.47%</u>	<u>2,675,770</u>
Total Contributions	65.44%	57.17%	122.61%	\$3,146,647	67.65%	55.95%	123.60%	\$3,500,849
	Payroll = \$2,566,387				Payroll = \$2,832,402			
CCCYPD Safety Tier D								
Normal Cost	14.28%	6.00%	20.28%	\$359,801	13.67%	5.77%	19.44%	\$329,369
UAAL	<u>14.63%</u>	<u>28.36%</u>	<u>42.99%</u>	<u>762,715</u>	<u>17.31%</u>	<u>27.22%</u>	<u>44.53%</u>	<u>754,465</u>
Total Contributions	28.91%	34.36%	63.27%	\$1,122,516	30.98%	32.99%	63.97%	\$1,083,834
	Payroll = \$1,774,169				Payroll = \$1,694,284			
East CCCYPD Safety Tier D								
Normal Cost	14.28%	6.00%	20.28%	\$62,491	13.67%	5.77%	19.44%	\$56,679
UAAL	<u>42.84%</u>	<u>49.87%</u>	<u>92.71%</u>	<u>285,676</u>	<u>45.64%</u>	<u>48.83%</u>	<u>94.47%</u>	<u>275,438</u>
Total Contributions	57.12%	55.87%	112.99%	\$348,167	59.31%	54.60%	113.91%	\$332,117
	Payroll = \$308,139				Payroll = \$291,561			

(1) The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.47% and 0.19% of payroll, respectively.

(2) The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.46% and 0.20% of payroll, respectively.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

CHART 14 (continued)

Components of Current and Recommended Employer Contribution Rates

Cost Group #8	December 31, 2017 (Recommended Rates for FY 19-20) ⁽¹⁾				December 31, 2016 (Recommended Rates for FY 18-19) ⁽²⁾			
	Basic	COLA	Total	Estimated Annual Amount	Basic	COLA	Total	Estimated Annual Amount
CCCYPD Safety Tier E								
Normal Cost	13.90%	3.90%	17.80%	\$386,348	13.01%	3.67%	16.68%	\$249,862
UAAL	<u>14.63%</u>	<u>28.36%</u>	<u>42.99%</u>	<u>933,095</u>	<u>17.31%</u>	<u>27.22%</u>	<u>44.53%</u>	<u>667,048</u>
Total Contributions	28.53%	32.26%	60.79%	\$1,319,443	30.32%	30.89%	61.21%	\$916,910
	Payroll = \$2,170,493				Payroll = \$1,497,974			
Cost Group #9								
County Safety Tier C								
Normal Cost	21.06%	4.51%	25.57%	\$3,445,978	21.29%	4.55%	25.84%	\$3,308,435
UAAL	<u>22.59%</u>	<u>19.54%</u>	<u>42.13%</u>	<u>5,677,710</u>	<u>25.44%</u>	<u>20.43%</u>	<u>45.87%</u>	<u>5,872,984</u>
Total Contributions	43.65%	24.05%	67.70%	\$9,123,688	46.73%	24.98%	71.71%	\$9,181,419
	Payroll = \$13,476,643				Payroll = \$12,803,541			
Cost Group #9								
County Safety Tier E								
Normal Cost	13.50%	3.76%	17.26%	\$3,775,786	13.72%	3.81%	17.53%	\$2,393,118
UAAL	<u>22.59%</u>	<u>19.54%</u>	<u>42.13%</u>	<u>9,216,330</u>	<u>25.44%</u>	<u>20.43%</u>	<u>45.87%</u>	<u>6,261,968</u>
Total Contributions	36.09%	23.30%	59.39%	\$12,992,116	39.16%	24.24%	63.40%	\$8,655,086
	Payroll = \$21,875,931				Payroll = \$13,651,555			

(1) The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.47% and 0.19% of payroll, respectively.

(2) The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.46% and 0.20% of payroll, respectively.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

CHART 14 (continued)

Components of Current and Recommended Employer Contribution Rates

Cost Group #10	December 31, 2017 (Recommended Rates for FY 19-20) ⁽¹⁾				December 31, 2016 (Recommended Rates for FY 18-19) ⁽²⁾			
	Basic	COLA	Total	Estimated Annual Amount	Basic	COLA	Total	Estimated Annual Amount
Moraga-Orinda FD Safety Tier A								
Normal Cost	21.38%	7.06%	28.44%	\$1,825,642	20.96%	6.96%	27.92%	\$1,725,213
UAAL	<u>13.83%</u>	<u>28.67%</u>	<u>42.50%</u>	<u>2,728,192</u>	<u>15.98%</u>	<u>27.46%</u>	<u>43.44%</u>	<u>2,684,215</u>
Total Contributions	35.21%	35.73%	70.94%	\$4,553,834	36.94%	34.42%	71.36%	\$4,409,428
	Payroll = \$6,419,275				Payroll = \$6,179,131			
Moraga-Orinda FD Safety Tier D								
Normal Cost	13.33%	5.65%	18.98%	\$177,156	13.29%	5.63%	18.92%	\$163,164
UAAL	<u>13.83%</u>	<u>28.67%</u>	<u>42.50%</u>	<u>396,687</u>	<u>15.98%</u>	<u>27.46%</u>	<u>43.44%</u>	<u>374,622</u>
Total Contributions	27.16%	34.32%	61.48%	\$573,843	29.27%	33.09%	62.36%	\$537,786
	Payroll = \$933,381				Payroll = \$862,390			
San Ramon FD Safety Tier A								
Normal Cost	22.22%	7.08%	29.30%	\$5,421,031	21.86%	7.01%	28.87%	\$5,179,535
UAAL	<u>28.83%</u>	<u>18.71%</u>	<u>47.54%</u>	<u>8,795,761</u>	<u>32.19%</u>	<u>20.32%</u>	<u>52.51%</u>	<u>9,420,761</u>
Total Contributions	51.05%	25.79%	76.84%	\$14,216,792	54.05%	27.33%	81.38%	\$14,600,296
	Payroll = \$18,501,811				Payroll = \$17,940,890			
San Ramon FD Safety Tier D								
Normal Cost	12.66%	5.40%	18.06%	\$549,052	13.28%	5.64%	18.92%	\$235,907
UAAL	<u>28.83%</u>	<u>18.71%</u>	<u>47.54%</u>	<u>1,445,289</u>	<u>32.19%</u>	<u>20.32%</u>	<u>52.51%</u>	<u>654,730</u>
Total Contributions	41.49%	24.11%	65.60%	\$1,994,341	45.47%	25.96%	71.43%	\$890,637
	Payroll = \$3,040,153				Payroll = \$1,246,868			

⁽¹⁾ The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.47% and 0.19% of payroll, respectively.

⁽²⁾ The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.46% and 0.20% of payroll, respectively.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

CHART 14 (continued)

Components of Current and Recommended Employer Contribution Rates

Cost Group #12	December 31, 2017 (Recommended Rates for FY 19-20) ⁽¹⁾				December 31, 2016 (Recommended Rates for FY 18-19) ⁽²⁾			
	Basic	COLA	Total	Estimated Annual Amount	Basic	COLA	Total	Estimated Annual Amount
Non-Enhanced Rodeo-Hercules FPD Safety Tier A								
Normal Cost	14.89%	5.21%	20.10%	\$371,801	14.82%	5.20%	20.02%	\$363,887
UAAL	<u>42.63%</u>	<u>30.04%</u>	<u>72.67%</u> ⁽³⁾	<u>1,344,216</u>	<u>46.06%</u>	<u>31.23%</u>	<u>77.29%</u> ⁽⁴⁾	<u>1,404,835</u>
Total Contributions	57.52%	35.25%	92.77%	\$1,716,017	60.88%	36.43%	97.31%	\$1,768,722
	Payroll = \$1,849,754				Payroll = \$1,817,615			
Cost Group #12								
Non-Enhanced Rodeo-Hercules FPD Safety Tier D								
Normal Cost	11.92%	5.07%	16.99%	\$58,095	11.92%	5.07%	16.99%	\$43,991
UAAL	<u>42.63%</u>	<u>30.04%</u>	<u>72.67%</u> ⁽³⁾	<u>248,483</u>	<u>46.06%</u>	<u>31.23%</u>	<u>77.29%</u> ⁽⁴⁾	<u>200,120</u>
Total Contributions	54.55%	35.11%	89.66%	\$306,578	57.98%	36.30%	94.28%	\$244,111
	Payroll = \$341,934				Payroll = \$258,921			
Total All Employers Combined (Aggregate)								
Normal Cost	12.87%	3.69%	16.56%	\$142,548,079	13.16%	3.80%	16.96%	\$133,072,503
UAAL	<u>13.45%</u>	<u>6.06%</u>	<u>19.51%</u>	<u>167,891,335</u>	<u>14.63%</u>	<u>6.49%</u>	<u>21.12%</u>	<u>165,673,760</u>
Total Contributions	26.32%	9.75%	36.07%	\$310,439,414	27.79%	10.29%	38.08%	\$298,746,263
	Payroll = \$860,624,613				Payroll = \$784,412,260			

⁽¹⁾ The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.47% and 0.19% of payroll, respectively.

⁽²⁾ The Basic Normal Cost and UAAL rates shown for each cost group include an explicit administrative expense load of 0.46% and 0.20% of payroll, respectively.

⁽³⁾ Total UAAL dollar contribution for Rodeo-Hercules FPD is \$1,670,971 for FY 19-20. It is based on the UAAL rate shown above multiplied by estimated payroll for FY 19-20. The estimated payroll for FY 19-20 was determined by increasing payroll amounts shown above for 2018 by 18-months of assumed wage inflation.

⁽⁴⁾ Total UAAL dollar contribution for Rodeo-Hercules FPD is \$1,683,829 for FY 18-19. It is based on the UAAL rate shown above multiplied by estimated payroll for FY 18-19. The estimated payroll for FY 18-19 was determined by increasing payroll amounts shown above for 2017 by 18-months of assumed wage inflation.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

The employer contribution rates as of December 31, 2017 are based on all of the data described in the previous sections, the actuarial assumptions described in Section 4, and the Plan provisions adopted at the time of preparation of the Actuarial Valuation. They include all changes affecting future costs, adopted benefit changes, actuarial gains and losses and changes in the actuarial assumptions.

Reconciliation of Recommended Employer Contribution Rate

The chart below details the changes in the recommended employer contribution rate from the prior valuation to the current year's valuation.

CHART 15

Reconciliation of Recommended Average Employer Contribution from December 31, 2016 to December 31, 2017 Valuation

	Contribution Rate ⁽¹⁾	Estimated Annual Dollar Cost ⁽²⁾
Recommended Average Employer Contribution Rate in December 31, 2016 Valuation	38.08%	\$298,746,263
Effect of investment gain ⁽³⁾	(0.68%)	\$(5,852,247)
Effect of difference in actual versus expected contributions due to delay in implementation of contribution rates calculated in 12/31/2016 valuation	(0.16%)	(1,376,999)
Effect of additional UAAL contributions	0.00%	(25,672)
Effect of higher than expected individual salary increases	0.53%	4,561,310
Effect of amortizing prior year's UAAL over a greater than expected projected total payroll	(1.24%)	5,333,219 ⁽⁴⁾
Effect of changes in member demographics on Normal Cost	(0.41%)	(3,528,561)
Effect of higher than expected COLA increases for retirees and beneficiaries	0.18%	1,549,124
Effect of mortality loss on retirees and beneficiaries (fewer deaths than expected)	0.07%	602,437
Effect of retirement experience gain on actives (later retirements than expected)	(0.23%)	(1,979,437)
Effect of net other experience gains ⁽⁵⁾	(0.07%)	12,409,977
Total change	(2.01%)	11,693,151
Recommended Average Employer Contribution Rate in December 31, 2017 Valuation	36.07%	\$310,439,414

⁽¹⁾ These rates do not include any employer subvention of member contributions, or member subvention of employer contributions.

⁽²⁾ Based on projected total payroll for each valuation date shown.

⁽³⁾ Return on the valuation value of assets of 8.00% was greater than the 7.00% assumed in the December 31, 2016 valuation.

⁽⁴⁾ Represents the dollar increase in UAAL amortization payments for amortization bases established prior to the December 31, 2017 valuation.

⁽⁵⁾ Other differences in actual versus expected experience including (but not limited to) disability, withdrawal and leave cashout experience. Estimated annual dollar cost also reflects change in payroll from prior valuation.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

The member contribution rates as of December 31, 2017 are based on all of the data described in the previous sections, the actuarial assumptions described in Section 4, and the Plan provisions adopted at the time of preparation of the Actuarial Valuation. They include all changes affecting future costs, adopted benefit changes, actuarial gains and losses and changes in the actuarial assumptions.

Reconciliation of Recommended Member Contribution Rate

The chart below details the changes in the recommended average member contribution rate from the prior valuation to the current year's valuation.

The chart reconciles the member contribution from the prior valuation to the amount determined in this valuation.

CHART 16

Reconciliation of Recommended Average Member Contribution from December 31, 2016 to December 31, 2017 Valuation

	Contribution Rate ⁽¹⁾	Estimated Annual Dollar Cost ⁽²⁾
Recommended Average Member Contribution Rate in December 31, 2016 Valuation	12.08%	\$94,778,385
Effect of change in administrative expense load	0.01%	\$86,062
Effect of changes in member demographics ⁽³⁾	<u>(0.06%)</u>	<u>8,686,859</u>
Total change	<u>(0.05%)</u>	<u>\$8,772,921</u>
Recommended Average Member Contribution Rate in December 31, 2017 Valuation	12.03%	\$103,551,307

⁽¹⁾ These rates do not include any employer subvention of member contributions, or member subvention of employer contributions.

⁽²⁾ Based on projected total payroll for each valuation date shown.

⁽³⁾ Includes changes in demographic profile of active membership. Estimated annual dollar cost also reflects change in payroll from prior valuation.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

E. FUNDED RATIO

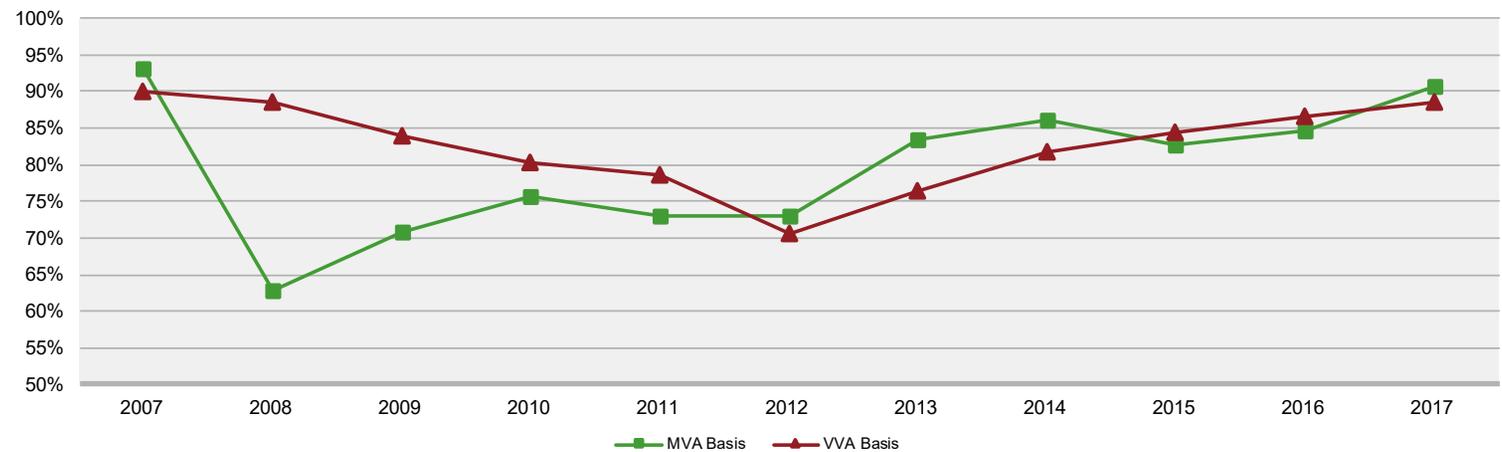
A critical piece of information regarding the Plan's financial status is the funded ratio. The ratios compare the valuation value of assets and market value of assets to the actuarial accrued liabilities of the Plan as calculated. High ratios indicate a well-funded plan with assets sufficient to cover the plan's actuarial accrued liabilities. Lower ratios may indicate recent changes to benefit structures, funding of the plan below actuarial requirements, poor asset performance, or a variety of other factors. The chart below depicts a history of the funded ratio for this plan.

Chart 18 on the next page shows the Plan's schedule of funding progress for the last ten years.

The funded status measures shown in this valuation are appropriate for assessing the need for or amount of future contributions. However, they are not necessarily appropriate for assessing the sufficiency of Plan assets to cover the estimated cost of settling the Plan's benefit obligations. As the chart below shows, the measures are different depending on whether the valuation or market value of assets is used.

CHART 17

Funded Ratio for Plan Years Ending December 31, 2007 – 2017



SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

CHART 18
Schedule of Funding Progress

Actuarial Valuation Date	Valuation Value of Assets⁽¹⁾ (a)	Actuarial Accrued Liability (AAL)⁽²⁾ (b)	Unfunded/ (Overfunded) AAL (UAAL) (b) – (a)	Funded Ratio (a) / (b)	Projected Payroll (c)	UAAL as a Percentage of Projected Payroll [(b) – (a)] / (c)
12/31/2008	\$5,282,505,159	\$5,972,471,074	\$689,965,915	88.45%	\$704,947,668	97.87%
12/31/2009	5,290,114,102	6,314,787,187	1,024,673,085	83.77%	694,443,999	147.55%
12/31/2010	5,341,821,711	6,654,036,801	1,312,215,090	80.28%	687,443,206	190.88%
12/31/2011	5,426,719,066	6,915,311,649	1,488,592,583	78.47%	666,394,146	223.38%
12/31/2012	5,482,257,062	7,761,315,535	2,279,058,473	70.64%	652,312,180	349.38%
12/31/2013	5,907,416,432	7,731,097,407	1,823,680,975	76.41%	679,428,911	268.41%
12/31/2014	6,557,496,101	8,027,438,213	1,469,942,112	81.69%	697,831,837	210.64%
12/31/2015	7,136,801,380	8,448,624,096	1,311,822,716	84.47%	746,352,663	175.76%
12/31/2016	7,606,997,530	8,794,434,139	1,187,436,609	86.50%	784,412,260	151.38%
12/31/2017	8,179,891,191	9,239,246,920	1,059,355,729	88.53%	860,624,613	123.09%

⁽¹⁾ Excludes assets for non-valuation reserves.

⁽²⁾ Excludes liabilities for non-valuation reserves.

SECTION 2: Valuation Results for the Contra Costa County Employees' Retirement Association

F. VOLATILITY RATIOS

Retirement plans are subject to volatility in the level of required contributions. This volatility tends to increase as retirement plans become more mature.

The Asset Volatility Ratio (AVR), which is equal to the market value of assets divided by total payroll, provides an indication of the potential contribution volatility for any given level of investment volatility. A higher AVR indicates that the plan is subject to a greater level of contribution volatility. This is a current measure since it is based on the current level of assets.

For CCCERA, the current AVR is about 9.7. This means that a 1% asset gain/(loss) (relative to the assumed investment return) translates to about 9.7% of one-year's payroll. Since CCCERA amortizes actuarial gains and losses over a 18-year period, there would be a 0.7% of payroll decrease/(increase) in the required contribution for each 1% asset gain/(loss).

The Liability Volatility Ratio (LVR), which is equal to the Actuarial Accrued Liability divided by payroll, provides an indication of the longer-term potential for contribution volatility for any given level of investment volatility. This is because, over an extended period of time, the plan's assets should track the plan's liabilities. For example, if a plan is 50% funded on a market value basis, the liability volatility ratio would be double the asset volatility ratio and the plan sponsor should expect contribution volatility to increase over time as the plan becomes better funded.

The LVR also indicates how volatile contributions will be in response to changes in the Actuarial Accrued Liability due to actual experience or to changes in actuarial assumptions.

For CCCERA, the current LVR is about 10.7. This is about 10% higher than the AVR. Therefore, we would expect that contribution volatility will increase over the long-term.

This chart shows how the asset and liability volatility ratios have varied over time, both for the plan in total and separately for General and Safety.

CHART 19
Volatility Ratios for Years Ended December 31, 2009 – 2017

Year Ended December 31	Asset Volatility Ratios			Liability Volatility Ratios		
	General	Safety	Total	General	Safety	Total
2009	5.0	11.4	6.4	7.0	16.0	9.1
2010	5.6	13.1	7.3	7.5	17.2	9.7
2011	5.9	13.6	7.6	8.0	18.6	10.4
2012	6.7	16.2	8.7	9.0	22.5	11.9
2013	7.3	18.2	9.5	8.6	22.3	11.4
2014	7.5	19.7	9.9	8.6	23.5	11.5
2015	7.1	18.7	9.3	8.4	23.3	11.3
2016	7.2	19.0	9.5	8.3	23.1	11.1
2017	7.4	19.6	9.7	8.0	22.2	10.7

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

**EXHIBIT A
Table of Plan Coverage
i. General Tier 1**

Category	Year Ended December 31		Change From Prior Year
	2017	2016	
Active members in valuation			
Number	529	559	-5.4%
Average age	50.5	49.9	0.6
Average service	16.5	15.8	0.7
Projected total payroll ⁽¹⁾	\$58,286,293	\$57,462,335	1.4%
Projected average payroll	\$110,182	\$102,795	7.2%
Account balances	\$66,823,081	\$61,775,547	8.2%
Total active members with at least five years of service	512	500	2.4%
Vested terminated members⁽²⁾	233	234	-0.4%
Retired members⁽²⁾			
Number in pay status	2,437	2,503	-2.6%
Average age	74.9	74.6	0.3
Average monthly benefit	\$4,247	\$4,087	3.9%
Disabled members⁽²⁾			
Number in pay status ⁽³⁾	255	265	-3.8%
Average age	71.7	71.6	0.1
Average monthly benefit	\$2,890	\$2,802	3.1%
Beneficiaries⁽²⁾			
Number in pay status	686	682	0.6%
Average age	78.0	77.4	0.6
Average monthly benefit	\$2,336	\$2,243	4.1%

⁽¹⁾ Calculated by increasing actual calendar year salaries by the assumed salary scale.

⁽²⁾ Includes members from terminated employers.

⁽³⁾ For 2017, includes 187 members receiving a service-connected disability and 68 members receiving an ordinary disability.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT A (continued)

Table of Plan Coverage

ii. General Tier 2

Category	Year Ended December 31		Change From Prior Year
	2017	2016	
Active members in valuation			
Number ⁽¹⁾	0	0	N/A
Average age	N/A	N/A	N/A
Average service	N/A	N/A	N/A
Projected total payroll	N/A	N/A	N/A
Projected average payroll	N/A	N/A	N/A
Account balances	N/A	N/A	N/A
Total active members with at least five years of service	0	0	N/A
Vested terminated members⁽²⁾	201	214	-6.1%
Retired members⁽²⁾			
Number in pay status	420	419	0.2%
Average age	75.2	74.6	0.6
Average monthly benefit	\$857	\$849	0.9%
Disabled members⁽²⁾			
Number in pay status ⁽³⁾	42	45	-6.7%
Average age	71.6	70.7	0.9
Average monthly benefit	\$2,323	\$2,309	0.6%
Beneficiaries⁽²⁾			
Number in pay status	102	106	-3.8%
Average age	68.7	68.4	0.3
Average monthly benefit	\$891	\$836	6.6%

⁽¹⁾ As of the December 31, 2005 valuation, there are no longer any Tier 2 Active Members since they have all transferred to Tier 3.

