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2018 JUN 14 PM 5:28

# AGENDA REPORT

**TO:** Sabrina B. Landreth  
City Administrator

**FROM:** Katano Kasaine  
Finance Director

**SUBJECT:** Informational Report on PFRS'  
Investment Portfolio and Actuarial  
Valuation

**DATE:** May 25, 2018

City Administrator Approval

Date:

## RECOMMENDATION

**Staff Recommends That The City Council Receive An Informational Report On The Oakland Police And Fire Retirement System ("PFRS") Investment Portfolio As Of March 31, 2018 And Actuarial Valuation As Of July 1, 2017..**

## EXECUTIVE SUMMARY

The attached Quarterly Investment Performance report (**Attachment A**) provided by the PFRS Investment Consultant, Pension Consulting Alliance, (PCA) summarizes the performance of the PFRS investment portfolio for the quarter ended March 31, 2018, herein. In addition, the Council is being provided the recently updated PFRS' Actuarial Valuation (**Attachment B**) as of July 1, 2017.

During the most recent quarter, the PFRS Total Portfolio generated an absolute return of -0.4 percent, gross of fees, outperforming its policy benchmark by 0.6 percent. The portfolio also outperformed its benchmark over the latest one, three and five year periods. This is discussed in more detail in the "Investment Performance" section of this report.

	Quarter	1 Year	3 Year	5 Year
Total Portfolio	-0.4	12.2	7.7	8.7
Policy Benchmark	-1.0	10.3	7.6	8.3
<b>Excess Return</b>	0.6	1.9	0.1	0.4

As of July 1, 2017, the System's Unfunded Actuarial Liability is approximately \$340.07 million and the System had a Funded Ratio of 52.4 percent on a Market Value of Assets (MVA) basis. This is discussed in more detail in the "PFRS Actuarial Valuation" section of this report.

Item: \_\_\_\_\_  
Finance and Management Committee  
June 26, 2018

## **BACKGROUND / LEGISLATIVE HISTORY**

The Oakland Police and Fire Retirement System (the "PFRS") is a closed defined benefit plan established by the City of Oakland's (the "City") Charter. PFRS is governed by a board of seven trustees (the "PFRS Board"). PFRS covers the City's sworn police and fire employees hired prior to July 1, 1976. PFRS was closed to new members on June 30, 1976. As of March 31, 2018, PFRS had 844 retired members and no active members.

The System's investment portfolio is governed by the investment policy set by the PFRS Board. The PFRS Board sets an investment policy that authorizes investments in a variety of domestic and international equity and fixed income securities. 12 external investment managers currently manage the System's portfolio. Most the portfolio is held in custody at Northern Trust. In accordance with the City Charter, the PFRS Board makes investment decisions in accordance with the prudent person standard as defined by applicable court decisions and as required by the California Constitution.

In March 1997, the City issued Taxable Pension Obligation Bonds, Series 1997 ("1997 POBs") and as a result deposited \$417 million into the System to pay the City's contributions through June 2011. As a result of the funding agreement entered at the time the 1997 POBs were issued, City payments to PFRS were suspended from February 25, 1997 to June 30, 2011. The City of Oakland resumed contributing to PFRS effective July 1, 2011 and contributed \$45.5 million for the fiscal year ended June 30, 2012.

In July 2012, the City issued \$212.5 million of Taxable Pension Obligation Bonds, Series 2012 ("2012 POBs"). The City subsequently deposited \$210 million into the System and entered a funding agreement with the PFRS Board. Thus, no additional contributions were required until July 1, 2017. As of the most recent actuary study dated July 1, 2016, the System's Unfunded Actuarial Liability is approximately \$309.37 million and the System had a Funded Ratio of 53.7 percent on a Market Value of Assets (MVA) basis. The City of Oakland is currently making monthly payments to the Plan for the FY 2017/2018 required contribution of \$44.86 million.

## **ANALYSIS AND POLICY ALTERNATIVES**

### ***PFRS' Membership***

The City Charter establishes plan membership, contribution, and benefit provisions. The System serves the City's sworn employees hired prior to July 1, 1976 who have not transferred to the California Public Employees' Retirement System ("CalPERS"). As of March 31, 2018, the System's membership was 844, as shown on **Table 1** below.