⁽²⁾ Includes members from terminated employers.

⁽³⁾ For 2017, includes 22 members receiving a service-connected disability and 20 members receiving an ordinary disability.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT A (continued)
Table of Plan Coverage
iii. General Tier 3

Category	Year Ended December 31		Change From Prior Year
	2017	2016	
Active members in valuation			
Number	4,738	5,053	-6.2%
Average age	50.7	50.0	0.7
Average service	13.9	13.3	0.6
Projected total payroll ⁽¹⁾	\$416,511,431	\$414,748,891	0.4%
Projected average payroll	\$87,909	\$82,080	7.1%
Account balances	\$523,594,120	\$487,288,911	7.5%
Total active members with at least five years of service	4,507	4,411	2.2%
Vested terminated members	1,743	1,687	3.3%
Retired members			
Number in pay status	2,878	2,695	6.8%
Average age	67.8	67.2	0.6
Average monthly benefit	\$2,778	\$2,716	2.3%
Disabled members			
Number in pay status ⁽²⁾	83	84	-1.2%
Average age	62.6	62.0	0.6
Average monthly benefit	\$2,390	\$2,341	2.1%
Beneficiaries			
Number in pay status	204	187	9.1%
Average age	61.0	62.0	-1.0
Average monthly benefit	\$1,556	\$1,612	-3.5%

⁽¹⁾ Calculated by increasing actual calendar year salaries by the assumed salary scale.

⁽²⁾ For 2017, includes 26 members receiving a service-connected disability and 57 members receiving an ordinary disability.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT A (continued)

Table of Plan Coverage

iv. General Tier 4 – 2% COLA

Category	Year Ended December 31		Change From Prior Year
	2017	2016	
Active members in valuation			
Number	18	14	28.6%
Average age	43.1	42.6	0.5
Average service	1.5	1.2	0.3
Projected total payroll ⁽¹⁾	\$1,132,669	\$704,009	60.9%
Projected average payroll	\$62,926	\$50,286	25.1%
Account balances	\$147,903	\$98,401	50.3%
Total active members with at least five years of service	0	0	N/A
Vested terminated members	4	1	300.0%
Retired members			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A
Disabled members			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A
Beneficiaries			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A

⁽¹⁾ Calculated by increasing actual calendar year salaries by the assumed salary scale. Projected compensation for 2018 has been limited. It is our understanding that in the determination of pension benefits under the PEPRA formulas, the compensation that can be taken into account for 2018 is equal to \$121,388. (For an employer that is not enrolled in Social Security, the maximum amount is 120% of \$121,388, or \$145,666). (reference: Section 7522.10). These amounts should be adjusted for changes to the Consumer Price Index for All Urban Consumers after 2018. (reference: Section 7522.10(d))

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT A (continued)

Table of Plan Coverage

v. General Tier 4 – 3% COLA

Category	Year Ended December 31		Change From Prior Year
	2017	2016	
Active members in valuation			
Number	129	103	25.2%
Average age	41.1	40.8	0.3
Average service	2.2	1.9	0.3
Projected total payroll ⁽¹⁾	\$10,968,716	\$7,537,862	45.5%
Projected average payroll	\$85,029	\$73,183	16.2%
Account balances	\$1,994,064	\$1,038,597	92.0%
Total active members with at least five years of service	2	1	100.0%
Vested terminated members			
	14	11	27.3%
Retired members			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A
Disabled members			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A
Beneficiaries			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A

⁽¹⁾ Calculated by increasing actual calendar year salaries by the assumed salary scale. Projected compensation for 2018 has been limited. It is our understanding that in the determination of pension benefits under the PEPRA formulas, the compensation that can be taken into account for 2018 is equal to \$121,388. (For an employer that is not enrolled in Social Security, the maximum amount is 120% of \$121,388, or \$145,666). (reference: Section 7522.10). These amounts should be adjusted for changes to the Consumer Price Index for All Urban Consumers after 2018. (reference: Section 7522.10(d))

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT A (continued)

Table of Plan Coverage

vi. General Tier 5 – 2% COLA

Category	Year Ended December 31		Change From Prior Year
	2017	2016	
Active members in valuation			
Number	2,350	1,784	31.7%
Average age	39.9	39.2	0.7
Average service	1.5	1.1	0.4
Projected total payroll ⁽¹⁾	\$152,226,351	\$95,976,834	58.6%
Projected average payroll	\$64,777	\$53,799	20.4%
Account balances	\$20,015,213	\$9,678,004	106.8%
Total active members with at least five years of service	12	17	-29.4%
Vested terminated members	417	256	62.9%
Retired members			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A
Disabled members			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A
Beneficiaries			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A

⁽¹⁾ Calculated by increasing actual calendar year salaries by the assumed salary scale. Projected compensation for 2018 has been limited. It is our understanding that in the determination of pension benefits under the PEPRAs formulas, the compensation that can be taken into account for 2018 is equal to \$121,388. (For an employer that is not enrolled in Social Security, the maximum amount is 120% of \$121,388, or \$145,666). (reference: Section 7522.10). These amounts should be adjusted for changes to the Consumer Price Index for All Urban Consumers after 2018. (reference: Section 7522.10(d))

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT A (continued)

Table of Plan Coverage

vii. General Tier 5 – 3% COLA

Category	Year Ended December 31		Change From Prior Year
	2017	2016	
Active members in valuation			
Number	801	865	-7.4%
Average age	43.1	42.0	1.1
Average service	3.6	2.8	0.8
Projected total payroll ⁽¹⁾	\$58,293,249	\$57,816,803	0.8%
Projected average payroll	\$72,776	\$66,840	8.9%
Account balances	\$20,237,024	\$14,800,751	36.7%
Total active members with at least five years of service	3	12	-75.0%
Vested terminated members			
	274	243	12.8%
Retired members			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A
Disabled members			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A
Beneficiaries			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A

⁽¹⁾ Calculated by increasing actual calendar year salaries by the assumed salary scale. Projected compensation for 2018 has been limited. It is our understanding that in the determination of pension benefits under the PEPRA formulas, the compensation that can be taken into account for 2018 is equal to \$121,388. (For an employer that is not enrolled in Social Security, the maximum amount is 120% of \$121,388, or \$145,666). (reference: Section 7522.10). These amounts should be adjusted for changes to the Consumer Price Index for All Urban Consumers after 2018. (reference: Section 7522.10(d))

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT A (continued)
Table of Plan Coverage
viii. Safety Tier A

Category	Year Ended December 31		Change From Prior Year
	2017	2016	
Active members in valuation			
Number	945	991	-4.6%
Average age	45.2	44.6	0.6
Average service	15.8	15.5	0.3
Projected total payroll ⁽¹⁾	\$115,755,798	\$114,697,741	0.9%
Projected average payroll	\$122,493	\$115,739	5.8%
Account balances	\$377,672,109	\$358,633,855	5.3%
Total active members with at least five years of service	935	953	-1.9%
Vested terminated members⁽²⁾	314	331	-5.1%
Retired members⁽²⁾			
Number in pay status	1,238	1,208	2.5%
Average age	66.2	65.9	0.3
Average monthly benefit	\$7,796	\$7,653	1.9%
Disabled members⁽²⁾			
Number in pay status ⁽³⁾	509	506	0.6%
Average age	63.9	63.5	0.4
Average monthly benefit	\$6,063	\$5,877	3.2%
Beneficiaries⁽²⁾			
Number in pay status	406	395	2.8%
Average age	69.2	68.3	0.9
Average monthly benefit	\$3,833	\$3,723	3.0%

⁽¹⁾ Calculated by increasing actual calendar year salaries by the assumed salary scale.

⁽²⁾ Includes members from terminated employers.

⁽³⁾ For 2017, includes 488 members receiving a service-connected disability and 21 members receiving an ordinary disability.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT A (continued)
Table of Plan Coverage
ix. Safety Tier C

Category	Year Ended December 31		Change From Prior Year
	2017	2016	
Active members in valuation			
Number	128	136	-5.9%
Average age	37.4	36.6	0.8
Average service	7.6	6.7	0.9
Projected total payroll ⁽¹⁾	\$13,476,643	\$12,803,541	5.3%
Projected average payroll	\$105,286	\$94,144	11.8%
Account balances	\$12,548,377	\$10,676,664	17.5%
Total active members with at least five years of service	118	88	34.1%
Vested terminated members			
	74	72	2.8%
Retired members			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A
Disabled members			
Number in pay status ⁽²⁾	7	5	40.0%
Average age	43.1	43.8	-0.7
Average monthly benefit	\$3,758	\$3,704	1.5%
Beneficiaries			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A

⁽¹⁾ Calculated by increasing actual calendar year salaries by the assumed salary scale.

⁽²⁾ For 2017, includes 7 members receiving a service-connected disability.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT A (continued)

Table of Plan Coverage

x. Safety Tier D

Category	Year Ended December 31		Change From Prior Year
	2017	2016	
Active members in valuation			
Number	115	106	8.5%
Average age	33.6	33.0	0.6
Average service	2.8	2.0	0.8
Projected total payroll ⁽¹⁾	\$9,927,039	\$7,514,715	32.1%
Projected average payroll	\$86,322	\$70,894	21.8%
Account balances	\$4,701,883	\$2,916,657	61.2%
Total active members with at least five years of service	0	0	N/A
Vested terminated members	21	17	23.5%
Retired members			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A
Disabled members			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A
Beneficiaries			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A

⁽¹⁾ Calculated by increasing actual calendar year salaries by the assumed salary scale. Projected compensation for 2018 has been limited. It is our understanding that in the determination of pension benefits under the PEPRAs formulas, the compensation that can be taken into account for 2018 is equal to \$121,388. (For an employer that is not enrolled in Social Security, the maximum amount is 120% of \$121,388, or \$145,666). (reference: Section 7522.10). These amounts should be adjusted for changes to the Consumer Price Index for All Urban Consumers after 2018. (reference: Section 7522.10(d))

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT A (continued)

Table of Plan Coverage

xi. Safety Tier E

Category	Year Ended December 31		Change From Prior Year
	2017	2016	
Active members in valuation			
Number	285	237	20.3%
Average age	31.9	31.4	0.5
Average service	2.2	1.6	0.6
Projected total payroll ⁽¹⁾	\$24,046,424	\$15,149,530	58.7%
Projected average payroll	\$84,373	\$63,922	32.0%
Account balances	\$7,288,339	\$3,886,353	87.5%
Total active members with at least five years of service	0	0	N/A
Vested terminated members			
	32	23	39.1%
Retired members			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A
Disabled members			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A
Beneficiaries			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A

⁽¹⁾ Calculated by increasing actual calendar year salaries by the assumed salary scale. Projected compensation for 2018 has been limited. It is our understanding that in the determination of pension benefits under the PEPRAs formulas, the compensation that can be taken into account for 2018 is equal to \$121,388. (For an employer that is not enrolled in Social Security, the maximum amount is 120% of \$121,388, or \$145,666). (reference: Section 7522.10). These amounts should be adjusted for changes to the Consumer Price Index for All Urban Consumers after 2018. (reference: Section 7522.10(d))

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT B

**Members in Active Service and Projected Payroll as of December 31, 2017
By Age and Years of Service**

i. General Tier 1 Non-Enhanced

Age	Years of Service									
	Total	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	--	--	--	--	--	--	--	--	--	--
25 - 29	--	--	--	--	--	--	--	--	--	--
30 - 34	--	--	--	--	--	--	--	--	--	--
35 - 39	1	1	--	--	--	--	--	--	--	--
40 - 44	\$11,256	\$11,256	--	--	--	--	--	--	--	--
45 - 49	3	--	--	2	1	--	--	--	--	--
50 - 54	115,253	--	--	\$133,769	\$78,222	--	--	--	--	--
55 - 59	4	--	3	1	--	--	--	--	--	--
60 - 64	76,561	--	\$71,055	93,081	--	--	--	--	--	--
65 - 69	--	--	--	--	--	--	--	--	--	--
70 & over	--	--	--	--	--	--	--	--	--	--
Total	8	1	3	3	1	--	--	--	--	--
	\$82,908	\$11,256	\$71,055	\$120,206	\$78,222	--	--	--	--	--

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT B (continued)

**Members in Active Service and Projected Payroll as of December 31, 2017
By Age and Years of Service**

ii. General Tier 1 Enhanced

Age	Total	Years of Service								
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	--	--	--	--	--	--	--	--	--	--
25 - 29	8	--	8	--	--	--	--	--	--	--
30 - 34	20	3	15	2	--	--	--	--	--	--
35 - 39	52	7	26	13	6	--	--	--	--	--
40 - 44	65	8	17	17	19	4	--	--	--	--
45 - 49	79	4	18	13	31	11	2	--	--	--
50 - 54	120	3	12	31	41	12	17	4	--	--
55 - 59	92	5	17	12	25	11	14	4	3	1
60 - 64	60	3	12	7	13	9	10	1	4	1
65 - 69	23	--	4	4	10	1	2	--	--	2
70 & over	2	--	--	1	1	--	--	--	--	--
	85,624	--	--	79,669	91,579	--	--	--	--	--
Total	521	33	129	100	146	48	45	9	7	4
	\$110,601	\$118,797	\$111,975	\$106,498	\$113,713	\$98,765	\$111,863	\$139,115	\$79,516	\$105,691

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT B (continued)

**Members in Active Service and Projected Payroll as of December 31, 2017
By Age and Years of Service**

iii. General Tier 3 Enhanced

Age	Total	Years of Service								
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	--	--	--	--	--	--	--	--	--	--
25 - 29	31	--	31	--	--	--	--	--	--	--
30 - 34	239	43	157	37	2	--	--	--	--	--
35 - 39	504	49	223	190	42	--	--	--	--	--
40 - 44	621	55	202	193	158	13	--	--	--	--
45 - 49	749	45	196	192	223	72	20	1	--	--
50 - 54	921	42	182	199	252	124	100	22	--	--
55 - 59	805	32	151	166	192	97	104	48	15	--
60 - 64	586	11	124	130	154	62	54	33	18	--
65 - 69	233	11	57	61	43	34	21	4	2	--
70 & over	49	3	13	14	11	2	4	1	1	--
Total	4,738	291	1,336	1,182	1,077	404	303	109	36	--
	\$87,909	\$85,567	\$84,589	\$87,221	\$86,991	\$95,761	\$97,883	\$98,233	\$76,719	--

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT B (continued)

**Members in Active Service and Projected Payroll as of December 31, 2017
By Age and Years of Service**

iv. General Tier 4 – 2% COLA

Age	Total	Years of Service								
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	1	1	--	--	--	--	--	--	--	--
	\$68,290	\$68,290	--	--	--	--	--	--	--	--
25 - 29	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
30 - 34	5	5	--	--	--	--	--	--	--	--
	60,257	60,257	--	--	--	--	--	--	--	--
35 - 39	1	1	--	--	--	--	--	--	--	--
	46,119	46,119	--	--	--	--	--	--	--	--
40 - 44	3	3	--	--	--	--	--	--	--	--
	63,425	63,425	--	--	--	--	--	--	--	--
45 - 49	2	2	--	--	--	--	--	--	--	--
	94,096	94,097	--	--	--	--	--	--	--	--
50 - 54	4	4	--	--	--	--	--	--	--	--
	62,712	62,712	--	--	--	--	--	--	--	--
55 - 59	2	2	--	--	--	--	--	--	--	--
	43,832	43,832	--	--	--	--	--	--	--	--
60 - 64	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
65 - 69	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
70 & over	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
Total	18	18	--	--	--	--	--	--	--	--
	\$62,926	\$62,926	--	--	--	--	--	--	--	--

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT B (continued)

**Members in Active Service and Projected Payroll as of December 31, 2017
By Age and Years of Service**

v. General Tier 4 – 3% COLA

Age	Years of Service									
	Total	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	1	1	--	--	--	--	--	--	--	--
	\$71,937	\$71,937	--	--	--	--	--	--	--	--
25 - 29	19	19	--	--	--	--	--	--	--	--
	81,744	81,744	--	--	--	--	--	--	--	--
30 - 34	22	22	--	--	--	--	--	--	--	--
	83,901	83,901	--	--	--	--	--	--	--	--
35 - 39	22	22	--	--	--	--	--	--	--	--
	86,803	86,803	--	--	--	--	--	--	--	--
40 - 44	22	22	--	--	--	--	--	--	--	--
	84,811	84,811	--	--	--	--	--	--	--	--
45 - 49	12	12	--	--	--	--	--	--	--	--
	90,174	90,174	--	--	--	--	--	--	--	--
50 - 54	17	17	--	--	--	--	--	--	--	--
	89,977	89,977	--	--	--	--	--	--	--	--
55 - 59	11	11	--	--	--	--	--	--	--	--
	78,414	78,414	--	--	--	--	--	--	--	--
60 - 64	2	2	--	--	--	--	--	--	--	--
	85,943	85,943	--	--	--	--	--	--	--	--
65 - 69	1	1	--	--	--	--	--	--	--	--
	76,166	76,166	--	--	--	--	--	--	--	--
70 & over	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
Total	129	129	--	--	--	--	--	--	--	--
	\$85,029	\$85,029	--	--	--	--	--	--	--	--

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT B (continued)

**Members in Active Service and Projected Payroll as of December 31, 2017
By Age and Years of Service**

vi. General Tier 5 – 2% COLA

Age	Total	Years of Service								
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	87	87	--	--	--	--	--	--	--	--
	\$48,670	\$48,670	--	--	--	--	--	--	--	--
25 - 29	407	407	--	--	--	--	--	--	--	--
	57,851	57,851	--	--	--	--	--	--	--	--
30 - 34	498	497	1	--	--	--	--	--	--	--
	67,845	67,737	\$121,388	--	--	--	--	--	--	--
35 - 39	373	371	2	--	--	--	--	--	--	--
	68,306	68,234	81,589	--	--	--	--	--	--	--
40 - 44	258	258	--	--	--	--	--	--	--	--
	67,375	67,375	--	--	--	--	--	--	--	--
45 - 49	229	228	--	1	--	--	--	--	--	--
	66,784	66,673	--	\$92,135	--	--	--	--	--	--
50 - 54	198	198	--	--	--	--	--	--	--	--
	66,005	66,005	--	--	--	--	--	--	--	--
55 - 59	165	164	1	--	--	--	--	--	--	--
	64,640	64,716	52,180	--	--	--	--	--	--	--
60 - 64	102	98	4	--	--	--	--	--	--	--
	62,883	63,465	48,630	--	--	--	--	--	--	--
65 - 69	23	22	--	--	--	--	1	--	--	--
	76,863	74,839	--	--	--	--	\$121,388	--	--	--
70 & over	10	10	--	--	--	--	--	--	--	--
	58,891	58,891	--	--	--	--	--	--	--	--
Total	2,350	2,340	8	1	--	--	1	--	--	--
	\$64,777	\$64,736	\$66,408	\$92,135	--	--	\$121,388	--	--	--

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT B (continued)

**Members in Active Service and Projected Payroll as of December 31, 2017
By Age and Years of Service**

vii. General Tier 5 – 3% COLA

Age	Total	Years of Service								
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	5	5	--	--	--	--	--	--	--	--
	\$54,871	\$54,871	--	--	--	--	--	--	--	--
25 - 29	55	54	--	1	--	--	--	--	--	--
	60,396	60,562	--	\$51,458	--	--	--	--	--	--
30 - 34	157	156	1	--	--	--	--	--	--	--
	73,023	73,003	\$76,233	--	--	--	--	--	--	--
35 - 39	160	160	--	--	--	--	--	--	--	--
	74,752	74,752	--	--	--	--	--	--	--	--
40 - 44	115	115	--	--	--	--	--	--	--	--
	78,655	78,655	--	--	--	--	--	--	--	--
45 - 49	87	87	--	--	--	--	--	--	--	--
	74,028	74,028	--	--	--	--	--	--	--	--
50 - 54	76	74	2	--	--	--	--	--	--	--
	72,902	72,152	100,663	--	--	--	--	--	--	--
55 - 59	76	74	2	--	--	--	--	--	--	--
	68,691	68,887	61,422	--	--	--	--	--	--	--
60 - 64	51	49	2	--	--	--	--	--	--	--
	69,862	70,576	52,375	--	--	--	--	--	--	--
65 - 69	17	16	1	--	--	--	--	--	--	--
	77,533	78,998	54,092	--	--	--	--	--	--	--
70 & over	2	2	--	--	--	--	--	--	--	--
	72,188	72,189	--	--	--	--	--	--	--	--
Total	801	792	8	1	--	--	--	--	--	--
	\$72,776	\$72,832	\$69,906	\$51,458	--	--	--	--	--	--

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT B (continued)

**Members in Active Service and Projected Payroll as of December 31, 2017
By Age and Years of Service**

viii. Safety Tier A Non-Enhanced

Age	Years of Service									
	Total	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	--	--	--	--	--	--	--	--	--	--
25 - 29	--	--	--	--	--	--	--	--	--	--
30 - 34	--	--	--	--	--	--	--	--	--	--
35 - 39	2	2	--	--	--	--	--	--	--	--
40 - 44	\$129,562	\$129,562	--	--	--	--	--	--	--	--
45 - 49	3	--	--	--	3	--	--	--	--	--
50 - 54	140,255	--	--	--	\$140,255	--	--	--	--	--
55 - 59	2	--	--	--	1	--	1	--	--	--
60 - 64	131,156	--	--	--	136,890	--	\$125,421	--	--	--
65 - 69	4	1	--	--	--	--	3	--	--	--
70 & over	145,036	130,599	--	--	--	--	149,848	--	--	--
Total	2	--	--	--	--	--	1	1	--	--
	163,706	--	--	--	--	--	190,300	\$137,111	--	--
	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
	13	3	--	--	4	--	5	1	--	--
	\$142,289	\$129,908	--	--	\$139,414	--	\$153,053	\$137,111	--	--

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT B (continued)

**Members in Active Service and Projected Payroll as of December 31, 2017
By Age and Years of Service**

ix. Safety Tier A Enhanced

Age	Total	Years of Service								
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	--	--	--	--	--	--	--	--	--	--
25 - 29	9	5	4	--	--	--	--	--	--	--
30 - 34	\$98,198	\$93,610	\$103,933	--	--	--	--	--	--	--
35 - 39	75	14	44	17	--	--	--	--	--	--
40 - 44	114,533	97,466	114,138	\$129,609	--	--	--	--	--	--
45 - 49	148	13	41	78	16	--	--	--	--	--
50 - 54	116,246	93,871	113,386	118,929	\$128,680	--	--	--	--	--
55 - 59	213	6	14	80	108	5	--	--	--	--
60 - 64	117,939	124,372	117,635	119,426	115,652	\$136,680	--	--	--	--
65 - 69	267	2	16	51	128	48	22	--	--	--
70 & over	126,271	191,864	106,773	124,604	123,254	130,482	\$146,721	--	--	--
	145	1	4	18	56	26	32	8	--	--
	133,661	124,308	100,357	112,180	126,282	126,469	162,120	\$161,010	--	--
	45	--	5	9	16	9	4	1	1	--
	120,571	--	110,561	105,632	106,461	136,042	178,980	181,890	\$96,636	--
	24	--	3	7	8	4	1	1	--	--
	120,709	--	115,426	106,318	103,627	147,482	240,717	146,841	--	--
	6	--	1	3	2	--	--	--	--	--
	114,794	--	110,140	104,577	132,446	--	--	--	--	--
Total	932	41	132	263	334	92	59	10	1	--
	\$122,217	\$105,053	\$112,519	\$119,455	\$120,344	\$130,968	\$158,853	\$161,681	\$96,636	--

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT B (continued)

**Members in Active Service and Projected Payroll as of December 31, 2017
By Age and Years of Service**

x. Safety Tier C

Age	Total	Years of Service								
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	--	--	--	--	--	--	--	--	--	--
25 - 29	15	2	13	--	--	--	--	--	--	--
	\$103,751	\$98,467	\$104,564	--	--	--	--	--	--	--
30 - 34	48	6	40	2	--	--	--	--	--	--
	103,395	88,267	105,448	\$107,719	--	--	--	--	--	--
35 - 39	29	2	24	3	--	--	--	--	--	--
	101,831	62,108	104,601	106,158	--	--	--	--	--	--
40 - 44	17	--	11	5	1	--	--	--	--	--
	107,155	--	106,682	107,746	\$109,403	--	--	--	--	--
45 - 49	10	--	7	3	--	--	--	--	--	--
	110,652	--	110,636	110,689	--	--	--	--	--	--
50 - 54	5	--	5	--	--	--	--	--	--	--
	132,831	--	132,831	--	--	--	--	--	--	--
55 - 59	1	--	1	--	--	--	--	--	--	--
	101,709	--	101,709	--	--	--	--	--	--	--
60 - 64	3	1	2	--	--	--	--	--	--	--
	103,423	99,888	105,191	--	--	--	--	--	--	--
65 & over	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
Total	128	11	103	13	1	--	--	--	--	--
	\$105,286	\$86,422	\$106,912	\$108,055	\$109,403	--	--	--	--	--

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT B (continued)

**Members in Active Service and Projected Payroll as of December 31, 2017
By Age and Years of Service**

xi. Safety Tier D

Age	Total	Years of Service								
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	7	7	--	--	--	--	--	--	--	--
	\$73,730	\$73,730	--	--	--	--	--	--	--	--
25 - 29	31	31	--	--	--	--	--	--	--	--
	80,304	80,304	--	--	--	--	--	--	--	--
30 - 34	46	46	--	--	--	--	--	--	--	--
	86,891	86,891	--	--	--	--	--	--	--	--
35 - 39	14	14	--	--	--	--	--	--	--	--
	92,526	92,526	--	--	--	--	--	--	--	--
40 - 44	8	8	--	--	--	--	--	--	--	--
	85,530	85,530	--	--	--	--	--	--	--	--
45 - 49	3	3	--	--	--	--	--	--	--	--
	102,924	102,924	--	--	--	--	--	--	--	--
50 - 54	3	3	--	--	--	--	--	--	--	--
	131,451	131,451	--	--	--	--	--	--	--	--
55 - 59	3	3	--	--	--	--	--	--	--	--
	80,601	80,601	--	--	--	--	--	--	--	--
60 - 64	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
65 & over	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
Total	115	115	--	--	--	--	--	--	--	--
	\$86,322	\$86,322	--	--	--	--	--	--	--	--

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT B (continued)

**Members in Active Service and Projected Payroll as of December 31, 2017
By Age and Years of Service**

xii. Safety Tier E

Age	Total	Years of Service								
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	24	24	--	--	--	--	--	--	--	--
	\$80,890	\$80,890	--	--	--	--	--	--	--	--
25 - 29	137	137	--	--	--	--	--	--	--	--
	82,055	82,055	--	--	--	--	--	--	--	--
30 - 34	58	58	--	--	--	--	--	--	--	--
	84,342	84,342	--	--	--	--	--	--	--	--
35 - 39	28	28	--	--	--	--	--	--	--	--
	85,562	85,562	--	--	--	--	--	--	--	--
40 - 44	14	14	--	--	--	--	--	--	--	--
	79,342	79,342	--	--	--	--	--	--	--	--
45 - 49	9	9	--	--	--	--	--	--	--	--
	91,524	91,524	--	--	--	--	--	--	--	--
50 - 54	7	7	--	--	--	--	--	--	--	--
	108,360	108,360	--	--	--	--	--	--	--	--
55 - 59	7	7	--	--	--	--	--	--	--	--
	109,073	109,073	--	--	--	--	--	--	--	--
60 - 64	1	1	--	--	--	--	--	--	--	--
	119,347	119,347	--	--	--	--	--	--	--	--
65 & over	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
Total	285	285	--	--	--	--	--	--	--	--
	\$84,373	\$84,373	--	--	--	--	--	--	--	--

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT C

Average Monthly Benefit and Membership Distribution of Retired Members and Beneficiaries

i. General Tier 1 as of December 31, 2017

Age	Total	Years of Retirement								
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	--	--	--	--	--	--	--	--	--	--
25 - 29	2	--	1	--	--	1	--	--	--	--
30 - 34	5	--	2	--	--	3	--	--	--	--
35 - 39	858	--	1,027	--	--	745	--	--	--	--
40 - 44	1	--	--	--	--	1	--	--	--	--
45 - 49	596	--	--	--	--	596	--	--	--	--
50 - 54	6	1	--	1	--	2	1	1	--	--
55 - 59	1,173	\$1,288	--	\$2,446	--	631	\$1,022	\$1,020	--	--
60 - 64	8	3	1	--	1	2	1	--	--	--
65 - 69	1,940	2,065	3,857	--	\$2,329	1,057	1,029	--	--	--
70 - 74	32	20	2	1	3	3	2	1	--	--
75 - 80	1,664	1,871	2,219	566	1,057	1,307	1,420	879	--	--
80 - 84	119	62	38	6	4	4	2	3	--	--
85 - 89	2,751	3,167	2,424	1,795	2,875	1,518	3,087	1,450	--	--
90 & over	351	79	175	53	15	11	8	6	1	3
Total	3,895	3,388	5,000	2,488	2,160	2,674	2,045	1,823	\$1,856	\$459
	585	51	218	184	82	19	19	3	6	3
	4,303	2,855	6,042	4,065	2,338	2,560	2,357	2,033	1,860	1,406
	658	10	89	277	158	71	24	14	7	8
	4,412	2,103	5,409	5,568	3,723	2,078	2,273	2,961	2,104	1,457
	494	--	11	76	180	117	72	20	12	6
	3,978	--	4,110	5,430	5,263	2,766	1,987	2,412	2,868	1,747
	449	1	1	14	99	133	109	69	13	10
	3,510	340	257	5,228	5,434	3,799	2,589	1,638	2,945	2,535
	348	--	--	3	17	67	112	95	40	14
	3,089	--	--	1,556	3,383	4,316	3,816	2,070	1,779	2,027
	320	--	--	1	4	13	64	89	103	46
	2,738	--	--	1,266	3,091	2,889	3,570	2,687	2,457	2,271
Total	3,378	227	538	616	563	447	414	301	182	90
	\$3,756	\$2,978	\$5,246	\$4,753	\$4,236	\$3,127	\$2,917	\$2,198	\$2,333	\$2,066

Note: Includes members from terminated employers.

Note: Total retired benefit \$12,688,893, average age 75.3 and average years retired 19.0.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT C (continued)

Average Monthly Benefit and Membership Distribution of Retired Members and Beneficiaries

ii. General Tier 2 as of December 31, 2017

Age	Total	Years of Retirement								
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	--	--	--	--	--	--	--	--	--	--
25 - 29	--	--	--	--	--	--	--	--	--	--
30 - 34	2	--	--	--	2	--	--	--	--	--
35 - 39	\$827	--	--	--	\$827	--	--	--	--	--
40 - 44	8	--	--	--	3	3	2	--	--	--
45 - 49	859	--	--	--	900	\$628	\$1,145	--	--	--
50 - 54	10	--	--	--	2	5	3	--	--	--
55 - 59	1,031	--	--	--	434	1,427	768	--	--	--
60 - 64	7	3	--	1	--	2	1	--	--	--
65 - 69	946	\$198	--	\$644	--	1,698	1,986	--	--	--
70 - 74	27	14	9	1	2	1	--	--	--	--
75 - 80	447	324	\$254	180	2,068	932	--	--	--	--
80 - 84	53	9	9	17	9	8	1	--	--	--
85 - 89	967	514	764	578	1,986	1,152	2,854	--	--	--
90 & over	78	8	13	26	22	5	4	--	--	--
	867	574	834	792	705	1,916	1,624	--	--	--
	120	4	15	21	42	32	3	3	--	--
	915	746	829	661	953	970	1,835	\$1,293	--	--
	85	--	6	12	38	25	4	--	--	--
	1,090	--	479	1,065	1,350	939	566	--	--	--
	98	--	3	1	42	35	15	2	--	--
	1,103	--	1,341	747	1,178	1,084	910	1,109	--	--
	52	--	--	1	11	27	10	2	1	--
	1,100	--	--	60	911	1,302	1,065	451	\$405	--
	24	--	--	--	1	11	11	1	--	--
	1,016	--	--	--	1,032	853	1,218	577	--	--
Total	564	38	55	80	174	154	54	8	1	--
	\$973	\$456	\$715	\$734	\$1,118	\$1,098	\$1,137	\$947	\$405	--

Note: Includes members from terminated employers.

Note: Total retired benefit \$548,535, average age 73.7 and average years retired 17.3.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT C (continued)

Average Monthly Benefit and Membership Distribution of Retired Members and Beneficiaries

iii. General Tier 3 as of December 31, 2017

Age	Total	Years of Retirement									
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over	
Under 25	6	4	2	--	--	--	--	--	--	--	--
	\$561	\$160	\$1,363	--	--	--	--	--	--	--	--
25 - 29	3	2	1	--	--	--	--	--	--	--	--
	414	161	922	--	--	--	--	--	--	--	--
30 - 34	8	4	--	1	2	1	--	--	--	--	--
	1,088	607	--	\$1,656	\$1,923	\$777	--	--	--	--	--
35 - 39	6	1	1	4	--	--	--	--	--	--	--
	847	494	1,920	667	--	--	--	--	--	--	--
40 - 44	8	3	3	2	--	--	--	--	--	--	--
	2,019	2,503	1,800	1,620	--	--	--	--	--	--	--
45 - 49	15	6	2	3	4	--	--	--	--	--	--
	1,300	1,425	1,729	1,144	1,014	--	--	--	--	--	--
50 - 54	108	91	7	6	4	--	--	--	--	--	--
	1,767	1,723	2,428	2,122	1,084	--	--	--	--	--	--
55 - 59	331	217	106	5	3	--	--	--	--	--	--
	2,147	2,358	1,734	2,444	930	--	--	--	--	--	--
60 - 64	649	291	279	74	5	--	--	--	--	--	--
	2,913	2,819	3,307	1,793	2,930	--	--	--	--	--	--
65 - 69	889	300	411	153	25	--	--	--	--	--	--
	2,938	2,495	3,519	2,547	1,104	--	--	--	--	--	--
70 - 74	693	103	327	225	37	1	--	--	--	--	--
	2,950	1,949	3,430	2,958	1,470	2,117	--	--	--	--	--
75 - 80	330	17	100	155	57	--	1	--	--	--	--
	2,387	1,508	2,567	2,616	1,726	--	\$1,513	--	--	--	--
80 - 84	107	3	19	48	37	--	--	--	--	--	--
	1,820	2,112	2,235	1,753	1,668	--	--	--	--	--	--
85 - 89	9	1	1	6	1	--	--	--	--	--	--
	1,767	760	3,162	1,196	4,811	--	--	--	--	--	--
90 & over	3	--	2	1	--	--	--	--	--	--	--
	3,433	--	1,915	6,468	--	--	--	--	--	--	--
Total	3,165	1,043	1,261	683	175	2	1	--	--	--	--
	\$2,689	\$2,388	\$3,182	\$2,529	\$1,581	\$1,447	\$1,513	--	--	--	--

Note: Total retired benefit \$8,510,824, average age 67.2 and average years retired 7.2.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT C (continued)

Average Monthly Benefit and Membership Distribution of Retired Members and Beneficiaries

iv. Safety Tier A and Tier C as of December 31, 2017

Age	Total	Years of Retirement								
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	6	--	--	3	--	--	2	--	1	--
	\$1,888	--	--	\$1,425	--	--	\$1,467	--	\$4,121	--
25 - 29	1	--	--	1	--	--	--	--	--	--
	891	--	--	891	--	--	--	--	--	--
30 - 34	2	2	--	--	--	--	--	--	--	--
	3,316	\$3,316	--	--	--	--	--	--	--	--
35 - 39	11	5	4	--	--	2	--	--	--	--
	3,750	4,476	\$4,102	--	--	\$1,233	--	--	--	--
40 - 44	22	8	7	6	--	--	1	--	--	--
	3,525	3,144	3,238	4,734	--	--	1,342	--	--	--
45 - 49	55	20	14	16	5	--	--	--	--	--
	4,138	4,312	3,773	4,403	\$3,620	--	--	--	--	--
50 - 54	254	162	50	18	15	6	3	--	--	--
	6,045	6,168	7,472	4,185	4,129	3,683	1,122	--	--	--
55 - 59	325	55	214	24	21	6	5	--	--	--
	7,002	6,229	7,946	4,000	4,480	4,299	3,356	--	--	--
60 - 64	330	20	122	134	26	12	8	6	1	1
	7,717	4,412	8,812	8,724	4,390	3,439	3,285	\$4,268	2,878	\$4,012
65 - 69	343	13	56	159	54	33	14	11	3	--
	7,283	4,009	8,138	9,204	5,609	3,668	3,816	3,445	3,829	--
70 - 74	356	6	17	84	149	39	19	26	13	3
	6,671	3,813	5,803	7,776	8,051	4,682	4,421	2,914	3,678	3,454
75 - 80	223	1	9	16	68	66	30	17	7	9
	6,531	1,376	2,920	5,027	8,281	7,542	5,552	3,347	3,994	4,000
80 - 84	116	--	2	--	7	30	45	17	12	3
	5,875	--	4,175	--	6,413	6,219	6,632	4,823	4,131	3,902
85 - 89	80	--	--	--	2	5	12	26	22	13
	4,867	--	--	--	5,188	5,936	5,162	5,262	4,506	3,955
90 & over	36	--	--	--	--	--	--	7	11	18
	5,454	--	--	--	--	--	--	6,429	6,889	4,198
Total	2,160	292	495	461	347	199	139	110	70	47
	\$6,629	\$5,640	\$7,737	\$7,899	\$6,943	\$5,574	\$5,144	\$4,182	\$4,553	\$4,023

Note: Includes members from terminated employers.

Note: Total retired benefit \$14,319,373, average age 66.2 and average years retired 15.2.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT D

Reconciliation of Member Data – December 31, 2016 to December 31, 2017

	Active Participants	Vested Terminated Members	Pensioners	Disableds	Beneficiaries	Total
Number as of December 31, 2016	9,848	3,089	6,825	905	1,370	22,037
New participants	977	67	0	0	83	1,127
Terminations – with vested rights	-396	396	0	0	0	0
Contribution refunds	-177	-124	0	0	0	-301
Retirements	-241	-54	295	0	0	0
New disabilities	-13	0	-5	18	0	0
Return to work	47	-43	-4	0	0	0
Died with or without beneficiary	-6	-1	-141	-25	-52	-225
Data adjustments	<u>-1</u>	<u>-3</u>	<u>3</u>	<u>-2</u>	<u>-3</u>	<u>-6</u>
Number as of December 31, 2017	10,038	3,327	6,973	896	1,398	22,632

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT E

Summary Statement of Income and Expenses on an Actuarial Value Basis

	Year Ended December 31, 2017	Year Ended December 31, 2016
Contribution income:		
Employer contributions ⁽¹⁾	\$314,836,561	\$307,457,143
Employee contributions ⁽¹⁾	96,466,906	89,240,172
Administrative expenses	<u>(9,146,115)</u>	<u>(8,486,463)</u>
Net contribution income	\$402,157,352	\$388,210,852
Investment income:		
Interest, dividends and other income	\$216,736,117	\$163,255,934
Adjustment toward market value ⁽²⁾	434,648,740	385,424,070
Less investment expenses	<u>(42,864,983)</u>	<u>(46,327,831)</u>
Net investment income	<u>608,519,874</u>	<u>502,352,173</u>
Total income available for benefits	\$1,010,677,226	\$890,563,025
Less benefit payments:		
Benefits paid	\$(429,574,195)	\$(411,779,400)
Refunds of contributions	(5,980,405)	(7,448,304)
Adjustments/transfers/other expenses	<u>(1,957,188)</u>	<u>(920,314)</u>
Net benefit payments	\$(437,511,788)	\$(420,148,018)
Change in reserve for future benefits	\$573,165,438	\$470,415,007

⁽¹⁾ For the year ended December 31, 2017, employer contributions include "member subvention of employer contributions" and exclude "employer subvention of member contributions".

⁽²⁾ Equals the "non-cash" earnings on investments implicitly included in the Actuarial Value of Assets.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

**EXHIBIT F
Summary Statement of Assets**

	Year Ended December 31, 2017	Year Ended December 31, 2016
Cash equivalents	\$690,793,803	\$644,324,488
Other Assets	516,754	266,092
Accounts receivable:		
Investment trades	\$22,462,322	\$232,983,556
Investment income	20,293,645	18,879,074
Employee and employer contributions	9,805,486	8,834,817
Additional contributions ⁽¹⁾	<u>14,367,397</u>	<u>15,965,773</u>
Total accounts receivable	66,928,850	276,663,220
Investments:		
Stocks	\$3,899,074,060	\$2,948,533,927
Bonds	2,385,460,866	2,563,716,770
Real estate	652,385,617	701,599,169
Alternative investments and real assets	<u>1,216,666,285</u>	<u>977,913,714</u>
Total investments at market value	<u>8,153,586,828</u>	<u>7,191,763,580</u>
Total assets	<u>\$8,911,826,235</u>	<u>\$8,113,017,380</u>
Less accounts payable:		
Investment trades	\$(25,352,546)	\$(302,095,514)
Security lending	(294,005,415)	(204,196,090)
Employer contributions unearned	(155,492,320)	(149,089,010)
Other	<u>(46,394,905)</u>	<u>(19,117,262)</u>
Total accounts payable	\$(521,245,186)	\$(674,497,876)
Net assets at market value	<u>\$8,390,581,049</u>	<u>\$7,438,519,504</u>
Net assets at actuarial value	<u>\$8,195,516,541</u>	<u>\$7,622,351,103</u>
Net assets at valuation value	<u>\$8,179,891,191</u>	<u>\$7,606,997,530</u>

⁽¹⁾ Equals the sum of additional contribution receivables for the final Paulson Settlement.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT G

Actuarial Balance Sheet

An overview of the Plan's funding is given by an Actuarial Balance Sheet. In this approach, we first determine the amount and timing of all future payments that are projected/anticipated to be made by the Plan for current participants. We then discount these payments at the valuation interest rate to the date of the valuation, thereby determining their present value. We refer to this present value as the "liability" of the Plan.

Second, we determine how this liability will be met. These actuarial "assets" include the net amount of assets already accumulated by the Plan, the present value of future member contributions, the present value of future employer normal cost contributions, and the present value of future employer amortization payments.

Assets⁽¹⁾	Basic	COLA	Total
1. Total valuation value of assets	\$5,051,054,664	\$3,128,836,527	\$8,179,891,191
2. Present value of future contributions by members	528,135,237	229,557,863	757,693,100
3. Present value of future employer contributions for:			
(a) entry age normal cost	735,945,571	218,878,311	954,823,882
(b) unfunded actuarial accrued liability	763,637,018	295,718,711	1,059,355,729
4. Total actuarial assets	\$7,078,772,490	\$3,872,991,412	\$10,951,763,902
Liabilities⁽¹⁾			
5. Present value of benefits for retirees and beneficiaries	\$3,363,692,416	\$2,509,325,115	\$5,873,017,531
6. Present value of benefits for vested terminated members ⁽²⁾	218,940,106	76,751,231	295,691,337
7. Present value of benefits for active members	3,496,139,968	1,286,915,066	4,783,055,034
8. Total present value of benefits	\$7,078,772,490	\$3,872,991,412	\$10,951,763,902

⁽¹⁾ Assets and liabilities exclude administrative expenses.

⁽²⁾ Includes nonvested terminated members.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT H

Summary of Total Allocated Reserves

Reserves	December 31, 2017	December 31, 2016
Member Deposits ⁽¹⁾	\$795,727,498	\$729,442,554
Member Cost of Living ⁽¹⁾	420,388,707	387,381,328
Employer Advance ⁽¹⁾⁽²⁾	2,063,002,259	1,834,547,821
Employer Cost of Living ⁽¹⁾⁽²⁾	928,964,628	824,863,184
Retired Members ⁽¹⁾⁽²⁾	3,363,343,722	3,292,924,578
Retired Cost of Living ⁽¹⁾⁽²⁾	2,444,582,495	2,333,427,992
Dollar Power Cost of Living Supplement Pre-Funding ⁽¹⁾	3,946,603	5,348,040
Post Retirement Death Benefit ⁽³⁾	15,625,350	15,353,573
Statutory Contingency (one percent) ⁽³⁾	0	0
Additional One Percent Contingency Designation ⁽³⁾	0	0
Contra Tracking Account ⁽¹⁾	(1,840,064,721)	(1,800,937,967)
Total Allocated Reserves	8,195,516,541	7,622,351,103
Total Deferred Return	195,064,508	(183,831,599)
Net Market Value	\$8,390,581,049	\$7,438,519,504

Note: Results may not add due to rounding.

⁽¹⁾ *Included in valuation value of assets.*

⁽²⁾ *Both December 31, 2017 and December 31, 2016 information reflect a "true-up" of retired reserves.*

⁽³⁾ *Not included in valuation value of assets.*

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT I

Development of Unfunded Actuarial Accrued Liability

	Year Ended December 31, 2017
1. Unfunded actuarial accrued liability at beginning of year	\$1,187,436,609
2. Total Normal Cost at middle of year ⁽¹⁾	220,685,740
3. Expected administrative expenses	8,785,414
4. Expected employer and member contributions	(394,614,328)
5. Interest (whole year on (1) plus half year on (2) + (3) + (4))	<u>77,643,016</u>
6. Expected unfunded actuarial accrued liability at end of year	\$1,099,936,451
7. Actuarial (gain)/loss due to all changes:	
(a) Investment return more than expected	\$(76,209,273)
(b) Actual contributions greater than expected due to delay in implementation of rates	(17,598,527)
(c) Gain from additional UAAL contributions	(334,623)
(d) Higher than expected individual salary increases	59,574,068
(e) Higher than expected COLA increases for retirees and beneficiaries	19,930,011
(f) Mortality loss on retirees and beneficiaries (fewer deaths than expected)	8,816,238
(g) Retirement experience gain on actives (later retirements than expected)	(25,633,003)
(h) Other experience gain ⁽²⁾	<u>(9,125,613)</u>
(i) Total changes	<u>\$(40,580,722)</u>
8. Unfunded actuarial accrued liability at end of year	\$1,059,355,729

Note: The "net loss from other experience" of \$53,561,701 shown in Section 2, Chart 10 is equal to the sum of items 7(d) through 7(h).