<b>Table 1</b>			
PFRS Membership as of March 31, 2018			
Membership	POLICE	FIRE	TOTAL
Retiree	368	225	593
Beneficiary	127	124	251
<b>Total Membership</b>	<b>495</b>	<b>349</b>	<b>844</b>

**PFRS Investment Portfolio**

As of March 31, 2018, the PFRS' portfolio had an aggregate value of \$375.7 million as shown in **Table 2** below.

<b>Table 2</b>	
PFRS Investment Portfolio as of March 31, 2018 (in thousands)	
Investment	Fair Value
Domestic Equities	\$ 148,261
Fixed Income	97,876
International Equities	50,215
Covered Calls	70,373
Cash and Cash Equivalents	8,968
<b>Total Portfolio</b>	<b>\$375,693</b>

As of March 31, 2018, the PFRS portfolio had an aggregate value of \$375.7 million. This represents a (\$1.6) million decrease in value, including the withdrawal of (\$3.2) million to pay pension payments, over the quarter. During the previous one-year period, the OPFRS Total Portfolio increased in value by \$41.9 million, including the withdrawal of (\$23.9) million for pension payments as shown in **Table 3** below. The investment drawdowns for benefit payments are less City of Oakland Contributions to the PFRS Plan of \$11.8 million for the Quarter and \$24.0 million for the Calendar Year.

<b>Table 3</b>		
Change in PFRS Portfolio Valuation as of March 31, 2018 (in thousands)		
<b>Total Plan Value</b>	<b>1 Quarter</b>	<b>1 Year</b>
Beginning Market Value	\$380,459	\$357,684
Investment Drawdowns for Benefit Payments	(3,216)	(23,921)
Gain/Loss on Investment	(1,555)	41,925
<b>Ending Market Value</b>	<b>\$375,693</b>	<b>\$375,693</b>

### ***PFRS Investment Performance***

During the most recent quarter, the PFRS Total Portfolio generated an absolute return of (0.4%), gross of fees, outperforming its policy benchmark by 0.6 percent. The portfolio outperformed its benchmark by 1.5 percent over the one-year period, outperformed by 0.1 percent over the three-year period, and outperformed by 0.4 percent over the five-year period.

Over the most recent quarter, the Plan's Domestic Equity allocation outperformed its benchmark by 1.1 percent. The Plan's International Equity allocation outperformed its benchmark by 0.5 percent. The Plan's Fixed Income allocation outperformed its benchmark by 0.5 percent, while the Covered Calls allocation underperformed its benchmark by 1.1 percent. **Table 4** below shows PFRS recent investment performance in comparison to its corresponding benchmarks.

<b>Table 4</b>				
PFRS Asset Class Performance as of March 31, 2018				
<b>PFRS Total Fund</b>	-0.4%	12.2%	7.7%	8.7%
PFRS Policy Benchmark	-1.0%	10.3%	7.6%	8.3%
Excess Returns	0.6%	1.9%	0.1%	0.4%
PFRS Domestic Equity	0.5%	15.8%	10.7%	13.5%
Benchmark: Russell 3000	-0.6%	13.8%	10.2%	13.0%
Excess Returns	1.1%	2.0%	0.5%	0.5%
PFRS International Equity	-0.6%	20.1%	7.8%	7.9%
Benchmark: MSCI ACWI Ex US	-1.1%	17.0%	6.7%	6.4%
Excess Returns	0.5%	3.1%	1.1%	1.5%

PFRS Fixed Income	-0.9%	3.1%	2.4%	2.5%
Benchmark: Bloomberg Barclays Universal	-1.4%	1.5%	1.7%	2.2%
Excess Returns	0.5%	1.6%	0.7%	0.3%
PFRS Covered Calls	-2.7%	7.8%	8.5%	---
Benchmark: CBOE BXM	-1.6%	6.9%	7.2%	---
Excess Returns	-1.1%	0.9%	1.3%	---
Cash	0.4%	1.3%	0.7%	0.4%
Citigroup 3 Month T-Bill Index	0.3%	1.1%	0.5%	0.3%
Excess Returns	0.1%	0.2%	0.2%	0.1%