⁽¹⁾ *Excludes administrative expense load.*

⁽²⁾ *Other differences in actual versus expected experience including (but not limited to) disability, withdrawal and leave cashout experience.*

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT J

Table of Amortization Bases

	Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Annual Payment⁽¹⁾
Cost Groups #1 and #2	December 31, 2007	Restart of Amortization	\$785,069,153	\$451,570,768	5	\$100,481,011
General County and	December 31, 2008	Actuarial Loss	80,033,199	65,014,920	9	8,605,931
Small Districts	December 31, 2009	Actuarial Loss	165,041,323	140,650,587	10	17,040,368
	December 31, 2009	Assumption Change ⁽²⁾	39,563,826	33,716,861	10	4,084,929
	December 31, 2009	Depooling Implementation	(74,701,913)	(63,662,043)	10	(7,712,905)
	December 31, 2010	Actuarial Loss	153,070,543	135,519,666	11	15,177,890
	December 31, 2011	Actuarial Loss	94,750,078	86,434,514	12	9,022,488
	December 31, 2012	Actuarial Loss	117,029,116	109,247,412	13	10,701,907
	December 31, 2012	Assumption Change ⁽²⁾	288,802,882	269,599,297	13	26,410,022
	December 31, 2013	Actuarial Gain	(134,810,112)	(128,453,911)	14	(11,877,911)
	December 31, 2013	Assumption Change ⁽³⁾	(107,553,289)	(102,482,228)	14	(9,476,355)
	December 31, 2014	Actuarial Gain	(171,898,812)	(166,348,135)	15	(14,592,489)
	December 31, 2015	Actuarial Gain	(105,003,533)	(102,746,884)	16	(8,587,918)
	December 31, 2015	Assumption Change ⁽²⁾	39,814,884	38,959,215	16	3,256,338
	December 31, 2016	Actuarial Gain	(28,579,026)	(28,317,823)	17	(2,263,817)
	December 31, 2017	Actuarial Gain	(17,937,638)	<u>(17,937,638)</u>	18	<u>(1,376,161)</u>
Total for Cost Groups #1 and #2				\$720,764,577		\$138,893,328

Note: Results may not add due to rounding.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT J (continued)

Table of Amortization Bases

	Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Annual Payment⁽¹⁾
Cost Group #3	December 31, 2007	Restart of Amortization	\$36,185,000	\$20,813,566	5	\$4,631,319
Central Contra Costa	December 31, 2008	Actuarial Loss	3,709,835	3,013,682	9	398,917
Sanitary District	December 31, 2009	Actuarial Loss	10,118,261	8,622,927	10	1,044,701
	December 31, 2009	Assumption Change ⁽²⁾	2,003,000	1,706,985	10	206,808
	December 31, 2009	Depooling Implementation	20,037,235	17,076,020	10	2,068,826
	December 31, 2010	Actuarial Loss	18,178,489	16,094,167	11	1,802,510
	December 31, 2010	Assumption Change ⁽³⁾	11,479,648	10,163,406	11	1,138,278
	December 31, 2011	Actuarial Loss	10,514,535	9,591,747	12	1,001,237
	December 31, 2012	Actuarial Loss	12,564,241	11,728,798	13	1,148,956
	December 31, 2012	Assumption Change ⁽²⁾	22,455,342	20,962,202	13	2,053,463
	December 31, 2012	UAAL Prepayment	(4,666,477)	(4,356,185)	13	(426,733)
	December 31, 2013	Actuarial Loss	582,962	555,476	14	51,364
	December 31, 2013	Assumption Change ⁽³⁾	(14,950,866)	(14,245,943)	14	(1,317,298)
	December 31, 2013	UAAL Prepayment	(4,662,899)	(4,443,047)	14	(410,841)
	December 31, 2014	Actuarial Gain	(11,848,823)	(11,466,221)	15	(1,005,846)
	December 31, 2014	UAAL Prepayment	(2,331,896)	(2,256,598)	15	(197,955)
	December 31, 2015	Actuarial Gain	(6,504,510)	(6,364,720)	16	(531,984)
	December 31, 2015	Assumption Change ⁽²⁾	44,220	43,270	16	3,617
	December 31, 2016	Actuarial Gain	(1,522,932)	(1,509,013)	17	(120,635)
	December 31, 2017	Actuarial Gain	(1,621,926)	<u>(1,621,926)</u>	18	<u>(124,433)</u>
Total for Cost Group #3				\$74,108,590		\$11,414,271

Note: Results may not add due to rounding.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT J (continued)

Table of Amortization Bases

	Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Annual Payment⁽¹⁾
Cost Group #4	December 31, 2007	Restart of Amortization	\$7,770,000	\$4,469,294	5	\$994,482
Contra Costa Housing Authority	December 31, 2008	Actuarial Loss	1,573,513	1,278,242	9	169,199
	December 31, 2009	Actuarial Loss	1,277,079	1,088,345	10	131,857
	December 31, 2009	Assumption Change ⁽²⁾	425,000	362,191	10	43,881
	December 31, 2009	Depooling Implementation	(189,275)	(161,303)	10	(19,542)
	December 31, 2010	Actuarial Loss	619,697	548,643	11	61,447
	December 31, 2010	Assumption Change ⁽³⁾	(920,656)	(815,095)	11	(91,289)
	December 31, 2011	Actuarial Loss	1,059,328	966,358	12	100,874
	December 31, 2012	Actuarial Loss	1,912,999	1,785,796	13	174,937
	December 31, 2012	Assumption Change ⁽²⁾	3,722,862	3,475,315	13	340,443
	December 31, 2013	Actuarial Gain	(2,220,704)	(2,115,999)	14	(195,663)
	December 31, 2013	Assumption Change ⁽³⁾	(1,077,289)	(1,026,496)	14	(94,918)
	December 31, 2014	Actuarial Gain	(1,360,021)	(1,316,105)	15	(115,452)
	December 31, 2015	Actuarial Gain	(875,294)	(856,483)	16	(71,588)
	December 31, 2015	Assumption Change ⁽²⁾	432,801	423,500	16	35,397
	December 31, 2016	Actuarial Gain	(297,092)	(294,376)	17	(23,533)
	December 31, 2017	Actuarial Loss	53,895	<u>53,895</u>	18	<u>4,135</u>
Total for Cost Group #4				\$7,865,723		\$1,444,667

Note: Results may not add due to rounding.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT J (continued)

Table of Amortization Bases

	Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Annual Payment⁽¹⁾
Cost Group #5	December 31, 2007	Restart of Amortization	\$(1,011,000)	\$(581,526)	5	\$(129,398)
Contra Costa County Fire	December 31, 2008	Actuarial Loss	45,963	37,338	9	4,942
Protection District	December 31, 2009	Actuarial Loss	1,614,180	1,375,627	10	166,663
	December 31, 2009	Assumption Change ⁽²⁾	336,000	286,344	10	34,692
	December 31, 2009	Depooling Implementation	2,142,538	1,825,902	10	221,215
	December 31, 2010	Actuarial Loss	2,722,306	2,410,170	11	269,933
	December 31, 2011	Actuarial Loss	1,350,620	1,232,085	12	128,612
	December 31, 2012	Actuarial Loss	1,787,426	1,668,573	13	163,454
	December 31, 2012	Assumption Change ⁽²⁾	3,184,172	2,972,444	13	291,181
	December 31, 2013	Actuarial Gain	(2,500,665)	(2,382,761)	14	(220,330)
	December 31, 2013	Assumption Change ⁽³⁾	(985,653)	(939,180)	14	(86,844)
	December 31, 2014	Actuarial Gain	(2,215,758)	(2,144,210)	15	(188,096)
	December 31, 2015	Actuarial Gain	(756,551)	(740,292)	16	(61,876)
	December 31, 2015	Assumption Change ⁽²⁾	355,946	348,296	16	29,112
	December 31, 2016	Actuarial Loss	1,591,375	1,576,830	17	126,057
	December 31, 2017	Actuarial Loss	1,476,313	<u>1,476,313</u>	18	<u>113,262</u>
Total for Cost Group #5				\$8,421,955		\$862,579

Note: Results may not add due to rounding.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT J (continued)

Table of Amortization Bases

	Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Annual Payment⁽¹⁾
Cost Group #6						
Small Districts (General Non-enhanced)						
	December 31, 2017	Actuarial Surplus	\$(111,682)	<u>\$(111,682)</u>	N/A	<u>\$0⁽⁶⁾</u>
Total for Cost Group #6				<u>\$(111,682)</u>		<u>\$0</u>

Note: Results may not add due to rounding.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT J (continued)

Table of Amortization Bases

	Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Annual Payment⁽¹⁾
Cost Groups #7 and #9	December 31, 2007	Restart of Amortization	\$127,662,439	\$73,431,271	5	\$16,339,517
County Safety	December 31, 2008	Actuarial Loss	25,619,265	20,811,794	9	2,754,827
	December 31, 2009	Actuarial Loss	55,134,940	46,986,788	10	5,692,633
	December 31, 2009	Assumption Change ⁽²⁾	11,076,665	9,439,693	10	1,143,656
	December 31, 2009	Depooling Implementation	23,852,078	20,327,083	10	2,462,706
	December 31, 2010	Actuarial Loss	57,287,975	50,719,408	11	5,680,457
	December 31, 2011	Actuarial Loss	45,209,350	41,241,636	12	4,305,018
	December 31, 2012	Actuarial Loss	53,258,503	49,717,146	13	4,870,305
	December 31, 2012	Assumption Change ⁽²⁾	138,353,562	129,153,916	13	12,651,954
	December 31, 2013	Actuarial Gain	(35,024,912)	(33,373,513)	14	(3,085,991)
	December 31, 2013	Assumption Change ⁽³⁾	(43,771,706)	(41,707,901)	14	(3,856,658)
	December 31, 2014	Actuarial Gain	(61,815,393)	(59,819,350)	15	(5,247,509)
	December 31, 2014	Assumption Change ⁽⁴⁾	(51,701)	(50,031)	15	(4,389)
	December 31, 2015	Actuarial Gain	(58,489,966)	(57,232,948)	16	(4,783,715)
	December 31, 2015	Assumption Change ⁽²⁾	39,291,409	38,446,990	16	3,213,524
	December 31, 2016	Actuarial Gain	(13,557,811)	(13,433,897)	17	(1,073,949)
	December 31, 2017	Actuarial Gain	(8,178,240)	<u>(8,178,240)</u>	18	<u>(627,428)</u>
Total for Cost Groups #7 and #9				\$266,479,844		\$40,434,958

Note: Results may not add due to rounding.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT J (continued)

Table of Amortization Bases

	Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Annual Payment⁽¹⁾
Cost Group #8	December 31, 2007	Restart of Amortization	\$124,138,710	\$71,404,427	5	\$15,888,515
Contra Costa and East Fire	December 31, 2008	Actuarial Loss	6,780,436	5,508,083	9	729,097
Protection Districts	December 31, 2009	Actuarial Loss	27,018,706	23,025,730	10	2,789,657
	December 31, 2009	Assumption Change ⁽²⁾	4,945,000	4,214,200	10	510,567
	December 31, 2009	Depooling Implementation	47,818,666	40,751,754	10	4,937,234
	December 31, 2010	Actuarial Loss	38,165,445	33,789,443	11	3,784,340
	December 31, 2010	Assumption Change ⁽³⁾	(1,599,051)	(1,415,706)	11	(158,556)
	December 31, 2011	Actuarial Loss	26,533,166	24,204,533	12	2,526,596
	December 31, 2012	Actuarial Loss	31,501,440	29,406,791	13	2,880,697
	December 31, 2012	Assumption Change ⁽²⁾	68,193,356	63,658,924	13	6,236,046
	December 31, 2013	Actuarial Gain	(22,661,640)	(21,593,160)	14	(1,996,682)
	December 31, 2013	Assumption Change ⁽³⁾	(17,910,676)	(17,066,200)	14	(1,578,082)
	December 31, 2014	Actuarial Gain	(29,217,962)	(28,274,503)	15	(2,480,312)
	December 31, 2015	Actuarial Gain	(19,005,510)	(18,597,059)	16	(1,554,403)
	December 31, 2015	Assumption Change ⁽²⁾	24,296,846	23,774,678	16	1,987,165
	December 31, 2016	Actuarial Gain	(8,297,685)	(8,221,847)	17	(657,281)
	December 31, 2017	Actuarial Gain	(10,658,502)	<u>(10,658,502)</u>	18	<u>(817,711)</u>
Total for Cost Group #8				\$213,911,585		\$33,026,887

Note: Results may not add due to rounding.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT J (continued)

Table of Amortization Bases

	Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Annual Payment⁽¹⁾
Cost Group #10	December 31, 2007	Restart of Amortization	\$(2,591,000)	\$(1,490,340)	5	\$(331,622)
Moraga-Orinda	December 31, 2008	Actuarial Loss	2,002,150	1,626,446	9	215,290
Fire District	December 31, 2009	Actuarial Loss	5,671,684	4,833,491	10	585,596
	December 31, 2009	Assumption Change ⁽²⁾	1,012,000	862,441	10	104,488
	December 31, 2009	Depooling Implementation	4,873,631	4,153,378	10	503,198
	December 31, 2010	Actuarial Loss	5,334,964	4,723,264	11	528,995
	December 31, 2010	Assumption Change ⁽³⁾	806,018	713,601	11	79,922
	December 31, 2011	Actuarial Loss	6,791,005	6,195,005	12	646,667
	December 31, 2012	Actuarial Loss	8,924,598	8,331,168	13	816,124
	December 31, 2012	Assumption Change ⁽²⁾	12,149,892	11,342,000	13	1,111,065
	December 31, 2013	Actuarial Gain	(1,027,440)	(978,997)	14	(90,526)
	December 31, 2013	Assumption Change ⁽³⁾	(3,613,981)	(3,443,584)	14	(318,422)
	December 31, 2014	Actuarial Gain	(4,813,045)	(4,657,630)	15	(408,579)
	December 31, 2015	Actuarial Gain	(8,490,806)	(8,308,329)	16	(694,437)
	December 31, 2015	Assumption Change ⁽²⁾	3,844,347	3,761,727	16	314,417
	December 31, 2016	Actuarial Loss	1,028,690	1,019,288	17	81,485
	December 31, 2017	Actuarial Gain	(422,995)	<u>(422,995)</u>	18	<u>(32,452)</u>
Total for Cost Group #10				\$28,259,935		\$3,111,209

Note: Results may not add due to rounding.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT J (continued)

Table of Amortization Bases

	Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Annual Payment⁽¹⁾
Cost Group #11	December 31, 2007	Restart of Amortization	\$58,766,000	\$33,802,128	5	\$7,521,461
San Ramon Valley	December 31, 2008	Actuarial Loss	10,216,694	8,299,526	9	1,098,596
Fire District	December 31, 2009	Actuarial Loss	9,262,105	7,893,299	10	956,304
	December 31, 2009	Assumption Change ⁽²⁾	2,453,000	2,090,482	10	253,270
	December 31, 2009	Depooling Implementation	(20,174,500)	(17,192,999)	10	(2,082,999)
	December 31, 2010	Actuarial Loss	6,585,812	5,830,691	11	653,024
	December 31, 2010	Assumption Change ⁽³⁾	5,093,420	4,509,415	11	505,044
	December 31, 2011	Actuarial Loss	5,513,071	5,029,227	12	524,977
	December 31, 2012	Actuarial Loss	14,600,741	13,629,883	13	1,335,187
	December 31, 2012	Assumption Change ⁽²⁾	26,672,143	24,898,612	13	2,439,075
	December 31, 2013	Actuarial Gain	(4,492,900)	(4,281,063)	14	(395,862)
	December 31, 2013	Assumption Change ⁽³⁾	(12,984,002)	(12,371,816)	14	(1,144,000)
	December 31, 2014	Actuarial Gain	(13,850,852)	(13,403,603)	15	(1,175,799)
	December 31, 2015	Actuarial Gain	(9,008,582)	(8,814,977)	16	(736,784)
	December 31, 2015	Assumption Change ⁽²⁾	5,533,144	5,414,230	16	452,539
	December 31, 2016	Actuarial Loss	2,020,042	2,001,580	17	160,013
	December 31, 2017	UAAL Prepayment	(303,806)	(303,806)	18	(23,308)
	December 31, 2017	Actuarial Gain	(1,837,378)	<u>(1,837,378)</u>	18	<u>(140,962)</u>
Total for Cost Group #11				\$55,193,431		\$10,199,776

Note: Results may not add due to rounding.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT J (continued)

Table of Amortization Bases

	Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Annual Payment⁽¹⁾
Cost Group #12	December 31, 2007	Restart of Amortization	\$3,960,000	\$2,277,787	5	\$506,840
Rodeo-Hercules Fire	December 31, 2008	Actuarial Loss	957,150	777,540	9	102,922
Protection District	December 31, 2009	Actuarial Loss	2,872,360	2,447,867	10	296,569
	December 31, 2009	Assumption Change ⁽²⁾	1,154,000	983,455	10	119,149
	December 31, 2009	Depooling Implementation	(1,809,374)	(1,541,975)	10	(186,816)
	December 31, 2010	Actuarial Loss	1,502,503	1,330,228	11	148,982
	December 31, 2010	Assumption Change ⁽³⁾	662,085	586,171	11	65,650
	December 31, 2011	Actuarial Loss	2,067,217	1,885,792	12	196,849
	December 31, 2012	Actuarial Loss	2,246,131	2,096,777	13	205,401
	December 31, 2012	Assumption Change ⁽²⁾	3,018,796	2,818,065	13	276,058
	December 31, 2013	Actuarial Loss	413,088	393,611	14	36,397
	December 31, 2013	Assumption Change ⁽³⁾	(1,169,821)	(1,114,665)	14	(103,071)
	December 31, 2014	Actuarial Loss	315,937	305,735	15	26,820
	December 31, 2015	Actuarial Gain	(990,379)	(969,095)	16	(81,000)
	December 31, 2015	Assumption Change ⁽²⁾	775,874	759,200	16	63,456
	December 31, 2016	Actuarial Gain	(270,731)	(268,257)	17	(21,445)
	December 31, 2017	Actuarial Gain	(836,969)	<u>(836,969)</u>	18	<u>(64,212)</u>
Total for Cost Group #12				\$11,931,268		\$1,588,549

Note: Results may not add due to rounding.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT J (continued)

Table of Amortization Bases

	Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Annual Payment⁽¹⁾
Special Adjustments⁽⁵⁾	December 31, 2007	County General POBs	\$(453,973,319)	\$(261,123,984)	5	\$(58,103,854)
	December 31, 2007	Moraga General POBs	(701,412)	(403,450)	5	(89,773)
	December 31, 2007	CCCFPD Safety POBs	(127,509,711)	(73,343,174)	5	(16,319,914)
	December 31, 2011	First Five UAAL Prepayment	(1,794,205)	(986,428)	5	(233,191)
	December 31, 2017	LAFCO UAAL Prepayment	(30,817)	<u>(30,817)</u>	18	<u>(2,364)</u>
Total for Special Adjustments				\$(335,887,854)		\$(74,749,096)
Terminated Employers⁽⁷⁾				\$8,418,356		

Note: Results may not add due to rounding.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT J (continued)

Table of Amortization Bases

	Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Annual Payment⁽¹⁾
All Cost Groups Combined	December 31, 2007	Restart of Amortization	\$1,139,949,302	\$655,697,374	5	\$145,902,125
	December 31, 2007	County General POBs ⁽⁵⁾	(453,973,319)	(261,123,984)	5	(58,103,854)
	December 31, 2007	Moraga General POBs ⁽⁵⁾	(701,412)	(403,450)	5	(89,773)
	December 31, 2007	CCCFPD Safety POBs ⁽⁵⁾	(127,509,711)	(73,343,174)	5	(16,319,914)
	December 31, 2008	Actuarial Loss	130,938,206	106,367,571	9	14,079,721
	December 31, 2009	Actuarial Loss	278,010,637	236,924,660	10	28,704,348
	December 31, 2009	Assumption Change ⁽²⁾	62,968,491	53,662,653	10	6,501,440
	December 31, 2009	Depooling Implementation	1,849,086	1,575,817	10	190,917
	December 31, 2010	Actuarial Loss	283,467,735	250,965,679	11	28,107,578
	December 31, 2010	Assumption Change ⁽³⁾	15,521,464	13,741,792	11	1,539,049
	December 31, 2011	Actuarial Loss	193,788,371	176,780,896	12	18,453,318
	December 31, 2011	First Five UAAL Prepayment ⁽⁵⁾	(1,794,205)	(986,428)	5	(233,191)
	December 31, 2012	Actuarial Loss	243,825,195	227,612,345	13	22,296,968
	December 31, 2012	Assumption Change ⁽²⁾	566,553,007	528,880,776	13	51,809,307
	December 31, 2012	Sanitary UAAL Prepayment	(4,666,477)	(4,356,185)	13	(426,733)
	December 31, 2013	Actuarial Gain	(201,742,323)	(192,230,317)	14	(17,775,204)
	December 31, 2013	Assumption Change ⁽³⁾	(204,017,283)	(194,398,013)	14	(17,975,648)
	December 31, 2013	Sanitary UAAL Prepayment	(4,662,899)	(4,443,047)	14	(410,841)
	December 31, 2014	Actuarial Gain	(296,704,729)	(287,124,022)	15	(25,187,262)
	December 31, 2014	Assumption Change ⁽⁴⁾	(51,701)	(50,031)	15	(4,389)
	December 31, 2014	Sanitary UAAL Prepayment	(2,331,896)	(2,256,598)	15	(197,955)

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT J (continued)

Table of Amortization Bases

	Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Annual Payment⁽¹⁾
All Cost Groups Combined	December 31, 2015	Actuarial Gain	\$(209,125,132)	\$(204,630,787)	16	\$(17,103,705)
(continued)	December 31, 2015	Assumption Change ⁽²⁾	114,389,471	111,931,107	16	9,355,565
	December 31, 2016	Actuarial Gain	(47,885,171)	(47,447,516)	17	(3,793,105)
	December 31, 2017	San Ramon UAAL Prepayment	(303,806)	(303,806)	18	(23,308)
	December 31, 2017	LAFCO UAAL Prepayment ⁽⁵⁾	(30,817)	(30,817)	18	(2,364)
	December 31, 2017	Actuarial Gain	(39,963,440)	(39,963,440)	18	(3,065,962)
	December 31, 2017	CG #6 Actuarial Surplus	(111,682)	<u>(111,682)</u>	N/A	<u>0</u> ⁽⁶⁾
Total for All Cost Groups				\$1,050,937,373		\$166,227,128
Terminated Employers⁽⁷⁾				<u>8,418,356</u>		
Total CCCERA				\$1,059,355,729		

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT J (continued)

Table of Amortization Bases

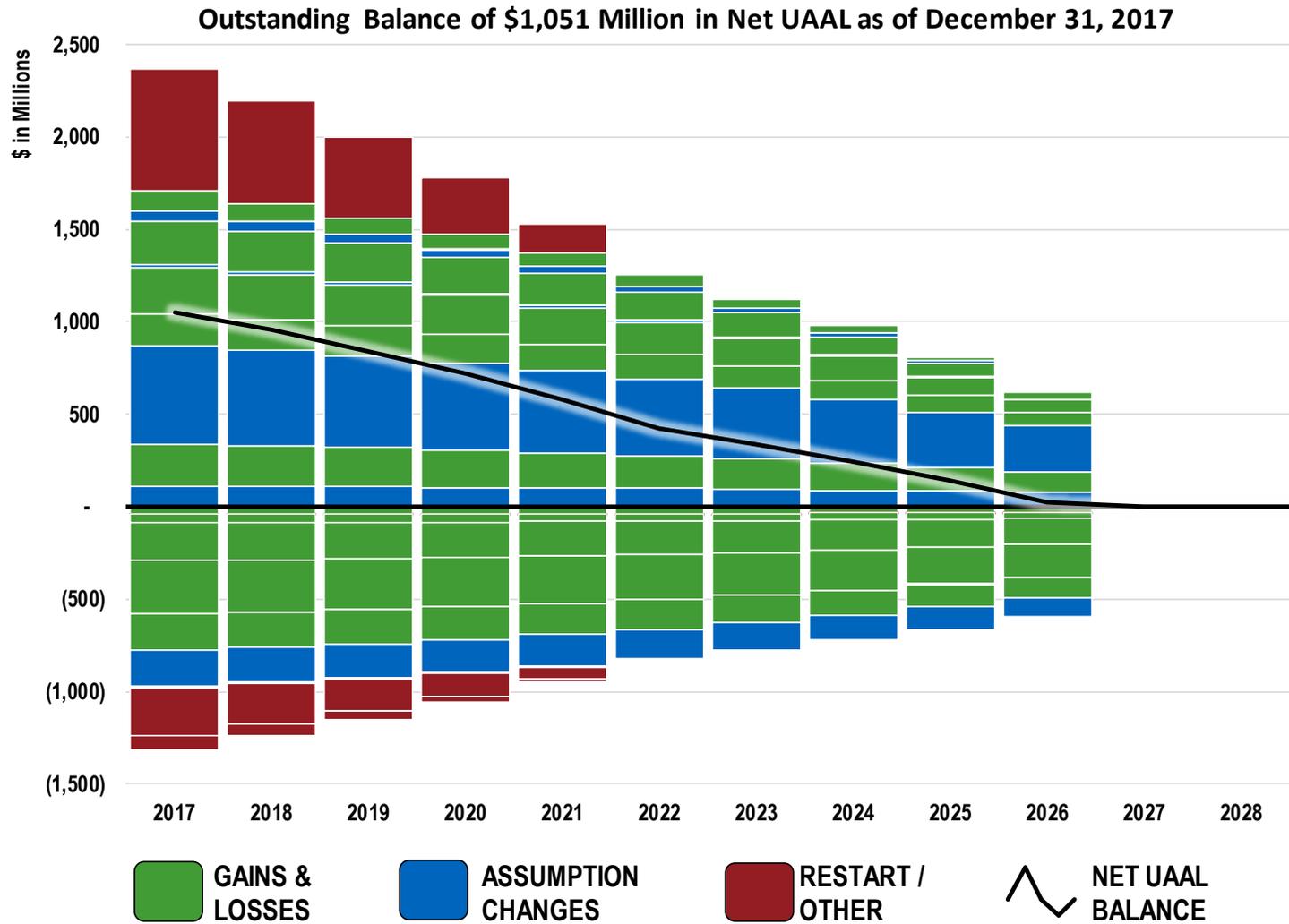
Note: Results may not add due to rounding.

- (1) As of middle of year. The annual payment amounts shown for the Special Adjustments represent the credit allocated to the employer to reflect the receipt of the proceeds for Pension Obligation Bonds (POBs) or any other special contributions. These adjustments serve to reduce the UAAL contribution rate for these employers. The cost of debt service associated with the POBs is not reflected in this report.*
- (2) Changes in actuarial assumptions and methods from actuarial experience study.*
- (3) The Board approved changes in actuarial assumptions. Effective with the December 31, 2010 valuation, leave cashout (terminal pay) assumptions are now based on cost groups. Effective with the December 31, 2013 valuation, the leave cashout assumptions were reduced to reflect AB 197.*
- (4) The Board approved changes in actuarial assumptions. Effective with the December 31, 2014 valuation, leave cashout (terminal pay) assumptions were eliminated for Cost Group #9.*
- (5) Includes remaining balance of POBs and any other special contributions made by the County (including Courts), First 5 – Children & Families Commission, Local Agency Formation Commission, or Moraga-Orinda Fire District that have been allocated to the County General cost groups or for Contra Costa Fire Protection District that have been allocated to their Safety cost group.*
- (6) Consistent with CCCERA's Actuarial Funding Policy, all prior UAAL layers are considered fully amortized due to surplus.*
- (7) Starting with the December 31, 2016 valuation, the three terminated employers (i.e., Diablo Water District, Delta Diablo Sanitation District and City of Pittsburg) have been moved from Cost Groups #1, #2 and #7 to their own Terminated Employers Cost Group.*

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT K

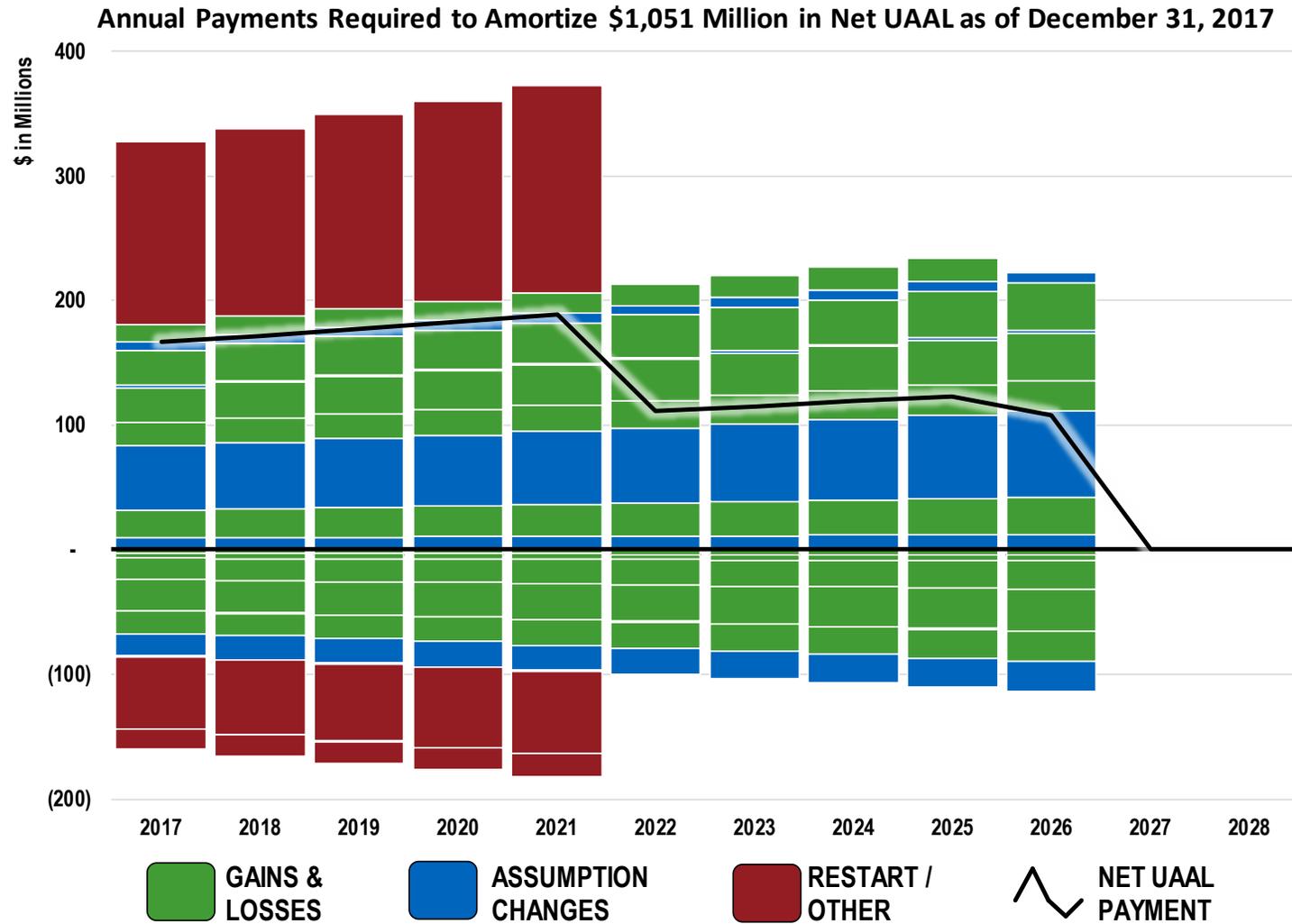
Projection of UAAL Outstanding Balances and Payments (Excludes Terminated Employers)



SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT K (continued)

Projection of UAAL Outstanding Balances and Payments (Excludes Terminated Employers)



SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT L

Section 415 Limitations

Section 415 of the Internal Revenue Code (IRC) specifies the maximum benefits that may be paid to an individual from a defined benefit plan and the maximum amounts that may be allocated each year to an individual's account in a defined contribution plan.

A qualified pension plan may not pay benefits in excess of the Section 415 limits. The ultimate penalty for non-compliance is disqualification: active participants could be taxed on their vested benefits and the IRS may seek to tax the income earned on the plan's assets.

In particular, Section 415(b) of the IRC limits the maximum annual benefit payable at the Normal Retirement Age to a dollar limit of \$160,000 indexed for inflation. That limit is \$220,000 for 2018. Normal Retirement Age for these purposes is age 62. These are the limits in simplified terms. They must generally be adjusted based on each participant's circumstances, for such things as age at

retirement, form of benefits chosen and after tax contributions. Limits are also affected by the "grandfather" election under Section 415(b)(10).

For non-PEPRA members, benefits in excess of the limits may be paid through a qualified governmental excess plan that meets the requirements of Section 415(m).

Legal Counsel's review and interpretation of the law and regulations should be sought on any questions in this regard.

Contribution rates determined in this valuation have not been reduced for the Section 415 limitations. However, it is anticipated that PEPRA members will not be limited in the future due to the PEPRA compensation limit applied in the determination of their benefit. Actual limitations will result in actuarial gains as they occur.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

EXHIBIT M

Definitions of Pension Terms

The following list defines certain technical terms for the convenience of the reader:

Assumptions or Actuarial Assumptions:

The estimates on which the cost of the Plan is calculated including:

- (a) Investment return — the rate of investment yield that the Plan will earn over the long-term future;
- (b) Mortality rates — the death rates of employees and pensioners; life expectancy is based on these rates;
- (c) Retirement rates — the rate or probability of retirement at a given age; and
- (d) Turnover rates — the rates at which employees of various ages are expected to leave employment for reasons other than death, disability, or retirement.

Normal Cost:

The amount of contributions required to fund the level cost allocated to the current year of service.

Actuarial Accrued Liability For Actives:

The equivalent of the accumulated normal costs allocated to the years before the valuation date.

Actuarial Accrued Liability For Pensioners:

The single sum value of lifetime benefits to existing pensioners. This sum takes account of life expectancies appropriate to the ages of the pensioners and of the interest that the sum is expected to earn before it is entirely paid out in benefits.

Unfunded Actuarial Accrued Liability:

The extent to which the actuarial accrued liability of the Plan exceeds the assets of the Plan.

Amortization of the Unfunded Actuarial Accrued Liability:

Payments made over a period of years equal in value to the Plan's unfunded actuarial accrued liability.

SECTION 3: Supplemental Information for the Contra Costa County Employees' Retirement Association

Investment Return:	The rate of earnings of the Plan from its investments, including interest, dividends and capital gain and loss adjustments, computed as a percentage of the average value of the fund. For actuarial purposes, the investment return often reflects a smoothing of the market gains and losses to avoid significant swings in the value of assets from one year to the next.
Payroll or Compensation:	Payroll for pension purposes expected to be paid to active members during the twelve months following the valuation date. Only pay that would possibly go into the determination of retirement benefits is included.
Asset Volatility Ratio:	Equal to the market value of assets divided by total projected payroll. This provides an indication of the potential contribution volatility for any given level of investment volatility.
Liability Volatility Ratio:	Equal to the Actuarial Accrued Liability divided by total projected payroll. This provides an indication of the longer-term potential for contribution volatility for any given level of investment volatility. It also indicates how volatile contributions will be in response to changes in the Actuarial Accrued Liability due to actual experience or to changes in actuarial assumptions.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

EXHIBIT I

Summary of Actuarial Valuation Results

The valuation was made with respect to the following data supplied to us:

1. Retired members as of the valuation date (including 1,398 beneficiaries in pay status)	9,267
2. Members inactive during year ended December 31, 2017 with vested rights	3,327
3. Members active during the year ended December 31, 2017	10,038

The actuarial factors as of the valuation date are as follows (amounts in 000s):

1. Normal cost ⁽¹⁾	\$246,099
2. Present value of future benefits	10,951,764
3. Present value of future normal costs	1,712,517
4. Actuarial accrued liability ⁽²⁾	9,239,247
Retired members and beneficiaries	\$5,873,018
Inactive members with vested rights	295,691
Active members	3,070,538
5. Valuation value of assets ⁽³⁾ (\$8,390,581 at market value as reported by CCCERA)	8,179,891
6. Unfunded actuarial accrued liability	\$1,059,356

⁽¹⁾ *Includes administrative expense load*

⁽²⁾ *Excludes liabilities for non-valuation reserves*

⁽³⁾ *Excludes assets for non-valuation reserves*

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

EXHIBIT I (continued)

Summary of Actuarial Valuation Results

The determination of the recommended average employer contribution is as follows
(amounts in 000s):

	Dollar Amount	% of Payroll
1. Total normal cost	\$246,099	28.59%
2. Expected employee contributions	<u>(103,551)</u>	<u>(12.03%)</u>
3. Employer normal cost: (1) + (2)	\$142,548	16.56%
4. Amortization of unfunded actuarial accrued liability	<u>167,891</u>	<u>19.51%</u>
5. Total recommended average employer contribution: (3) + (4)	\$310,439	36.07%
6. Projected payroll	\$860,625	

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

EXHIBIT II

Actuarial Assumptions and Methods

Rationale for Assumptions:

The information and analysis used in selecting each demographic (non-economic) assumption that has a significant effect on this actuarial valuation is shown in the January 1, 2012 through December 31, 2014 Actuarial Experience Study dated June 1, 2016. The information and analysis used in selecting each economic assumption is shown in our Review of Economic Actuarial Assumptions dated April 19, 2016. Unless otherwise noted, all actuarial assumptions and methods shown below apply to both PEPRA and Non-PEPRA members.

Economic Assumptions

Net Investment Return:

7.00%, net of investment expenses

Administrative Expenses:

1.13% of payroll allocated to both the employer and the member based on normal cost (before expenses) for the employer and member. This assumption changes each year based on the actual administrative expenses as a percent of actual compensation during the calendar year leading up to the valuation date.

Employee Contribution Crediting Rate:

7.00%, compounded semi-annually

Consumer Price Index:

Increase of 2.75% per year; retiree COLA increases due to CPI subject to a 3.00% maximum change per year (valued as a 2.75% increase) except for Tier 3 and PEPRA Tier 5 disability benefits and Tier 2 benefits which are subject to a 4.00% maximum change per year (valued as a 2.75% increase). Safety Tier C benefits, Safety PEPRA Tier E benefits and benefits for PEPRA Tier 4 and Tier 5 members covered under certain memoranda of understanding are subject to a 2.00% maximum change per year. For members that have COLA banks, they are reflected in projected future COLAs.

The actual COLA granted by CCCERA on April 1, 2018 has been reflected for nonactive members in the December 31, 2017 valuation.

Payroll Growth:

Inflation of 2.75% per year plus “across the board” real salary increases of 0.50% per year.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Increase in Internal Revenue

Code Section 401(a)(17)

Compensation Limit:

Increase of 2.75% per year from the valuation date.

Increase in Section 7522.10

Compensation Limit:

Increase of 2.75% per year from the valuation date.

Individual Salary Increases:

Annual Rate of Compensation Increase

Inflation: 2.75% 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%	10.50%
1	7.25	7.25
2	5.25	5.75
3	3.75	4.50
4	2.75	3.00
5	2.25	1.75
6	1.75	1.25
7	1.50	1.20
8	1.25	1.15
9	1.20	1.10
10	1.15	1.05
11	1.10	1.00
12	1.00	0.95
13	0.90	0.85
14	0.80	0.80
15	0.75	0.75
16	0.75	0.75
17	0.75	0.75
18	0.75	0.75
19	0.75	0.75
20 or more	0.75	0.75

The average total assumed salary increase for active members in the December 31, 2017 actuarial valuation is 5.4%.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Demographic Assumptions

Post – Retirement Mortality Rates:

- Healthy:* For General Members: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table, projected generationally with the two-dimensional MP-2015 projection scale.
For Safety Members: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set back three years, projected generationally with the two-dimensional MP-2015 projection scale.
- Disabled:* For General Members: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set forward eight years, projected generationally with the two-dimensional MP-2015 projection scale.
For Safety Members: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set forward three years, projected generationally with the two-dimensional MP-2015 projection scale.
- Beneficiaries:* Beneficiaries are assumed to have the same mortality as a General Member of the opposite sex who has taken a service (non-disability) retirement.

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.

- Member Contribution Rates:* For General Members: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table, projected to 2034 with the two-dimensional MP-2015 projection scale, weighted 30% male and 70% female.
For Safety Members: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set back three years, projected to 2034 with the two-dimensional MP-2015 projection scale, weighted 85% male and 15% female.

- Pre – Retirement Mortality Rates:** Headcount-Weighted RP-2014 Employee Mortality Table times 75%, projected generationally with the two-dimensional MP-2015 projection scale.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Termination Rates Before Retirement:

Age	Rate (%)	
	Mortality⁽¹⁾	
	Male	Female
25	0.05	0.02
30	0.05	0.02
35	0.05	0.03
40	0.06	0.04
45	0.09	0.06
50	0.16	0.10
55	0.26	0.16
60	0.42	0.23
65	0.73	0.33

⁽¹⁾ All pre-retirement deaths are assumed to be non-service connected. Note that generational projections beyond the base year (2014) are not reflected in the above mortality rates.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Termination Rates Before Retirement (continued):

Age	Rate (%) Disability		
	General Tier 1 and Tier 4 ⁽¹⁾	General Tier 3 and Tier 5 ⁽²⁾	Safety ⁽³⁾
20	0.01	0.01	0.02
25	0.02	0.02	0.22
30	0.04	0.03	0.42
35	0.08	0.05	0.56
40	0.22	0.08	0.66
45	0.36	0.13	1.00
50	0.52	0.16	2.88
55	0.60	0.20	4.60
60	0.60	0.28	5.00
65	0.60	0.32	5.00
70	0.60	0.32	5.00

⁽¹⁾ 65% of General Tier 1 and Tier 4 disabilities are assumed to be duty disabilities. The other 35% are assumed to be ordinary disabilities.
⁽²⁾ 30% of General Tier 3 and Tier 5 disabilities are assumed to be duty disabilities. The other 70% are assumed to be ordinary disabilities.
⁽³⁾ 100% of Safety disabilities are assumed to be duty disabilities.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Termination Rates Before Retirement (continued):

Years of Service	Rate (%)	
	Withdrawal ⁽¹⁾	
	General	Safety
Less than 1	13.50	13.00
1	9.25	8.00
2	9.00	7.00
3	6.00	5.50
4	4.50	3.75
5	4.25	3.25
6	3.75	3.00
7	3.50	2.75
8	3.25	2.50
9	3.00	2.25
10	2.75	2.00
11	2.50	1.90
12	2.40	1.80
13	2.30	1.70
14	2.20	1.60
15	2.10	1.50
16	2.00	1.40
17	2.00	1.30
18	2.00	1.20
19	1.75	1.10
20 or more	1.50	1.00

⁽¹⁾ The member is assumed to receive the greater of the member's contribution balance or a deferred retirement benefit. No withdrawal is assumed after a member is first assumed to retire.

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Retirement Rates (General):

Rates (%)				
Age	General Tier 1 (Enhanced)	General Tier 3 (Enhanced)	General Tier 1 (Non-enhanced)	PEPRA General Tiers 4 and 5
50	5.00	4.00	3.00	0.00
51	4.00	3.00	3.00	0.00
52	5.00	3.00	3.00	2.00
53	5.00	5.00	3.00	3.00
54	14.00	6.00	3.00	3.00
55	20.00	10.00	10.00	5.00
56	20.00	10.00	10.00	5.00
57	20.00	10.00	10.00	6.00
58	20.00	12.00	10.00	8.00
59	25.00	13.00	10.00	9.00
60	28.00	15.00	25.00	10.00
61	35.00	20.00	15.00	14.00
62	35.00	25.00	40.00	20.00
63	30.00	25.00	35.00	20.00
64	30.00	30.00	30.00	20.00
65	35.00	35.00	40.00	25.00
66	40.00	35.00	35.00	30.00
67	40.00	35.00	35.00	30.00
68	40.00	35.00	35.00	30.00
69	40.00	35.00	35.00	30.00
70	50.00	40.00	50.00	50.00
71	50.00	40.00	50.00	50.00
72	50.00	40.00	50.00	50.00
73	50.00	40.00	50.00	50.00
74	50.00	40.00	50.00	50.00
75	100.00	100.00	100.00	100.00

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Retirement Rates (Safety):

Age	Rates (%)			
	Safety Tier A (Enhanced)	Safety Tier C (Enhanced)	Safety Tier A (Non-enhanced)	PEPRA Safety Tiers D and E
45	4.00	2.00	0.00	0.00
46	3.00	1.00	0.00	0.00
47	10.00	4.00	0.00	0.00
48	10.00	4.00	0.00	0.00
49	25.00	12.00	0.00	0.00
50	30.00	18.00	5.00	5.00
51	30.00	18.00	4.00	4.00
52	25.00	15.00	4.00	4.00
53	25.00	15.00	5.00	5.00
54	25.00	15.00	8.00	6.00
55	28.00	18.00	10.00	10.00
56	25.00	15.00	10.00	10.00
57	25.00	15.00	12.00	18.00
58	35.00	25.00	18.00	18.00
59	35.00	25.00	20.00	18.00
60	35.00	30.00	20.00	18.00
61	35.00	30.00	20.00	20.00
62	35.00	30.00	20.00	20.00
63	35.00	30.00	20.00	20.00
64	50.00	40.00	100.00	30.00
65	100.00	100.00	100.00	30.00
66	100.00	100.00	100.00	100.00

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Retirement Age and Benefit for Deferred Vested Members:

For deferred vested benefits, we make the following retirement assumption:

General: Age 59

Safety: Age 54

We assume that 40% and 65% of future General and Safety deferred vested members, respectively, will continue to work for a reciprocal employer. For reciprocals, we assume 4.75% compensation increases per annum.