**PFRS Actuarial Valuation**

As of the latest actuarial valuation dated July 1, 2017, the PFRS Funded Ratio (actuarial value of assets divided by present value of future benefits) is 52.4 percent. As a result of the funding agreement and the City's deposit of \$210 million in 2012 POBs to the System, no contributions were required until fiscal year 2017/2018. The City resumed contributions to the System on July 1, 2017. The required contribution for fiscal year 2018/2019 is \$44.82 million. **Table 5** below shows a summary of the July 1, 2017 PFRS Actuarial valuation results.

	<b>July 01, 2016</b>
Actuarial Liability	\$ 673,441
Less: Actuarial Value of Assets	(333,373)
Unfunded Actuarial Liability	<u>\$ 340,068</u>
Funded Ratio (MVA) liability	<u>52.4%</u>

**Projected City of Oakland Contributions**

Article XXVI Section 2619 (6) required that the City fully fund the PFRS Plan by 2026. **Table 6** below summarizes the projected employer contributions.

<b>Table 6</b> Projected Employer Contributions Police and Fire Retirement System (in millions)	
<b>Fiscal Year Ending</b>	<b>Employer Contribution</b>
2017	\$ 0.0
2018	44.9
2019	44.8
2020	45.7
2021	46.6
2022	47.6
2023	48.5
2024	49.4
2025	50.2
2026	50.4

**FISCAL IMPACT**

This is an informational report. There are no budget implications associated with this report.

**PUBLIC OUTREACH / INTEREST**

This item did not require public outreach other than the required posting on the City's website.

**COORDINATION**

This report was prepared in coordination with the PFRS' Investment Consultant (PCA) and PFRS' Actuary (Cheiron).

**SUSTAINABLE OPPORTUNITIES**

**Economic:** Whenever possible, the PFRS Board seeks to benefit the local Oakland based economy. In 2006, the PFRS Board, along with staff, created the PFRS Local Broker provision. This provision mandates that the PFRS Investment Managers consider using Oakland based brokers for all trades conducted on behalf of the fund based on best execution. This program aims to regenerate some of the commissions generated by the System into the Oakland economy.

**Environmental:** There are no environmental opportunities associated with this report.

**Social Equity:** There are no social equity opportunities associated with this report.

**ACTION REQUESTED OF THE CITY COUNCIL**

Staff recommends that the Council receive this informational report on the Oakland Police and Fire Retirement System ("PFRS") Investment Portfolio as of March 31, 2018.

For questions regarding this report, please contact Katano Kasaine, Director of Finance, at (510) 238-2989.

Respectfully submitted,



KATANO KASAINE  
Finance Director

Prepared by:  
Téir Jenkins, Investment Officer  
Retirement Division

**Attachments (2):**

**Attachment A:** Oakland Police and Fire System Quarterly Investment Performance Report as of March 31, 2018

**Attachment B:** Oakland Police and Fire System Actuary Valuation as of July 1, 2017

**ATTACHMENT A:  
PFRS INVESTMENT PERFORMANCE  
AS OF MARCH 31, 2018**





# Q1 2018

## Oakland Police and Fire Retirement System Quarterly Report

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Nothing herein is intended to serve as investment advice, a recommendation of any particular investment or type of investment, a suggestion of purchasing or selling securities, or an invitation or inducement to engage in investment activity.

TABLE OF CONTENTS

<u>Tab</u>	<u>Section</u>
<b>A</b>	TOTAL PORTFOLIO SUMMARY
<b>B</b>	ECONOMIC OVERVIEW
<b>C</b>	INVESTMENT MARKET RISK METRICS
<b>D</b>	TOTAL PORTFOLIO REVIEW
<b>E</b>	MANAGER MONITORING / PROBATION LIST
<b>F</b>	INDIVIDUAL MANAGER PERFORMANCE
	Appendix

## TOTAL PORTFOLIO SUMMARY

As of March 31, 2018, the City of Oakland Police and Fire Retirement System (OPFRS) portfolio had an aggregate value of \$375.7 million. This represents a (\$1.6) million decrease in value, and (\$3.2) million in benefit payments, over the quarter. During the previous one-year period, the OPFRS Total Portfolio increased in value by \$41.9 million, and withdrew (\$23.9) million for benefit payments.

### Asset Allocation Trends

The asset allocation targets (see table on page 20) reflect those as of March 31, 2018. Target weightings do not yet reflect the interim phase of the Plan's recently approved asset allocation (effective 5/31/2017).

With respect to policy targets, the portfolio ended the latest quarter **overweight International Equity, Fixed Income, and Cash, while underweight Domestic Equity and Covered Calls.**

### Recent Investment Performance

During the most recent quarter, the OPFRS Total Portfolio generated an absolute return of (0.4%), gross of fees, outperforming its policy benchmark by 0.6%. The portfolio outperformed its benchmark by 1.5% over the 1-year period, outperformed by 0.1% over the 3-year period, and outperformed by 0.4% over the 5-year period.

The Total Portfolio outperformed the Median fund's return over all time periods measured. Performance differences with respect to the Median Fund continue to be attributed largely to differences in asset allocation.

	Quarter	Fiscal YTD	1 Year	3 Year	5 Year
Total Portfolio <sup>1</sup>	-0.4	8.5	12.2	7.7	8.7
Policy Benchmark <sup>2</sup>	-1.0	7.0	10.3	7.6	8.3
<b>Excess Return</b>	<b>0.6</b>	<b>1.5</b>	<b>1.9</b>	<b>0.1</b>	<b>0.4</b>
Reference: Median Fund <sup>3</sup>	-0.4	6.9	10.1	6.3	7.8
Reference: Total Net of Fees <sup>4</sup>	-0.5	8.3	11.9	7.4	8.4

<sup>1</sup> Gross of Fees. Performance since 2005 includes securities lending.

<sup>2</sup> Evolving Policy Benchmark consists of 48% Russell 3000, 12% MSCI ACWI ex U.S., 20% Bbg BC Universal, and 20% CBOE BXM

<sup>3</sup> Investment Metrics < \$1 Billion Public Plan Universe.

<sup>4</sup> Longer-term (>1 year) Net of fee returns are estimated based on OPFRS manager fee schedule (approximately 34 bps).

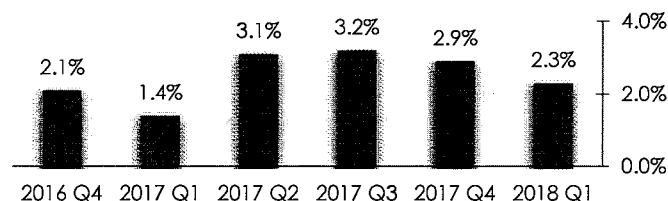
## ECONOMIC & MARKET OVERVIEW – 1Q 2018

**Overview:** Real U.S. GDP increased by 2.3% (advanced estimate) in the first quarter of 2018. GDP growth was driven by increases in business investment, consumer spending, exports, and inventory investment. At quarter-end, the unemployment rate was unchanged at 4.1%. The seasonally adjusted Consumer Price Index for All Urban Consumers increased by 2.5% on an annualized basis during the quarter. Commodities decreased during the first quarter, but the 1-year return for a basket of commodities remains positive at 3.7%. Global equity returns were negative for the quarter at -0.8% (MSCI ACWI). The U.S. Dollar depreciated against the Euro, Pound, and Yen by -2.7%, -3.7%, and -5.7%, respectively.

### Economic Growth

- Real GDP increased at an annualized rate of 2.3 percent in the first quarter of 2018.
- Real GDP growth was driven by increases in business investment, consumer spending, exports, and inventory investment.
- GDP growth was partially offset during the quarter by an increase in imports.