Future Benefit Accruals:

1.0 year of service per year for full-time employees. Continuation of current partial service accrual for part-time employees.

Unknown Data for Members:

Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.

Percent Married:

75% of male members and 50% of female members are assumed to be married at pre-retirement death or retirement. There is no explicit assumption for children's benefits.

Age of Spouse:

Males are 3 years older than their spouses, and females are 2 years younger than their spouses.

Offsets by Other Plans of the Employer for Disability Benefits:

The Plan requires members who retire because of disability from General Tier 3 and PEPRA General Tier 5 to offset the Plan's disability benefits with other Plans of the employer. We have not assumed any offsets in this valuation.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Leave Cashout Assumptions:

The following assumptions for leave cashouts as a percentage of final average pay are used:

*General Tiers 1, 2 and 3
Safety Tiers A and C*

Cost Group 1:	1.25%
Cost Group 2:	0.50% for Tier 2 1.00% for Tier 3
Cost Group 3:	5.50%
Cost Group 4:	0.50%
Cost Group 5:	1.00%
Cost Group 6:	0.75%
Cost Group 7:	1.00%
Cost Group 8:	0.75%
Cost Group 9:	0.00%
Cost Group 10:	1.00%
Cost Group 11:	2.50%
Cost Group 12:	2.50%

The cost of this pay element is recognized in the valuation as an employer and member cost in both basic and COLA components.

*PEPRA General Tiers 4 and 5
PEPRA Safety Tiers D and E*

None

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Service From Accumulated Sick Leave Conversion:

The following assumptions for additional service converted from accumulated sick leave as a percentage of service at retirement are used:

Service Retirements:

General:	1.20%
Safety:	1.90%

Disability Retirements:

General:	0.08%
Safety:	1.30%

Pursuant to Section 31641.01, the cost of this benefit for the non-PEPRA tiers will be charged only to employers and will not affect member contribution rates.

Actuarial Methods

Actuarial Cost Method:

Entry Age Actuarial Cost Method. Entry Age is calculated as age on the valuation date minus years of service. Normal Cost and Actuarial Accrued Liability are calculated on an individual basis and are based on costs allocated as a level percent of compensation, as if the current benefit formulas have always been in effect (i.e., “replacement life”).

Actuarial Value of Assets:

Market value of assets less unrecognized returns in each of the last nine semi-annual accounting periods. Unrecognized return is equal to the difference between the actual market return and the expected return on the market value, and is recognized semi-annually over a five-year period.

Valuation Value of Assets:

Actuarial Value of Assets reduced by the value of the non-valuation reserves and designations.

Amortization Policy:

The UAAL (i.e., the difference between the AAL and the Valuation Value of Assets) as of December 31, 2014 will continue to be amortized over separate amortization layers based on the valuations during which each separate layer was previously established.

Any new UAAL as a result of actuarial gains or losses identified in the annual valuation as of December 31 will be amortized over a period of 18 years.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Any new UAAL as a result of change in actuarial assumptions or methods will be amortized over a period of 18 years.

Unless the Board adopts an alternative amortization period after receiving an actuarial analysis:

- i. With the exception noted in ii., below, the increase in UAAL as a result of any plan amendments will be amortized over a period of 10 years;
- ii. The entire increase in UAAL resulting from a temporary retirement incentive will be funded in full upon adoption of the incentive. If the increase in UAAL is due to the impact of benefits resulting from additional service permitted in Section 31641.04 of the 1937 CERL (Golden Handshake), the entire increase in UAAL will be funded in full upon adoption of the Golden Handshake.

The UAAL will be amortized over “closed” amortization periods so that the amortization period for each layer decreases by one year with each actuarial valuation.

The UAAL will be amortized as a level percentage of payroll so that the amortization amount in each year during the amortization period shall be expected to be a level percentage of covered payroll, taking into consideration the current assumption for general payroll increase (i.e., wage inflation).

If an overfunding or “surplus” exists (i.e., the Valuation Value of Assets exceeds the AAL, so that the total of all UAAL amortization layers become negative), any prior UAAL amortization layers will be considered fully amortized, and any subsequent UAAL will be amortized as the first of a new series of amortization layers, using the above amortization periods.

If the surplus exceeds 20% of the AAL per Section 7522.52 of the Government Code, then the amount of surplus in excess of 20% of the AAL (and any subsequent surpluses in excess of that amount) will be amortized over an “open” amortization period of 30 years, but only if the other conditions of Section 7522.52 have also been met. If those conditions are not met, then the surplus will not be amortized and the full Normal Cost will be contributed.

These amortization policy components will generally apply separately to each of CCCERA's UAAL cost groups with the exception that the conditions of Section 7522.52 apply to the total plan.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

**Changes in Actuarial Assumptions
and Methods:**

The following assumption was changed. Previously, this assumption was as follows:

Administrative Expenses:

1.12% of payroll allocated to both the employer and the member based on normal cost (before expenses) for the employer and member. This assumption changes each year based on the actual administrative expenses as a percent of actual compensation during the calendar year leading up to the valuation date.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

EXHIBIT III

Summary of Plan Provisions

This exhibit summarizes the major provisions of the Plan included in the valuation. It is not intended to be, nor should it be interpreted as, a complete statement of all plan provisions.

Membership Eligibility:

<i>General Tier 1</i>	General members hired before July 1, 1980 and electing not to transfer to Tier 2 Plan. Certain General members with membership dates before January 1, 2013 hired by specific employers who did not adopt Tier 2 are placed in Tier 1.
<i>General Tier 2</i>	Most General members hired on or after August 1, 1980 and all General members hired before July 1, 1980 electing to transfer to the Tier 2 Plan. Effective October 1, 2002, for the County, Tier 2 was eliminated and all County employees (excluding CNA employees) in Tier 2 were placed in Tier 3. Effective January 1, 2005, all CNA employees in Tier 2 were placed in Tier 3.
<i>General Tier 3</i>	General members with membership dates before January 1, 2013 who are not placed in Tier 1 are placed in Tier 3.
<i>PEPRA General Tier 4</i>	General members with membership dates on or after January 1, 2013 hired by specific employers who did not adopt Tier 2 are placed in Tier 4.
<i>PEPRA General Tier 5</i>	General members with membership dates on or after January 1, 2013 who are not placed in Tier 4 are placed in Tier 5.
<i>Safety Tiers A and C</i>	Safety members with membership dates before January 1, 2013. County Sheriff's Department Safety members hired on or after January 1, 2007, but before January 1, 2013 are placed in Safety Tier C Enhanced.
<i>PEPRA Safety Tiers D and E</i>	Safety members with membership dates on or after January 1, 2013. Safety members from certain bargaining units are placed in Safety Tier E.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Final Compensation for Benefit Determination:

<i>General Tier 1, Tier 3 (non-disability), and Safety Tier A</i>	Highest consecutive twelve months of compensation earnable. (FAS1) (§31462.1)
<i>General Tier 2, Tier 3 (disability), and Safety Tier C</i>	Highest consecutive thirty-six months of compensation earnable. (FAS3) (§31462)
<i>PEPRA General Tiers 4 and 5 PEPRA Safety Tiers D and E</i>	Highest consecutive thirty-six months of pensionable compensation. (FAS3) (§7522.10(c), §7522.32 and §7522.34)

Compensation Limit:

<i>Non-PEPRA Tiers</i>	For members with membership dates on or after January 1, 1996, Compensation Earnable is limited to Internal Revenue Code Section 401(a)(17). The limit is \$275,000 for calendar year 2018. The limit is indexed for inflation on an annual basis.
<i>PEPRA Tiers</i>	Pensionable Compensation is limited to \$121,388 for 2018 (\$145,666, if not enrolled in Social Security). The limit is indexed for inflation on an annual basis.

Social Security Primary Insurance Amount:

<i>General Tier 2</i>	Estimated Social Security award at age 62 assuming level future earnings. (PIA)
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Service:

<i>All tiers</i>	Years of service*. (Yrs)
<i>General Tier 2</i>	Years of service up to a maximum of 30 years*. (Yrs30)

** Includes accumulated sick leave as of the date of retirement (§31641.01).*

Service Retirement Eligibility:

<i>General Tiers 1, 2 and 3</i>	Age 50 with 10 years of service, or age 70 regardless of service, or after 30 years of service, regardless of age. (§31672)
<i>PEPRA General Tiers 4 and 5</i>	Age 52 with 5 years of service, or age 70 regardless of service. (§7522.20(a) and §31672.3)
<i>Safety Tiers A and C</i>	Age 50 with 10 years of service, or age 70 regardless of service, or after 20 years of service, regardless of age. (§31663.25)

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PEPRA Safety Tiers D and E Age 50 with 5 years of service, or age 70 regardless of service. (§7522.25(a) and §31672.3)

Benefit Formula:

General Tiers 1 and 3 (Non-enhanced) (§31676.11)

Retirement Age	Benefit Formula
50	$(1.24\% \times \text{FAS1} - 1/3 \times 1.24\% \times \$350 \times 12) \times \text{Yrs}$
55	$(1.67\% \times \text{FAS1} - 1/3 \times 1.67\% \times \$350 \times 12) \times \text{Yrs}$
60	$(2.18\% \times \text{FAS1} - 1/3 \times 2.18\% \times \$350 \times 12) \times \text{Yrs}$
62	$(2.35\% \times \text{FAS1} - 1/3 \times 2.35\% \times \$350 \times 12) \times \text{Yrs}$
65 or later	$(2.61\% \times \text{FAS1} - 1/3 \times 2.61\% \times \$350 \times 12) \times \text{Yrs}$

General Tier 1 and Tier 3 (Enhanced) (§31676.16)

50	$(1.43\% \times \text{FAS1} - 1/3 \times 1.43\% \times \$350 \times 12) \times \text{Yrs}$
55	$(2.00\% \times \text{FAS1} - 1/3 \times 2.00\% \times \$350 \times 12) \times \text{Yrs}$
60	$(2.26\% \times \text{FAS1} - 1/3 \times 2.26\% \times \$350 \times 12) \times \text{Yrs}$
62	$(2.37\% \times \text{FAS1} - 1/3 \times 2.37\% \times \$350 \times 12) \times \text{Yrs}$
65 or later	$(2.42\% \times \text{FAS1} - 1/3 \times 2.42\% \times \$350 \times 12) \times \text{Yrs}$

For members previously covered under the non-enhanced §31676.11 formula, they are entitled to at least the benefits they could have received under §31676.11.

<i>General Tier 2 (§31752)</i>	50	$0.83\% \times \text{FAS3} \times \text{Yrs} - 0.57\% \times \text{Yrs} \times 30 \times \text{PIA}$
	55	$1.13\% \times \text{FAS3} \times \text{Yrs} - 0.87\% \times \text{Yrs} \times 30 \times \text{PIA}$
	60	$1.43\% \times \text{FAS3} \times \text{Yrs} - 1.37\% \times \text{Yrs} \times 30 \times \text{PIA}$
	62	$1.55\% \times \text{FAS3} \times \text{Yrs} - 1.67\% \times \text{Yrs} \times 30 \times \text{PIA}$
	65 or later	$1.73\% \times \text{FAS3} \times \text{Yrs} - 1.67\% \times \text{Yrs} \times 30 \times \text{PIA}$

The offsets shown in all of the above formulas only apply to members integrated with Social Security.

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Benefit Formula:

<i>PEPRA General Tiers 4 and 5</i> (§7522.20(a))	Retirement Age	Benefit Formula
	52	1.00%xFAS3xYrs
	55	1.30%xFAS3xYrs
	60	1.80%xFAS3xYrs
	62	2.00%xFAS3xYrs
	65	2.30%xFAS3xYrs
	67 or later	2.50%xFAS3xYrs
<i>Safety Tier A (Non-enhanced)(§31664)</i>	50	2.00%xFAS1xYrs
	55 or later	2.62%xFAS1xYrs
<i>Safety Tier A (Enhanced)(§31664.1)</i>	50 or later	3.00%xFAS1xYrs
<i>Safety Tier C (Enhanced)(§31664.1)</i>	50 or later	3.00%xFAS3xYrs
<i>PEPRA Safety Tiers D and E</i> (§7522.25(d))	50	2.00%xFAS3xYrs
	55	2.50%xFAS3xYrs
	57 or later	2.70%xFAS3xYrs

Maximum Benefit:

<i>General Tiers 1 and 3</i> <i>Safety Tiers A and C</i>	100% of Final Compensation (§31676.11, §31676.16, §31664, §31664.1)
<i>General Tier 2</i> <i>PEPRA General Tiers 4 and 5</i> <i>PEPRA Safety Tiers D and E</i>	None

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Ordinary Disability:

General Tiers 1 and 4

Eligibility

Five years of service (§31720).

Benefit Formula

1.5% per year of service. If the benefit does not exceed one-third of Final Compensation, the service is projected to 65, but total benefit cannot be more than one-third of Final Compensation (§31727).

General Tiers 2, 3 and 5

Eligibility

Ten years of service (definition of disability is more strict than Tier 1 Plan) (§31720.1).

Benefit Formula

40% of Final Compensation plus 10% of Final Compensation used in the benefit determination for each minor child (maximum of three) (§31727.01).

Offset

Disability benefits are offset by other plans of the employer except Workers Compensation and Social Security.

Safety

Eligibility

Five years of service (§31720).

Benefit Formula

1.8% per year of service. If the benefit does not exceed one-third of Final Compensation, the service is projected to 55, but total benefit cannot be more than one-third of Final Compensation (§31727.2).

Line-of-Duty Disability:

General Tiers 1 and 4, and Safety

Eligibility

No age or service requirements (§31720).

Benefit Formula

50% of the Final Compensation (§31727.4).

General Tiers 2, 3 and 5

Eligibility

No age or service requirements (§31720).

Benefit Formula

40% of Final Compensation plus 10% of Final Compensation for each minor child (maximum of three) (§31727.01).

Offset

Disability benefits are offset by other plans of the Employer except Workers Compensation and Social Security.

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Pre-Retirement Death:

Non-General Tier 2

Eligibility - A

None

Benefit - A

Refund of employee contributions with interest plus one month's compensation for each year of service to a maximum of six month's compensation (§31781); 50% of Final Compensation payable to spouse if Line of Duty death (§31787).

OR

Eligibility - B

Five years of service (Ten years for Tiers 3 and 5).

Benefit - B

Option 2 (100% continuation) of Service Retirement or Ordinary Disability benefit payable to designated beneficiary.

Death in line of duty

50% of Final compensation.

General Tier 2

Eligibility - A

None

Benefit - A

Refund of employee contributions with interest plus \$2,000 lump sum benefit offset by any Social Security payment. (§31781.01); If a Line of Duty death, then 60% of Service or Disability Retirement Benefit (minimum benefit is 24% of Final Compensation) plus, for each minor child, 10% of the allowance otherwise paid to the member. Minimum family benefit is 60% of the member's allowance. Maximum family benefit is 100% of member's allowance.

OR

Eligibility - B

Ten years of service.

Benefit - B

Option 2 (100% continuation) of Service Retirement or Ordinary Disability benefit payable to designated beneficiary.

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Death After Retirement:

Non-General Tier 2

Service or

Ordinary Disability Retirement

60% of member's unmodified allowance continued to eligible spouse. An eligible spouse is a surviving spouse who was married to the member one year prior to member's retirement or at least two years prior to the date of death and has attained age 55 on or prior to the date of death (§31760.2). An additional lump sum benefit of \$5,000 is payable to the member's beneficiary (§31789.5).

Line-of-Duty Disability

100% of members allowance continued to eligible spouse (§31786). An additional lump sum benefit of \$5,000 is payable to the member's beneficiary (§31789.5).

General Tier 2

Service or

Disability Retirement

60% of member's unmodified allowance continued to eligible spouse plus 20% of allowance to each minor child (§31789.11). Minimum benefit is 60% of allowance. Maximum benefit is 100% of allowance. \$5,000 lump sum death benefit (§31789.5) plus \$2,000 less any Social Security Lump sum payment (§31789.01) are payable to member's beneficiary.

Withdrawal Benefits:

Less than Five Years of Service

Refund of accumulated employee contributions with interest, or earned benefit at age 70 (§31628).

Five or More Years of Service

If contributions left on deposit, entitled to earned benefits commencing at any time after eligible to retire (§31700).

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Post-Retirement

Cost-of-Living Benefits:

*General Tiers 1, 3, 4 and 5
Safety Tiers A and D*

Future changes based on Consumer Price Index to a maximum of 3% per year, excess "banked." Tier 3 and PEPRA Tier 5 disability benefits have a maximum of 4% per year, excess "banked." Benefits for PEPRA Tier 4 and Tier 5 members covered under certain memoranda of understanding have a maximum of 2% per year, excess "banked".

General Tier 2

Future changes based on Consumer Price Index to a maximum of 4% per year, excess "banked."

Safety Tiers C and E

Future changes based on Consumer Price Index to a maximum of 2% per year, excess "banked."

Member Contributions:

Please refer to Appendices A and B for the specific rates.

General Tiers 1 and 3 (Non-enhanced)

Basic

Provide for one-half of the \$31676.11 benefit payable at age 55.

Cost-of-Living

Provide for one-half of future Cost-of-Living costs.

General Tiers 1 and 3 (Enhanced)

Basic

Provide for an average annuity at age 60 equal to 1/120 of FAS1.

Cost-of-Living

Provide for one-half of future Cost-of-Living costs.

PEPRA General Tiers 4 and 5

50% of the total Normal Cost rate.

Safety Tier A (Non-enhanced)

Basic

Provide for one-half of the \$31664 benefit payable at age 50.

Cost-of-Living

Provide for one-half of future Cost-of-Living costs.

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Member Contributions (continued):

Safety Tier A (Enhanced)

Basic

Provide for an average annuity at age 50 equal to 1/100 of FAS1.

Cost-of-Living

Provide for one-half of future Cost-of-Living costs.

Safety Tier C (Enhanced)

Basic

Provide for an average annuity at age 50 equal to 1/100 of FAS3.

Cost-of-Living

Provide for one-half of future Cost-of-Living costs.

PEPRA Safety Tiers D and E

50% of the total Normal Cost rate.

Other Information:

Transfers from the Tier 1 Plan to the Tier 2 Plan were made on an individual voluntary irrevocable basis. Credit is given under the Tier 2 Plan for future service only. The Cost-of-Living maximum is 4% only for the credit under the Tier 2 Plan. Transferred Tier 2 Plan members keep the five-year requirement for nonservice-connected disability. Those who were members on or before March 7, 1973 and Safety members under the enhanced benefit formula with membership dates on or before January 1, 2013 will be exempt from paying member contributions after 30 years of service.

Plan Provisions Not Valued:

Additional \$5,000 lump sum post-retirement death benefit (except for \$2,000 for General Tier 2 members paid out of the Valuation Value of Assets) payable to a member's beneficiary. This benefit is paid from a reserve that is not included in the Valuation Value of Assets and is subject at all times to the availability of funds.

Plan Changes:

There have been no changes in plan provisions since the previous actuarial valuation.

NOTE: The summary of major plan provisions is designed to outline principal plan benefits as interpreted for purposes of the actuarial valuation. If the Association should find the plan summary not in accordance with the actual provisions, the Association should alert the actuary so that both can be sure the proper provisions are valued.

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Appendix A

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**General Cost Group #1 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic		COLA		Total	
	First \$350	Over \$350	First \$350	Over \$350	First \$350	Over \$350
15	3.76%	5.41%	1.79%	2.69%	5.55%	8.10%
16	3.82%	5.50%	1.83%	2.74%	5.65%	8.24%
17	3.88%	5.59%	1.86%	2.79%	5.74%	8.38%
18	3.94%	5.68%	1.89%	2.84%	5.83%	8.52%
19	4.00%	5.77%	1.93%	2.89%	5.93%	8.66%
20	4.06%	5.86%	1.96%	2.94%	6.02%	8.80%
21	4.13%	5.96%	1.99%	2.99%	6.12%	8.95%
22	4.19%	6.05%	2.03%	3.04%	6.22%	9.09%
23	4.26%	6.15%	2.07%	3.10%	6.33%	9.25%
24	4.32%	6.25%	2.10%	3.15%	6.42%	9.40%
25	4.39%	6.35%	2.14%	3.21%	6.53%	9.56%
26	4.46%	6.45%	2.17%	3.26%	6.63%	9.71%
27	4.53%	6.56%	2.21%	3.32%	6.74%	9.88%
28	4.60%	6.66%	2.25%	3.37%	6.85%	10.03%
29	4.67%	6.77%	2.29%	3.43%	6.96%	10.20%
30	4.74%	6.88%	2.33%	3.49%	7.07%	10.37%
31	4.82%	6.99%	2.37%	3.55%	7.19%	10.54%
32	4.89%	7.10%	2.41%	3.61%	7.30%	10.71%
33	4.96%	7.21%	2.45%	3.67%	7.41%	10.88%
34	5.04%	7.33%	2.49%	3.74%	7.53%	11.07%
35	5.12%	7.45%	2.53%	3.80%	7.65%	11.25%
36	5.20%	7.57%	2.58%	3.87%	7.78%	11.44%
37	5.28%	7.69%	2.63%	3.94%	7.91%	11.63%
38	5.37%	7.82%	2.67%	4.01%	8.04%	11.83%
39	5.46%	7.95%	2.72%	4.08%	8.18%	12.03%
40	5.54%	8.08%	2.77%	4.15%	8.31%	12.23%
41	5.64%	8.22%	2.81%	4.22%	8.45%	12.44%

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**General Cost Group #1 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

<u>Entry Age</u>	<u>Basic</u>		<u>COLA</u>		<u>Total</u>	
	<u>First \$350</u>	<u>Over \$350</u>	<u>First \$350</u>	<u>Over \$350</u>	<u>First \$350</u>	<u>Over \$350</u>
42	5.73%	8.36%	2.87%	4.30%	8.60%	12.66%
43	5.82%	8.50%	2.92%	4.38%	8.74%	12.88%
44	5.92%	8.65%	2.97%	4.46%	8.89%	13.11%
45	6.03%	8.81%	3.03%	4.55%	9.06%	13.36%
46	6.12%	8.95%	3.08%	4.62%	9.20%	13.57%
47	6.22%	9.10%	3.13%	4.70%	9.35%	13.80%
48	6.32%	9.25%	3.19%	4.79%	9.51%	14.04%
49	6.43%	9.41%	3.25%	4.87%	9.68%	14.28%
50	6.54%	9.57%	3.31%	4.96%	9.85%	14.53%
51	6.64%	9.73%	3.37%	5.05%	10.01%	14.78%
52	6.76%	9.90%	3.43%	5.14%	10.19%	15.04%
53	6.86%	10.06%	3.49%	5.23%	10.35%	15.29%
54	6.94%	10.18%	3.53%	5.29%	10.47%	15.47%
55	7.04%	10.32%	3.58%	5.37%	10.62%	15.69%
56	7.09%	10.40%	3.61%	5.41%	10.70%	15.81%
57	7.08%	10.39%	3.61%	5.41%	10.69%	15.80%
58	7.02%	10.29%	3.57%	5.35%	10.59%	15.64%
59	6.84%	10.02%	3.47%	5.21%	10.31%	15.23%
60	6.84%	10.02%	3.47%	5.21%	10.31%	15.23%

Interest: 7.00%

Salary Increase: See Exhibit II.