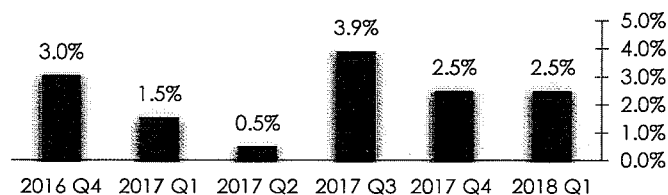
**Annualized Quarterly GDP Growth**



### Inflation

- The Consumer Price Index for All Urban Consumers (CPI-U) increased by 2.5 percent during the first quarter on an annualized basis after seasonal adjustment.
- Quarterly percentage changes may be adjusted between data publications due to periodic updates in seasonal factors.
- Core CPI-U increased by 2.9 percent for the quarter on an annualized basis after seasonal adjustment.
- Over the last 12 months, core CPI-U increased by 2.1 percent after seasonal adjustment.

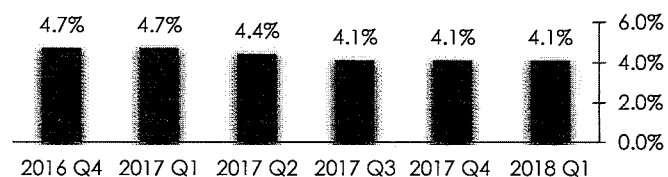
**CPI-U After Seasonal Adjustment**



### Unemployment

- The U.S. economy gained approximately 605,000 jobs in the first quarter of 2018.
- The unemployment rate remained unchanged at 4.1% at quarter-end.
- The majority of jobs gained occurred in goods-producing, professional and business services, and healthcare and social assistance. The primary contributors to jobs lost were in government and information.

**Unemployment Rate**

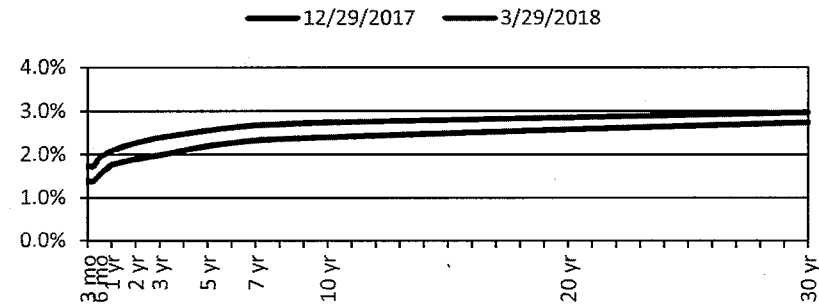


# ECONOMIC & MARKET OVERVIEW – 1Q 2018

## Interest Rates & US Dollar

- The yield curve slightly flattened over the quarter with shorter yields rising faster than intermediate and long-term yields.
- On March 22, the Federal Reserve raised the federal funds rate for the sixth time since the FOMC began raising rates off near-zero in December 2015. The current target is between 1.5 and 1.75 percent.
- The U.S. Dollar depreciated against the Euro, Pound, and Yen by -2.7%, -3.7%, and -5.7%, respectively.

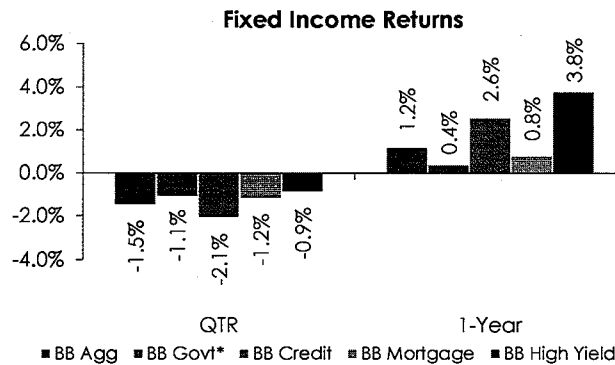
Treasury Yield Curve Changes



Source: US Treasury Department

## Fixed Income

- U.S. bonds were negative over the quarter with every major sector down approximately -1.0% to -2.0%.
- Over the trailing 1-year period, High Yield materially outperformed all other sectors producing a 3.8% return. Government bonds (U.S. Treasuries and Agencies) trailed all other bond sectors with a return of 0.4%.



\*U.S. Treasuries and Agencies

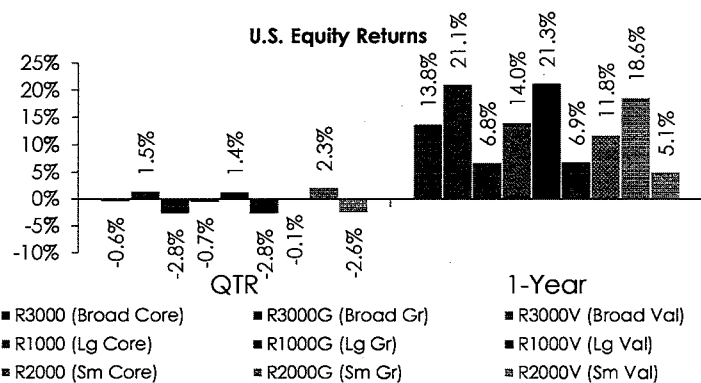
Sector	Weight	QTR	1 Year
Governments*	40.5%	-1.2%	0.6%
Agencies	3.4%	-0.7%	1.7%
Inv. Grade Credit	25.6%	-2.3%	2.7%
MBS	28.1%	-1.2%	0.8%
ABS	0.5%	-0.4%	1.6%
CMBS	1.8%	-1.3%	1.1%

\*U.S. Treasuries and Government Related

# ECONOMIC & MARKET OVERVIEW – 1Q 2018

## U.S. Equities

- During the quarter, growth stocks outperformed value stocks across the market cap spectrum. In terms of market capitalization, small cap stocks provided the strongest returns across styles. Small cap growth stocks returned this quarter's strongest return at 2.3%, and broad and large cap value each provided the weakest result at -2.8%.
- During the trailing 1-year period, core and growth U.S. equities provided positive double-digit returns, with the top performer, large cap growth, returning 21.3%. Conversely, small cap value trailed all other market caps and styles with a return of 5.1%.

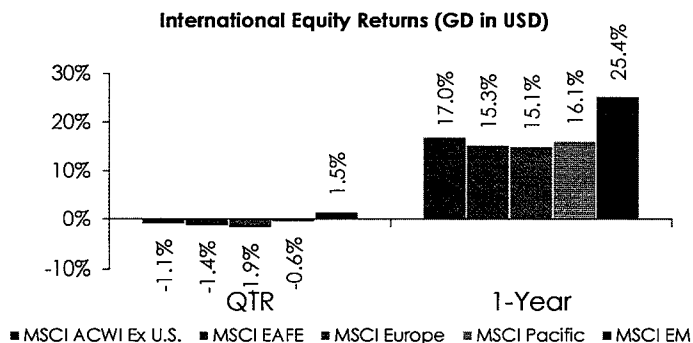


Sector	Weight	QTR	1 Year
Information Tech.	24.3%	4.1%	27.6%
Financials	15.4%	-0.4%	17.0%
Health Care	13.4%	-0.3%	12.8%
Consumer Disc.	12.9%	2.0%	16.2%
Industrials	10.8%	-1.9%	14.3%
Consumer Staples	6.8%	-6.7%	-0.8%
Energy	5.2%	-6.1%	-1.3%
Real Estate	3.4%	-6.2%	-0.2%
Materials	3.4%	-5.2%	9.8%
Utilities	2.7%	3.4%	2.4%
Telecom.	1.7%	-7.3%	-5.0%

## International Equities

- International equities performed poorly over the quarter as each region provided negative returns except for emerging markets, which posted a 1.5% return. Europe trailed all other regions with a return of -1.9%.

Over the trailing 1-year period, international equities provided double digit returns across the board. Emerging markets led all other regions with a return of 25.4%, while Europe trailed all other regions with a 15.1% return.