Administrative Expense: 0.47% of payroll added to Basic rates

Leave Cashout: 1.25%

COLA Loading: 54.51% applied to Basic rates prior to adjustment for administrative expenses.

Mortality: Headcount-Weighted RP 2014 Healthy Annuitant Mortality Table, projected to 2034 with the two-dimensional MP-2015 projection scale, weighted 30% male and 70% female.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**General Cost Group #2 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic		COLA		Total	
	First \$350	Over \$350	First \$350	Over \$350	First \$350	Over \$350
15	3.76%	5.40%	1.65%	2.47%	5.41%	7.87%
16	3.82%	5.49%	1.67%	2.51%	5.49%	8.00%
17	3.88%	5.58%	1.71%	2.56%	5.59%	8.14%
18	3.94%	5.67%	1.73%	2.60%	5.67%	8.27%
19	4.00%	5.76%	1.77%	2.65%	5.77%	8.41%
20	4.06%	5.85%	1.79%	2.69%	5.85%	8.54%
21	4.12%	5.94%	1.83%	2.74%	5.95%	8.68%
22	4.18%	6.04%	1.86%	2.79%	6.04%	8.83%
23	4.25%	6.14%	1.89%	2.84%	6.14%	8.98%
24	4.32%	6.24%	1.93%	2.89%	6.25%	9.13%
25	4.38%	6.34%	1.96%	2.94%	6.34%	9.28%
26	4.45%	6.44%	1.99%	2.99%	6.44%	9.43%
27	4.52%	6.54%	2.03%	3.04%	6.55%	9.58%
28	4.58%	6.64%	2.06%	3.09%	6.64%	9.73%
29	4.66%	6.75%	2.09%	3.14%	6.75%	9.89%
30	4.73%	6.86%	2.13%	3.20%	6.86%	10.06%
31	4.80%	6.97%	2.17%	3.25%	6.97%	10.22%
32	4.88%	7.08%	2.21%	3.31%	7.09%	10.39%
33	4.96%	7.20%	2.25%	3.37%	7.21%	10.57%
34	5.03%	7.31%	2.28%	3.42%	7.31%	10.73%
35	5.11%	7.43%	2.32%	3.48%	7.43%	10.91%
36	5.19%	7.55%	2.36%	3.54%	7.55%	11.09%
37	5.28%	7.68%	2.41%	3.61%	7.69%	11.29%
38	5.36%	7.80%	2.45%	3.67%	7.81%	11.47%
39	5.44%	7.93%	2.49%	3.73%	7.93%	11.66%
40	5.54%	8.07%	2.53%	3.80%	8.07%	11.87%
41	5.62%	8.20%	2.58%	3.87%	8.20%	12.07%

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**General Cost Group #2 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

<u>Entry Age</u>	<u>Basic</u>		<u>COLA</u>		<u>Total</u>	
	<u>First \$350</u>	<u>Over \$350</u>	<u>First \$350</u>	<u>Over \$350</u>	<u>First \$350</u>	<u>Over \$350</u>
42	5.72%	8.34%	2.63%	3.94%	8.35%	12.28%
43	5.82%	8.49%	2.67%	4.01%	8.49%	12.50%
44	5.91%	8.63%	2.72%	4.08%	8.63%	12.71%
45	6.01%	8.78%	2.77%	4.16%	8.78%	12.94%
46	6.12%	8.94%	2.83%	4.24%	8.95%	13.18%
47	6.22%	9.09%	2.87%	4.31%	9.09%	13.40%
48	6.31%	9.23%	2.92%	4.38%	9.23%	13.61%
49	6.41%	9.38%	2.97%	4.46%	9.38%	13.84%
50	6.52%	9.54%	3.03%	4.54%	9.55%	14.08%
51	6.64%	9.72%	3.09%	4.63%	9.73%	14.35%
52	6.74%	9.88%	3.14%	4.71%	9.88%	14.59%
53	6.84%	10.03%	3.19%	4.78%	10.03%	14.81%
54	6.94%	10.18%	3.24%	4.86%	10.18%	15.04%
55	7.01%	10.28%	3.27%	4.91%	10.28%	15.19%
56	7.06%	10.35%	3.29%	4.94%	10.35%	15.29%
57	7.04%	10.32%	3.29%	4.93%	10.33%	15.25%
58	6.93%	10.16%	3.23%	4.85%	10.16%	15.01%
59	6.85%	10.04%	3.19%	4.79%	10.04%	14.83%
60	6.85%	10.04%	3.19%	4.79%	10.04%	14.83%

Interest: 7.00%

Salary Increase: See Exhibit II.

Administrative Expense: 0.47% of payroll added to Basic rates

Leave Cashout: 0.50% for Tier 2 and 1.00% for Tier 3

COLA Loading: 50.01% applied to Basic rates prior to adjustment for administrative expenses.

Mortality: Headcount-Weighted RP 2014 Healthy Annuitant Mortality Table, projected to 2034 with the two-dimensional MP-2015 projection scale, weighted 30% male and 70% female.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**General Cost Group #3 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic		COLA		Total	
	First \$350	Over \$350	First \$350	Over \$350	First \$350	Over \$350
15	3.90%	5.62%	1.90%	2.85%	5.80%	8.47%
16	3.96%	5.71%	1.93%	2.90%	5.89%	8.61%
17	4.02%	5.80%	1.97%	2.95%	5.99%	8.75%
18	4.09%	5.90%	2.00%	3.00%	6.09%	8.90%
19	4.15%	5.99%	2.03%	3.05%	6.18%	9.04%
20	4.22%	6.09%	2.07%	3.11%	6.29%	9.20%
21	4.28%	6.18%	2.11%	3.16%	6.39%	9.34%
22	4.34%	6.28%	2.14%	3.21%	6.48%	9.49%
23	4.42%	6.39%	2.18%	3.27%	6.60%	9.66%
24	4.48%	6.49%	2.22%	3.33%	6.70%	9.82%
25	4.55%	6.59%	2.26%	3.39%	6.81%	9.98%
26	4.62%	6.70%	2.30%	3.45%	6.92%	10.15%
27	4.70%	6.81%	2.34%	3.51%	7.04%	10.32%
28	4.76%	6.91%	2.37%	3.56%	7.13%	10.47%
29	4.84%	7.03%	2.42%	3.63%	7.26%	10.66%
30	4.92%	7.14%	2.46%	3.69%	7.38%	10.83%
31	4.99%	7.25%	2.50%	3.75%	7.49%	11.00%
32	5.07%	7.37%	2.55%	3.82%	7.62%	11.19%
33	5.15%	7.49%	2.59%	3.88%	7.74%	11.37%
34	5.23%	7.61%	2.63%	3.95%	7.86%	11.56%
35	5.31%	7.73%	2.68%	4.02%	7.99%	11.75%
36	5.40%	7.86%	2.73%	4.09%	8.13%	11.95%
37	5.48%	7.99%	2.77%	4.16%	8.25%	12.15%
38	5.57%	8.12%	2.82%	4.23%	8.39%	12.35%
39	5.66%	8.25%	2.87%	4.30%	8.53%	12.55%
40	5.75%	8.39%	2.92%	4.38%	8.67%	12.77%
41	5.84%	8.53%	2.97%	4.46%	8.81%	12.99%

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**General Cost Group #3 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

<u>Entry Age</u>	<u>Basic</u>		<u>COLA</u>		<u>Total</u>	
	<u>First \$350</u>	<u>Over \$350</u>	<u>First \$350</u>	<u>Over \$350</u>	<u>First \$350</u>	<u>Over \$350</u>
42	5.94%	8.68%	3.03%	4.54%	8.97%	13.22%
43	6.04%	8.82%	3.08%	4.62%	9.12%	13.44%
44	6.14%	8.98%	3.14%	4.71%	9.28%	13.69%
45	6.24%	9.13%	3.19%	4.79%	9.43%	13.92%
46	6.34%	9.28%	3.25%	4.87%	9.59%	14.15%
47	6.45%	9.44%	3.31%	4.96%	9.76%	14.40%
48	6.56%	9.60%	3.37%	5.05%	9.93%	14.65%
49	6.65%	9.74%	3.42%	5.13%	10.07%	14.87%
50	6.76%	9.91%	3.48%	5.22%	10.24%	15.13%
51	6.87%	10.07%	3.54%	5.31%	10.41%	15.38%
52	6.98%	10.24%	3.60%	5.40%	10.58%	15.64%
53	7.09%	10.40%	3.66%	5.49%	10.75%	15.89%
54	7.18%	10.54%	3.71%	5.57%	10.89%	16.11%
55	7.24%	10.62%	3.74%	5.61%	10.98%	16.23%
56	7.28%	10.69%	3.77%	5.65%	11.05%	16.34%
57	7.26%	10.66%	3.76%	5.64%	11.02%	16.30%
58	7.14%	10.48%	3.69%	5.54%	10.83%	16.02%
59	6.77%	9.92%	3.49%	5.23%	10.26%	15.15%
60	6.77%	9.92%	3.49%	5.23%	10.26%	15.15%

Interest: 7.00%

Salary Increase: See Exhibit II.

Administrative Expense: 0.47% of payroll added to Basic rates

Leave Cashout: 5.50%

COLA Loading: 55.32% applied to Basic rates prior to adjustment for administrative expenses.

Mortality: Headcount-Weighted RP 2014 Healthy Annuitant Mortality Table, projected to 2034 with the two-dimensional MP-2015 projection scale, weighted 30% male and 70% female.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**General Cost Group #4 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic		COLA		Total	
	First \$350	Over \$350	First \$350	Over \$350	First \$350	Over \$350
15	3.74%	5.38%	1.78%	2.67%	5.52%	8.05%
16	3.80%	5.46%	1.81%	2.71%	5.61%	8.17%
17	3.86%	5.55%	1.84%	2.76%	5.70%	8.31%
18	3.92%	5.64%	1.87%	2.81%	5.79%	8.45%
19	3.98%	5.73%	1.91%	2.86%	5.89%	8.59%
20	4.04%	5.82%	1.94%	2.91%	5.98%	8.73%
21	4.10%	5.92%	1.97%	2.96%	6.07%	8.88%
22	4.16%	6.01%	2.01%	3.01%	6.17%	9.02%
23	4.23%	6.11%	2.04%	3.06%	6.27%	9.17%
24	4.30%	6.21%	2.08%	3.12%	6.38%	9.33%
25	4.36%	6.31%	2.11%	3.17%	6.47%	9.48%
26	4.43%	6.41%	2.15%	3.23%	6.58%	9.64%
27	4.50%	6.51%	2.19%	3.28%	6.69%	9.79%
28	4.57%	6.62%	2.23%	3.34%	6.80%	9.96%
29	4.64%	6.72%	2.27%	3.40%	6.91%	10.12%
30	4.71%	6.83%	2.31%	3.46%	7.02%	10.29%
31	4.78%	6.94%	2.35%	3.52%	7.13%	10.46%
32	4.86%	7.05%	2.39%	3.58%	7.25%	10.63%
33	4.94%	7.17%	2.43%	3.64%	7.37%	10.81%
34	5.01%	7.28%	2.47%	3.70%	7.48%	10.98%
35	5.09%	7.40%	2.51%	3.77%	7.60%	11.17%
36	5.17%	7.52%	2.55%	3.83%	7.72%	11.35%
37	5.25%	7.64%	2.60%	3.90%	7.85%	11.54%
38	5.34%	7.77%	2.65%	3.97%	7.99%	11.74%
39	5.42%	7.90%	2.69%	4.04%	8.11%	11.94%
40	5.51%	8.03%	2.74%	4.11%	8.25%	12.14%
41	5.60%	8.16%	2.79%	4.18%	8.39%	12.34%

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**General Cost Group #4 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic		COLA		Total	
	First \$350	Over \$350	First \$350	Over \$350	First \$350	Over \$350
42	5.69%	8.30%	2.83%	4.25%	8.52%	12.55%
43	5.79%	8.45%	2.89%	4.34%	8.68%	12.79%
44	5.88%	8.59%	2.94%	4.41%	8.82%	13.00%
45	5.99%	8.75%	3.00%	4.50%	8.99%	13.25%
46	6.09%	8.90%	3.05%	4.58%	9.14%	13.48%
47	6.19%	9.05%	3.11%	4.66%	9.30%	13.71%
48	6.28%	9.19%	3.16%	4.74%	9.44%	13.93%
49	6.39%	9.35%	3.22%	4.83%	9.61%	14.18%
50	6.49%	9.50%	3.27%	4.91%	9.76%	14.41%
51	6.60%	9.67%	3.33%	5.00%	9.93%	14.67%
52	6.72%	9.84%	3.39%	5.09%	10.11%	14.93%
53	6.82%	9.99%	3.45%	5.17%	10.27%	15.16%
54	6.91%	10.13%	3.50%	5.25%	10.41%	15.38%
55	6.99%	10.25%	3.54%	5.31%	10.53%	15.56%
56	7.06%	10.36%	3.58%	5.37%	10.64%	15.73%
57	7.05%	10.34%	3.57%	5.36%	10.62%	15.70%
58	6.95%	10.19%	3.52%	5.28%	10.47%	15.47%
59	6.68%	9.79%	3.37%	5.06%	10.05%	14.85%
60	6.68%	9.79%	3.37%	5.06%	10.05%	14.85%

Interest: 7.00%

Salary Increase: See Exhibit II.

Administrative Expense: 0.47% of payroll added to Basic rates

Leave Cashout: 0.50%

COLA Loading: 54.34% applied to Basic rates prior to adjustment for administrative expenses.

Mortality: Headcount-Weighted RP 2014 Healthy Annuitant Mortality Table, projected to 2034 with the two-dimensional MP-2015 projection scale, weighted 30% male and 70% female.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**General Cost Group #5 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic		COLA		Total	
	First \$350	Over \$350	First \$350	Over \$350	First \$350	Over \$350
15	3.76%	5.40%	1.77%	2.66%	5.53%	8.06%
16	3.82%	5.49%	1.80%	2.70%	5.62%	8.19%
17	3.88%	5.58%	1.83%	2.75%	5.71%	8.33%
18	3.94%	5.67%	1.87%	2.80%	5.81%	8.47%
19	4.00%	5.76%	1.90%	2.85%	5.90%	8.61%
20	4.06%	5.85%	1.93%	2.90%	5.99%	8.75%
21	4.12%	5.94%	1.97%	2.95%	6.09%	8.89%
22	4.18%	6.04%	2.00%	3.00%	6.18%	9.04%
23	4.25%	6.14%	2.03%	3.05%	6.28%	9.19%
24	4.32%	6.24%	2.07%	3.11%	6.39%	9.35%
25	4.38%	6.34%	2.11%	3.16%	6.49%	9.50%
26	4.45%	6.44%	2.15%	3.22%	6.60%	9.66%
27	4.52%	6.54%	2.18%	3.27%	6.70%	9.81%
28	4.58%	6.64%	2.21%	3.32%	6.79%	9.96%
29	4.66%	6.75%	2.25%	3.38%	6.91%	10.13%
30	4.73%	6.86%	2.29%	3.44%	7.02%	10.30%
31	4.80%	6.97%	2.33%	3.50%	7.13%	10.47%
32	4.88%	7.08%	2.37%	3.56%	7.25%	10.64%
33	4.96%	7.20%	2.42%	3.63%	7.38%	10.83%
34	5.03%	7.31%	2.46%	3.69%	7.49%	11.00%
35	5.11%	7.43%	2.50%	3.75%	7.61%	11.18%
36	5.19%	7.55%	2.54%	3.81%	7.73%	11.36%
37	5.28%	7.68%	2.59%	3.88%	7.87%	11.56%
38	5.36%	7.80%	2.63%	3.95%	7.99%	11.75%
39	5.44%	7.93%	2.68%	4.02%	8.12%	11.95%
40	5.54%	8.07%	2.73%	4.09%	8.27%	12.16%
41	5.62%	8.20%	2.77%	4.16%	8.39%	12.36%

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**General Cost Group #5 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

<u>Entry Age</u>	<u>Basic</u>		<u>COLA</u>		<u>Total</u>	
	<u>First \$350</u>	<u>Over \$350</u>	<u>First \$350</u>	<u>Over \$350</u>	<u>First \$350</u>	<u>Over \$350</u>
42	5.72%	8.34%	2.83%	4.24%	8.55%	12.58%
43	5.82%	8.49%	2.88%	4.32%	8.70%	12.81%
44	5.91%	8.63%	2.93%	4.40%	8.84%	13.03%
45	6.01%	8.78%	2.99%	4.48%	9.00%	13.26%
46	6.12%	8.94%	3.04%	4.56%	9.16%	13.50%
47	6.22%	9.09%	3.09%	4.64%	9.31%	13.73%
48	6.31%	9.23%	3.15%	4.72%	9.46%	13.95%
49	6.41%	9.38%	3.20%	4.80%	9.61%	14.18%
50	6.52%	9.54%	3.26%	4.89%	9.78%	14.43%
51	6.64%	9.72%	3.32%	4.98%	9.96%	14.70%
52	6.74%	9.88%	3.38%	5.07%	10.12%	14.95%
53	6.84%	10.03%	3.43%	5.15%	10.27%	15.18%
54	6.94%	10.18%	3.49%	5.23%	10.43%	15.41%
55	7.01%	10.28%	3.53%	5.29%	10.54%	15.57%
56	7.06%	10.35%	3.55%	5.32%	10.61%	15.67%
57	7.04%	10.32%	3.54%	5.31%	10.58%	15.63%
58	6.93%	10.16%	3.48%	5.22%	10.41%	15.38%
59	6.85%	10.04%	3.44%	5.16%	10.29%	15.20%
60	6.85%	10.04%	3.44%	5.16%	10.29%	15.20%

Interest: 7.00%

Salary Increase: See Exhibit II.

Administrative Expense: 0.47% of payroll added to Basic rates

Leave Cashout: 1.00%

COLA Loading: 53.88% applied to Basic rates prior to adjustment for administrative expenses.

Mortality: Headcount-Weighted RP 2014 Healthy Annuitant Mortality Table, projected to 2034 with the two-dimensional MP-2015 projection scale, weighted 30% male and 70% female.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**General Cost Group #6 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic		COLA		Total	
	First \$350	Over \$350	First \$350	Over \$350	First \$350	Over \$350
15	4.24%	6.13%	1.74%	2.61%	5.98%	8.74%
16	4.31%	6.23%	1.77%	2.66%	6.08%	8.89%
17	4.38%	6.33%	1.81%	2.71%	6.19%	9.04%
18	4.44%	6.43%	1.83%	2.75%	6.27%	9.18%
19	4.52%	6.54%	1.87%	2.80%	6.39%	9.34%
20	4.58%	6.64%	1.90%	2.85%	6.48%	9.49%
21	4.66%	6.75%	1.93%	2.90%	6.59%	9.65%
22	4.73%	6.86%	1.97%	2.95%	6.70%	9.81%
23	4.80%	6.97%	2.00%	3.00%	6.80%	9.97%
24	4.88%	7.08%	2.03%	3.05%	6.91%	10.13%
25	4.96%	7.20%	2.07%	3.11%	7.03%	10.31%
26	5.03%	7.31%	2.11%	3.16%	7.14%	10.47%
27	5.11%	7.43%	2.14%	3.21%	7.25%	10.64%
28	5.19%	7.55%	2.18%	3.27%	7.37%	10.82%
29	5.27%	7.67%	2.22%	3.33%	7.49%	11.00%
30	5.36%	7.80%	2.26%	3.39%	7.62%	11.19%
31	5.44%	7.93%	2.30%	3.45%	7.74%	11.38%
32	5.53%	8.06%	2.34%	3.51%	7.87%	11.57%
33	5.62%	8.19%	2.38%	3.57%	8.00%	11.76%
34	5.70%	8.32%	2.42%	3.63%	8.12%	11.95%
35	5.80%	8.46%	2.46%	3.69%	8.26%	12.15%
36	5.90%	8.61%	2.51%	3.76%	8.41%	12.37%
37	5.99%	8.75%	2.55%	3.82%	8.54%	12.57%
38	6.09%	8.90%	2.59%	3.89%	8.68%	12.79%
39	6.20%	9.06%	2.65%	3.97%	8.85%	13.03%
40	6.31%	9.23%	2.70%	4.05%	9.01%	13.28%
41	6.41%	9.38%	2.75%	4.12%	9.16%	13.50%

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**General Cost Group #6 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

<u>Entry Age</u>	<u>Basic</u>		<u>COLA</u>		<u>Total</u>	
	<u>First \$350</u>	<u>Over \$350</u>	<u>First \$350</u>	<u>Over \$350</u>	<u>First \$350</u>	<u>Over \$350</u>
42	6.52%	9.54%	2.79%	4.19%	9.31%	13.73%
43	6.62%	9.69%	2.84%	4.26%	9.46%	13.95%
44	6.73%	9.86%	2.89%	4.34%	9.62%	14.20%
45	6.84%	10.02%	2.94%	4.41%	9.78%	14.43%
46	6.95%	10.19%	2.99%	4.49%	9.94%	14.68%
47	7.08%	10.38%	3.05%	4.58%	10.13%	14.96%
48	7.18%	10.53%	3.10%	4.65%	10.28%	15.18%
49	7.28%	10.69%	3.15%	4.72%	10.43%	15.41%
50	7.38%	10.83%	3.19%	4.79%	10.57%	15.62%
51	7.42%	10.90%	3.21%	4.82%	10.63%	15.72%
52	7.40%	10.87%	3.20%	4.80%	10.60%	15.67%
53	7.30%	10.71%	3.15%	4.73%	10.45%	15.44%
54	7.01%	10.28%	3.02%	4.53%	10.03%	14.81%
55	7.01%	10.28%	3.02%	4.53%	10.03%	14.81%
56	7.01%	10.28%	3.02%	4.53%	10.03%	14.81%
57	7.01%	10.28%	3.02%	4.53%	10.03%	14.81%
58	7.01%	10.28%	3.02%	4.53%	10.03%	14.81%
59	7.01%	10.28%	3.02%	4.53%	10.03%	14.81%
60	7.01%	10.28%	3.02%	4.53%	10.03%	14.81%

Interest: 7.00%

Salary Increase: See Exhibit II.

Administrative Expense: 0.47% of payroll added to Basic rates

Leave Cashout: 0.75%

COLA Loading: 46.19% applied to Basic rates prior to adjustment for administrative expenses.