Sector	Weight	QTR	1 Year
Europe Ex. UK	31.5%	-1.1%	16.4%
Emerging Markets	25.6%	1.5%	25.4%
Japan	16.8%	1.0%	20.0%
United Kingdom	11.8%	-3.9%	12.0%
Pacific Ex. Japan	8.0%	-3.7%	8.6%
Canada	6.2%	-7.2%	5.7%

## ECONOMIC & MARKET OVERVIEW – 1Q 2018

### Market Summary – Multi-term Performance\*

Indexes	Month	Quarter	1 Year	3 Years	5 Years	10 Years	20 Years
<b>Global Equity</b>							
MSCI AC World Index	-2.1%	-0.8%	15.4%	8.7%	9.8%	6.1%	5.8%
<b>Domestic Equity</b>							
S&P 500	-2.5%	-0.8%	14.0%	10.8%	13.3%	9.5%	6.5%
Russell 3000	-2.0%	-0.6%	13.8%	10.2%	13.0%	9.6%	6.7%
Russell 3000 Growth	-2.4%	1.5%	21.1%	12.6%	15.3%	11.3%	6.2%
Russell 3000 Value	-1.5%	-2.8%	6.8%	7.9%	10.7%	7.8%	6.7%
Russell 1000	-2.3%	-0.7%	14.0%	10.4%	13.2%	9.6%	6.7%
Russell 1000 Growth	-2.7%	1.4%	21.3%	12.9%	15.5%	11.3%	6.2%
Russell 1000 Value	-1.8%	-2.8%	6.9%	7.9%	10.8%	7.8%	6.6%
Russell 2000	1.3%	-0.1%	11.8%	8.4%	11.5%	9.8%	7.4%
Russell 2000 Growth	1.3%	2.3%	18.6%	8.8%	12.9%	11.0%	6.2%
Russell 2000 Value	1.2%	-2.6%	5.1%	7.9%	10.0%	8.6%	8.0%
Russell Microcap	1.5%	0.7%	13.5%	8.0%	11.8%	9.2%	—
Alerian MLP Index	-6.9%	-11.1%	-20.1%	-11.2%	-5.8%	5.6%	10.3%
CBOE BXM Index	-1.1%	-1.6%	6.9%	7.2%	7.4%	5.1%	5.8%
<b>International Equity (GD)</b>							
MSCI AC World Index ex USA	-1.7%	-1.1%	17.0%	6.7%	6.4%	3.2%	5.4%
MSCI EAFE	-1.7%	-1.4%	15.3%	6.0%	7.0%	3.2%	4.9%
MSCI Europe	-1.1%	-1.9%	15.1%	5.4%	7.0%	2.7%	4.8%
MSCI Pacific	-2.7%	-0.6%	16.1%	7.5%	7.1%	4.5%	5.1%
MSCI EM (Emerging Markets)	-1.8%	1.5%	25.4%	9.2%	5.4%	3.4%	7.9%
<b>Fixed Income</b>							
BB Universal	0.5%	-1.4%	1.5%	1.7%	2.2%	4.0%	5.0%
Global Agg. - Hedged	0.8%	-0.1%	2.5%	2.0%	2.9%	4.0%	4.8%
BB Aggregate Bond	0.6%	-1.5%	1.2%	1.2%	1.8%	3.6%	4.8%
BB Government	0.9%	-1.1%	0.4%	0.5%	1.1%	2.7%	4.4%
BB Credit Bond	0.3%	-2.1%	2.6%	2.2%	2.8%	5.1%	5.5%
BB Mortgage Backed Securities	0.6%	-1.2%	0.8%	1.1%	1.8%	3.5%	4.7%
BB High Yield	-0.6%	-0.9%	3.8%	5.2%	5.0%	8.3%	6.5%
BCBWGIL All Maturities - Hedged	1.6%	0.1%	2.7%	3.2%	2.7%	4.2%	5.7%
Emerging Markets Debt	0.1%	-1.5%	3.2%	5.1%	3.9%	6.8%	8.2%
<b>Real Estate</b>							
NCREIF	0.7%	2.2%	8.1%	10.0%	11.4%	5.1%	8.9%
FTSE NAREIT All Equity Index	3.7%	-6.7%	-1.0%	3.1%	6.5%	7.0%	8.3%
<b>Commodity Index</b>							
Bloomberg Commodity Index	-0.6%	-0.4%	3.7%	-3.2%	-8.3%	-7.7%	0.9%

\*Performance is annualized for periods greater than one year.