Mortality: Headcount-Weighted RP 2014 Healthy Annuitant Mortality Table, projected to 2034 with the two-dimensional MP-2015 projection scale, weighted 30% male and 70% female.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**Safety Cost Group #7 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic	COLA	Total
15	9.05%	6.42%	15.47%
16	9.05%	6.42%	15.47%
17	9.05%	6.42%	15.47%
18	9.05%	6.42%	15.47%
19	9.05%	6.42%	15.47%
20	9.05%	6.42%	15.47%
21	9.05%	6.42%	15.47%
22	9.19%	6.52%	15.71%
23	9.34%	6.63%	15.97%
24	9.50%	6.75%	16.25%
25	9.65%	6.87%	16.52%
26	9.81%	6.99%	16.80%
27	9.97%	7.11%	17.08%
28	10.14%	7.23%	17.37%
29	10.31%	7.36%	17.67%
30	10.48%	7.49%	17.97%
31	10.65%	7.61%	18.26%
32	10.84%	7.76%	18.60%
33	11.03%	7.90%	18.93%
34	11.22%	8.04%	19.26%
35	11.42%	8.19%	19.61%
36	11.62%	8.34%	19.96%
37	11.81%	8.48%	20.29%
38	12.01%	8.63%	20.64%
39	12.22%	8.79%	21.01%
40	12.44%	8.95%	21.39%
41	12.67%	9.13%	21.80%
42	12.90%	9.30%	22.20%

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**Safety Cost Group #7 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic	COLA	Total
43	13.19%	9.51%	22.70%
44	13.42%	9.69%	23.11%
45	13.62%	9.84%	23.46%
46	13.66%	9.87%	23.53%
47	13.60%	9.82%	23.42%
48	13.39%	9.66%	23.05%
49	13.01%	9.38%	22.39%
50	13.01%	9.38%	22.39%
51	13.01%	9.38%	22.39%
52	13.01%	9.38%	22.39%
53	13.01%	9.38%	22.39%
54	13.01%	9.38%	22.39%
55	13.01%	9.38%	22.39%
56	13.01%	9.38%	22.39%
57	13.01%	9.38%	22.39%
58	13.01%	9.38%	22.39%
59	13.01%	9.38%	22.39%
60	13.01%	9.38%	22.39%

Interest: 7.00%
 Salary Increase: See Exhibit II.
 Administrative Expense: 0.47% of payroll added to Basic rates
 Leave Cashout: 1.00%
 COLA Loading: 74.80% applied to Basic rates prior to adjustment for administrative expenses.
 Mortality: Headcount-Weighted RP 2014 Healthy Annuitant Mortality Table set back three years, projected to 2034 with the two-dimensional MP-2015 projection scale, weighted 85% male and 15% female.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**Safety Cost Group #8 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic	COLA	Total
15	9.03%	6.56%	15.59%
16	9.03%	6.56%	15.59%
17	9.03%	6.56%	15.59%
18	9.03%	6.56%	15.59%
19	9.03%	6.56%	15.59%
20	9.03%	6.56%	15.59%
21	9.03%	6.56%	15.59%
22	9.17%	6.66%	15.83%
23	9.32%	6.78%	16.10%
24	9.48%	6.90%	16.38%
25	9.63%	7.01%	16.64%
26	9.79%	7.14%	16.93%
27	9.95%	7.26%	17.21%
28	10.12%	7.39%	17.51%
29	10.28%	7.51%	17.79%
30	10.46%	7.65%	18.11%
31	10.64%	7.79%	18.43%
32	10.82%	7.93%	18.75%
33	11.00%	8.06%	19.06%
34	11.20%	8.22%	19.42%
35	11.39%	8.36%	19.75%
36	11.59%	8.52%	20.11%
37	11.79%	8.67%	20.46%
38	11.99%	8.82%	20.81%
39	12.20%	8.98%	21.18%
40	12.41%	9.14%	21.55%
41	12.63%	9.31%	21.94%
42	12.88%	9.50%	22.38%

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**Safety Cost Group #8 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic	COLA	Total
43	13.16%	9.72%	22.88%
44	13.42%	9.92%	23.34%
45	13.58%	10.04%	23.62%
46	13.61%	10.06%	23.67%
47	13.52%	9.99%	23.51%
48	13.41%	9.91%	23.32%
49	13.04%	9.63%	22.67%
50	13.04%	9.63%	22.67%
51	13.04%	9.63%	22.67%
52	13.04%	9.63%	22.67%
53	13.04%	9.63%	22.67%
54	13.04%	9.63%	22.67%
55	13.04%	9.63%	22.67%
56	13.04%	9.63%	22.67%
57	13.04%	9.63%	22.67%
58	13.04%	9.63%	22.67%
59	13.04%	9.63%	22.67%
60	13.04%	9.63%	22.67%

Interest: 7.00%
 Salary Increase: See Exhibit II.
 Administrative Expense: 0.47% of payroll added to Basic rates
 Leave Cashout: 0.75%
 COLA Loading: 76.58% applied to Basic rates prior to adjustment for administrative expenses.
 Mortality: Headcount-Weighted RP 2014 Healthy Annuitant Mortality Table set back three years, projected to 2034 with the two-dimensional MP-2015 projection scale, weighted 85% male and 15% female.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**Safety Cost Group #9 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic	COLA	Total
15	8.64%	3.90%	12.54%
16	8.64%	3.90%	12.54%
17	8.64%	3.90%	12.54%
18	8.64%	3.90%	12.54%
19	8.64%	3.90%	12.54%
20	8.64%	3.90%	12.54%
21	8.64%	3.90%	12.54%
22	8.78%	3.97%	12.75%
23	8.92%	4.04%	12.96%
24	9.07%	4.11%	13.18%
25	9.22%	4.18%	13.40%
26	9.37%	4.25%	13.62%
27	9.52%	4.32%	13.84%
28	9.68%	4.40%	14.08%
29	9.84%	4.48%	14.32%
30	10.01%	4.56%	14.57%
31	10.18%	4.64%	14.82%
32	10.35%	4.72%	15.07%
33	10.53%	4.81%	15.34%
34	10.71%	4.89%	15.60%
35	10.89%	4.98%	15.87%
36	11.07%	5.06%	16.13%
37	11.25%	5.15%	16.40%
38	11.45%	5.25%	16.70%
39	11.64%	5.34%	16.98%
40	11.83%	5.43%	17.26%
41	12.05%	5.53%	17.58%
42	12.27%	5.64%	17.91%

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**Safety Cost Group #9 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic	COLA	Total
43	12.45%	5.72%	18.17%
44	12.53%	5.76%	18.29%
45	12.51%	5.75%	18.26%
46	12.43%	5.71%	18.14%
47	12.17%	5.59%	17.76%
48	12.55%	5.77%	18.32%
49	13.14%	6.05%	19.19%
50	13.14%	6.05%	19.19%
51	13.14%	6.05%	19.19%
52	13.14%	6.05%	19.19%
53	13.14%	6.05%	19.19%
54	13.14%	6.05%	19.19%
55	13.14%	6.05%	19.19%
56	13.14%	6.05%	19.19%
57	13.14%	6.05%	19.19%
58	13.14%	6.05%	19.19%
59	13.14%	6.05%	19.19%
60	13.14%	6.05%	19.19%

Interest: 7.00%
 Salary Increase: See Exhibit II.
 Administrative Expense: 0.47% of payroll added to Basic rates
 Leave Cashout: 0.00%
 COLA Loading: 47.78% applied to Basic rates prior to adjustment for administrative expenses.
 Mortality: Headcount-Weighted RP 2014 Healthy Annuitant Mortality Table set back three years, projected to 2034 with the two-dimensional MP-2015 projection scale, weighted 85% male and 15% female.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**Safety Cost Group #10 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic	COLA	Total
15	9.05%	6.39%	15.44%
16	9.05%	6.39%	15.44%
17	9.05%	6.39%	15.44%
18	9.05%	6.39%	15.44%
19	9.05%	6.39%	15.44%
20	9.05%	6.39%	15.44%
21	9.05%	6.39%	15.44%
22	9.19%	6.50%	15.69%
23	9.34%	6.61%	15.95%
24	9.50%	6.73%	16.23%
25	9.65%	6.84%	16.49%
26	9.81%	6.96%	16.77%
27	9.97%	7.08%	17.05%
28	10.14%	7.20%	17.34%
29	10.31%	7.33%	17.64%
30	10.48%	7.46%	17.94%
31	10.65%	7.58%	18.23%
32	10.84%	7.73%	18.57%
33	11.03%	7.87%	18.90%
34	11.22%	8.01%	19.23%
35	11.42%	8.16%	19.58%
36	11.62%	8.31%	19.93%
37	11.81%	8.45%	20.26%
38	12.01%	8.60%	20.61%
39	12.22%	8.75%	20.97%
40	12.44%	8.92%	21.36%
41	12.67%	9.09%	21.76%
42	12.90%	9.26%	22.16%

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**Safety Cost Group #10 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic	COLA	Total
43	13.19%	9.48%	22.67%
44	13.42%	9.65%	23.07%
45	13.62%	9.80%	23.42%
46	13.66%	9.83%	23.49%
47	13.60%	9.78%	23.38%
48	13.39%	9.63%	23.02%
49	13.01%	9.34%	22.35%
50	13.01%	9.34%	22.35%
51	13.01%	9.34%	22.35%
52	13.01%	9.34%	22.35%
53	13.01%	9.34%	22.35%
54	13.01%	9.34%	22.35%
55	13.01%	9.34%	22.35%
56	13.01%	9.34%	22.35%
57	13.01%	9.34%	22.35%
58	13.01%	9.34%	22.35%
59	13.01%	9.34%	22.35%
60	13.01%	9.34%	22.35%

Interest: 7.00%
 Salary Increase: See Exhibit II.
 Administrative Expense: 0.47% of payroll added to Basic rates
 Leave Cashout: 1.00%
 COLA Loading: 74.50% applied to Basic rates prior to adjustment for administrative expenses.
 Mortality: Headcount-Weighted RP 2014 Healthy Annuitant Mortality Table set back three years, projected to 2034 with the two-dimensional MP-2015 projection scale, weighted 85% male and 15% female.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**Safety Cost Group #11 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic	COLA	Total
15	9.17%	6.88%	16.05%
16	9.17%	6.88%	16.05%
17	9.17%	6.88%	16.05%
18	9.17%	6.88%	16.05%
19	9.17%	6.88%	16.05%
20	9.17%	6.88%	16.05%
21	9.17%	6.88%	16.05%
22	9.32%	7.00%	16.32%
23	9.47%	7.12%	16.59%
24	9.63%	7.25%	16.88%
25	9.78%	7.37%	17.15%
26	9.94%	7.49%	17.43%
27	10.11%	7.63%	17.74%
28	10.28%	7.76%	18.04%
29	10.45%	7.90%	18.35%
30	10.62%	8.03%	18.65%
31	10.80%	8.17%	18.97%
32	10.99%	8.32%	19.31%
33	11.17%	8.47%	19.64%
34	11.37%	8.62%	19.99%
35	11.57%	8.78%	20.35%
36	11.77%	8.94%	20.71%
37	11.97%	9.10%	21.07%
38	12.17%	9.26%	21.43%
39	12.38%	9.42%	21.80%
40	12.59%	9.59%	22.18%
41	12.83%	9.78%	22.61%
42	13.07%	9.97%	23.04%

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**Safety Cost Group #11 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic	COLA	Total
43	13.34%	10.18%	23.52%
44	13.60%	10.39%	23.99%
45	13.76%	10.52%	24.28%
46	13.80%	10.55%	24.35%
47	13.71%	10.48%	24.19%
48	13.44%	10.26%	23.70%
49	12.83%	9.78%	22.61%
50	12.83%	9.78%	22.61%
51	12.83%	9.78%	22.61%
52	12.83%	9.78%	22.61%
53	12.83%	9.78%	22.61%
54	12.83%	9.78%	22.61%
55	12.83%	9.78%	22.61%
56	12.83%	9.78%	22.61%
57	12.83%	9.78%	22.61%
58	12.83%	9.78%	22.61%
59	12.83%	9.78%	22.61%
60	12.83%	9.78%	22.61%

Interest: 7.00%
 Salary Increase: See Exhibit II.
 Administrative Expense: 0.47% of payroll added to Basic rates
 Leave Cashout: 2.50%
 COLA Loading: 79.12% applied to Basic rates prior to adjustment for administrative expenses.
 Mortality: Headcount-Weighted RP 2014 Healthy Annuitant Mortality Table set back three years, projected to 2034 with the two-dimensional MP-2015 projection scale, weighted 85% male and 15% female.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**Safety Cost Group #12 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic	COLA	Total
15	9.17%	4.75%	13.92%
16	9.17%	4.75%	13.92%
17	9.17%	4.75%	13.92%
18	9.17%	4.75%	13.92%
19	9.17%	4.75%	13.92%
20	9.17%	4.75%	13.92%
21	9.17%	4.75%	13.92%
22	9.32%	4.83%	14.15%
23	9.47%	4.91%	14.38%
24	9.63%	5.00%	14.63%
25	9.78%	5.08%	14.86%
26	9.94%	5.17%	15.11%
27	10.11%	5.26%	15.37%
28	10.28%	5.35%	15.63%
29	10.45%	5.44%	15.89%
30	10.62%	5.54%	16.16%
31	10.80%	5.64%	16.44%
32	10.99%	5.74%	16.73%
33	11.17%	5.84%	17.01%
34	11.37%	5.95%	17.32%
35	11.57%	6.06%	17.63%
36	11.77%	6.16%	17.93%
37	11.97%	6.27%	18.24%
38	12.17%	6.38%	18.55%
39	12.38%	6.50%	18.88%
40	12.59%	6.61%	19.20%
41	12.83%	6.74%	19.57%
42	13.07%	6.87%	19.94%

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix A (continued)

Member Contribution Rates for Members with Membership Dates before January 1, 2013

**Safety Cost Group #12 Members' Contribution Rates (Expressed as a Percentage of Monthly Payroll)
For Members with Membership Dates before January 1, 2013
Calculated Under Recommended Assumptions**

Entry Age	Basic	COLA	Total
43	13.34%	7.02%	20.36%
44	13.60%	7.16%	20.76%
45	13.76%	7.25%	21.01%
46	13.80%	7.27%	21.07%
47	13.71%	7.22%	20.93%
48	13.44%	7.08%	20.52%
49	12.83%	6.74%	19.57%
50	12.83%	6.74%	19.57%
51	12.83%	6.74%	19.57%
52	12.83%	6.74%	19.57%
53	12.83%	6.74%	19.57%
54	12.83%	6.74%	19.57%
55	12.83%	6.74%	19.57%
56	12.83%	6.74%	19.57%
57	12.83%	6.74%	19.57%
58	12.83%	6.74%	19.57%
59	12.83%	6.74%	19.57%
60	12.83%	6.74%	19.57%

Interest: 7.00%
 Salary Increase: See Exhibit II.
 Administrative Expense: 0.47% of payroll added to Basic rates
 Leave Cashout: 2.50%
 COLA Loading: 54.55% applied to Basic rates prior to adjustment for administrative expenses.
 Mortality: Headcount-Weighted RP 2014 Healthy Annuitant Mortality Table set back three years, projected to 2034 with the two-dimensional MP-2015 projection scale, weighted 85% male and 15% female.

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix B

Member Contribution Rates for Members with Membership Dates on or after January 1, 2013

**General Members' Contribution Rates for Members with Membership Dates on or after January 1, 2013
(Expressed as a Percentage of Monthly Payroll)**

Calculated Under Recommended Assumptions

	Basic	COLA	Total
Cost Group #1 – PEPRA Tier 4 (2% COLA)	8.80%	2.02%	10.82%
Cost Group #1 – PEPRA Tier 4 (3% COLA)	8.95%	3.01%	11.96%
Cost Group #2 - PEPRA Tier 5 (2% COLA)	8.20%	1.87%	10.07%
Cost Group #2 - PEPRA Tier 5 (3%/4% COLA)	8.42%	2.79%	11.21%
Cost Group #3 - PEPRA Tier 4 (3% COLA)	8.03%	2.80%	10.83%
Cost Group #4 - PEPRA Tier 4 (3% COLA)	9.49%	3.24%	12.73%
Cost Group #5 - PEPRA Tier 4 (2% COLA)	9.46%	2.19%	11.65%
Cost Group #5 - PEPRA Tier 4 (3% COLA)	11.44%	3.90%	15.34%
Cost Group #6 - PEPRA Tier 4 (3% COLA)	10.01%	3.47%	13.48%

The PEPRA member contribution rates are 50% of the Normal Cost rate. The Basic rates shown above also include an administrative expense load of 0.47% of payroll.

Note: It is our understanding that in the determination of pension benefits under the PEPRA formulas, the compensation that can be taken into account for 2018 is equal to the Social Security Taxable Wage Base or \$121,388. (For an employer that is not enrolled in Social Security, the maximum amount is \$145,666 or 120% of the Social Security Taxable Wage Base). (reference: Section 7522.10). These amounts should be adjusted for changes to the Consumer Price Index for All Urban Consumers after 2018. (reference: Section 7522.10(d))

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

Appendix B

Member Contribution Rates for Members with Membership Dates on or after January 1, 2013

**Safety Members' Contribution Rates for Members with Membership Dates on or after January 1, 2013
(Expressed as a Percentage of Monthly Payroll)**

Calculated Under Recommended Assumptions

	Basic	COLA	Total
Cost Group #7 - PEPRA Tier D	14.86%	6.13%	20.99%
Cost Group #8 - PEPRA Tier D	14.28%	6.00%	20.28%
Cost Group #8 - PEPRA Tier E	13.90%	3.90%	17.80%
Cost Group #9 - PEPRA Tier E	13.50%	3.76%	17.26%
Cost Group #10 - PEPRA Tier D	13.33%	5.65%	18.98%
Cost Group #11 - PEPRA Tier D	12.66%	5.40%	18.06%
Cost Group #12 - PEPRA Tier D	11.92%	5.07%	16.99%

The PEPRA member contribution rates are 50% of the Normal Cost rate. The Basic rates shown above also include an administrative expense load of 0.47% of payroll.

Note: It is our understanding that in the determination of pension benefits under the PEPRA formulas, the compensation that can be taken into account for 2018 is equal to the Social Security Taxable Wage Base or \$121,388. (For an employer that is not enrolled in Social Security, the maximum amount is \$145,666 or 120% of the Social Security Taxable Wage Base). (reference: Section 7522.10). These amounts should be adjusted for changes to the Consumer Price Index for All Urban Consumers after 2018. (reference: Section 7522.10(d))

SECTION 4: Reporting Information for the Contra Costa County Employees' Retirement Association

**Appendix C
Refundability Factors**

	December 31, 2017		December 31, 2016	
	Legacy Tiers	PEPRA Tiers	Legacy Tiers	PEPRA Tiers
General				
Cost Group #1 – County and Small Districts (Tier 1)	0.9602		0.9599	
PEPRA Tier 4 (2% COLA)		0.9605		0.9605
PEPRA Tier 4 (3% COLA)		0.9613		0.9625
Cost Group #2 – County and Small Districts (Tier 3)	0.9576		0.9576	
PEPRA Tier 5 (2% COLA)		0.9611		0.9621
PEPRA Tier 5 (3%/4% COLA)		0.9631		0.9630
Cost Group #3 – Central Contra Costa Sanitary District	0.9588	0.9670	0.9588	0.9661
Cost Group #4 – Contra Costa Housing Authority	0.9571	0.9654	0.9563	0.9667
Cost Group #5 – Contra Costa County Fire Protection District	0.9591		0.9590	
PEPRA Tier 4 (2% COLA)		0.9630		0.9635
PEPRA Tier 4 (3% COLA)		0.9606		0.9637
Cost Group #6 – Small Districts (Non-Enhanced Tier 1 and 4)	0.9556	0.9643	0.9535	0.9511
Safety				
Cost Group #7 – County (Tier A and D)	0.9657	0.9758	0.9657	0.9755
Cost Group #8 – Contra Costa and East Fire Protection Districts	0.9666		0.9665	
PEPRA Tier D (3% COLA)		0.9770		0.9779
PEPRA Tier E (2% COLA)		0.9748		0.9757
Cost Group #9 – County (Tier C and E)	0.9670	0.9752	0.9668	0.9747
Cost Group #10 – Moraga-Orinda Fire District	0.9688	0.9787	0.9693	0.9786
Cost Group #11 – San Ramon Valley Fire District	0.9665	0.9794	0.9670	0.9784
Cost Group #12 – Rodeo-Hercules Fire Protection District	0.9718	0.9803	0.9718	0.9807

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Meeting Date
08/22/18
Agenda Item
#12

MEMORANDUM

Date: August 22, 2018

To: CCCERA Board of Retirement

From: Anne Sommers, Admin/HR Manager

Subject: Consider and take possible action to revise Attachment B of the Board of Retirement Resolution 2018-1 providing health plan monthly premium subsidies for unrepresented employees of CCCERA effective January 1, 2019.

Overview

The Contra Costa County Employees' Retirement Association ("CCCERA") Board sets the monthly premium subsidies for medical and dental benefits of its unrepresented employees. The monthly premium subsidy amounts are included in the Board of Retirement Resolution 2018-1, Attachment B. The Board of Retirement Resolution 2018-1, Attachment B has been updated to include the 2019 monthly premium subsidy amounts for unrepresented employees. Open enrollment meetings for the 2019 plan year begin on August 28, 2018.

Recommendation

Consider and take possible action to revise Attachment B of the Board of Retirement Resolution 2018-1 providing health plan monthly premium subsidies for unrepresented employees of CCCERA effective January 1, 2019.

Attachment B

Health Plan Monthly Premium Subsidy

Effective: January 1, 2019

Health Plans:

➤ CalPERS

	Employee Only	Employee & 1 Dependent	Employee & 2+ Dependents
Anthem HMO Select	\$782.95	\$1,565.89	\$2,035.66
Anthem HMO Traditional	\$746.47	\$1,492.94	\$1,940.82
BSC Access +	\$746.47	\$1,492.94	\$1,940.82
HealthNet SmartCare	\$804.97	\$1,609.95	\$2,092.93
Kaiser Permanente	\$763.16	\$1,526.33	\$1,984.23
PERS Choice	\$746.47	\$1,492.94	\$1,940.82
PERS Select	\$543.19	\$1,086.38	\$1,412.29
PERSCare	\$746.47	\$1,492.94	\$1,940.82
Western Health Advantage	\$746.47	\$1,492.94	\$1,940.82

➤ Delta Dental

Employee Only: \$46.21

Employee and Spouse: \$103.72

Employee and Children: \$103.41

Family: \$169.38

Effective January 1, 2016, CCCERA shall offer an Internal Revenue Code Section 125 Flexible Benefits Plan that offers (i) CalPERS health plan coverages for each eligible employee and the employee's eligible family members and (ii) at least one other nontaxable benefit. CCCERA shall make monthly contributions under the plan for each eligible employee and their dependents (if applicable) up to the relevant amount set forth above. Such contributions shall consist of (i) the Minimum Employer Contribution (MEC) established by the Public Employees' Medical and Hospital Care Act, and designated by CCCERA as the MEC, and (ii) the additional amount of such contributions in excess of the MEC.



Meeting Date
08/22/18
Agenda Item
#13a

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📅 Start Date – End Date

**November 13, 2018 –
November 16, 2018**

🔔 Early Bird Discount Deadline

**Monday, October 01,
2018**

🔔 Regular Registration Deadline

**Wednesday, October 31,
2018**

🔗 REGISTER

💰 PRICING

☰ FUNCTIONS

📍 LOCATION

Registration Fees

Price Description	Amount
Affiliate Early Pricing	\$1,020
Non-Member Pricing	\$2,670
Non-Profit Member Pricing	\$120
Speaker Registration	\$00
System Member Pricing	\$120



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