## Investment Market Risk Metrics

### Takeaways

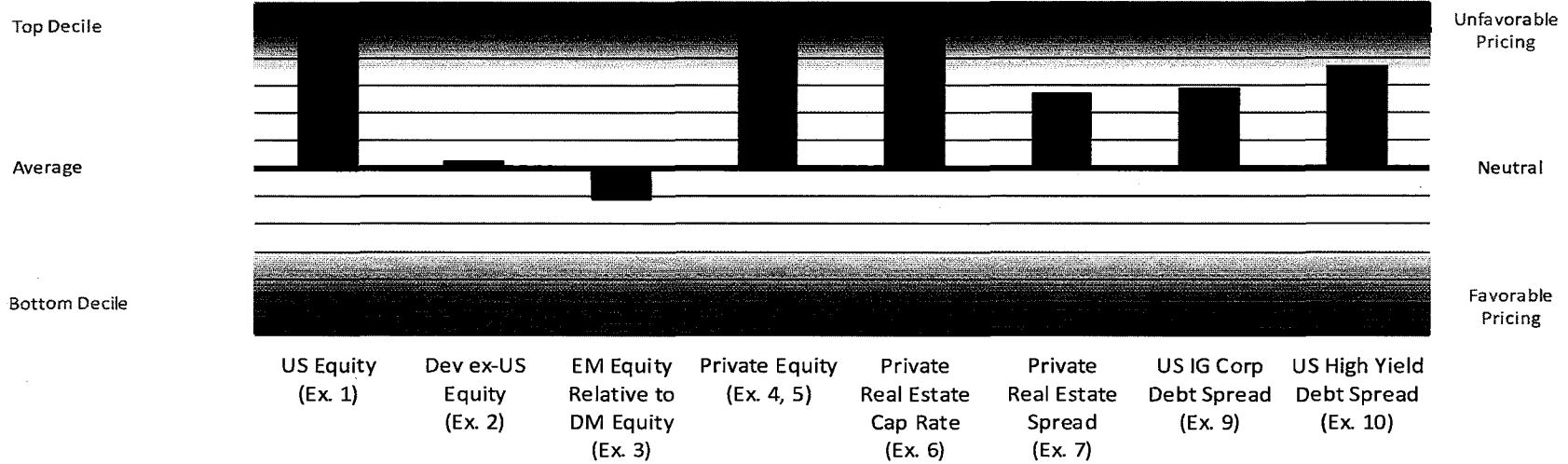
- March was the second down month in a row for most risk-oriented assets. Contrary to February, however, certain diversifying assets (e.g., U.S. Treasuries) produced positive returns for the month.
- The month of January (i.e., mid-to-high single digit returns) is the primary reason that YTD returns for most risk-oriented assets/indices are generally +/-2% (despite recent drawdowns).
- Several market themes from the last few years reversed in March, with small caps outperforming large caps, value beating growth, and material drawdowns in a handful of the strongest performing equities (e.g., FANG stocks).
- On a trailing one-year basis, certain risk assets (e.g., large cap growth stocks, EM equity, etc.) have outperformed other risk-oriented assets (e.g., MLPs, REITs, etc.) by upwards of 40%.
- The first quarter of 2018 saw implied equity market volatility materially elevate before settling closer to the historical averages by quarter-end. PCA expects this environment (i.e., significantly higher implied and realized volatility than recent past) to persist over the near-term.
- U.S. Treasury interest rates increased during the first quarter, with short-term rates generally rising more than long-term rates.
- Non-U.S. Developed and Emerging Market equity valuations are currently in-line with long-term averages, but they remain modestly cheap relative to U.S. levels.
- A prevailing market theme at the moment is the divergence of U.S. fiscal and monetary policies. Whereas fiscal policy is currently stimulative, monetary policy is generally tightening as economic growth, inflation, and unemployment are approaching late-cycle levels. PCA expects this to remain a topic of interest/concern throughout 2018.
- PCA's sentiment indicator remains positive. The sentiment indicator remains solidly **green**.

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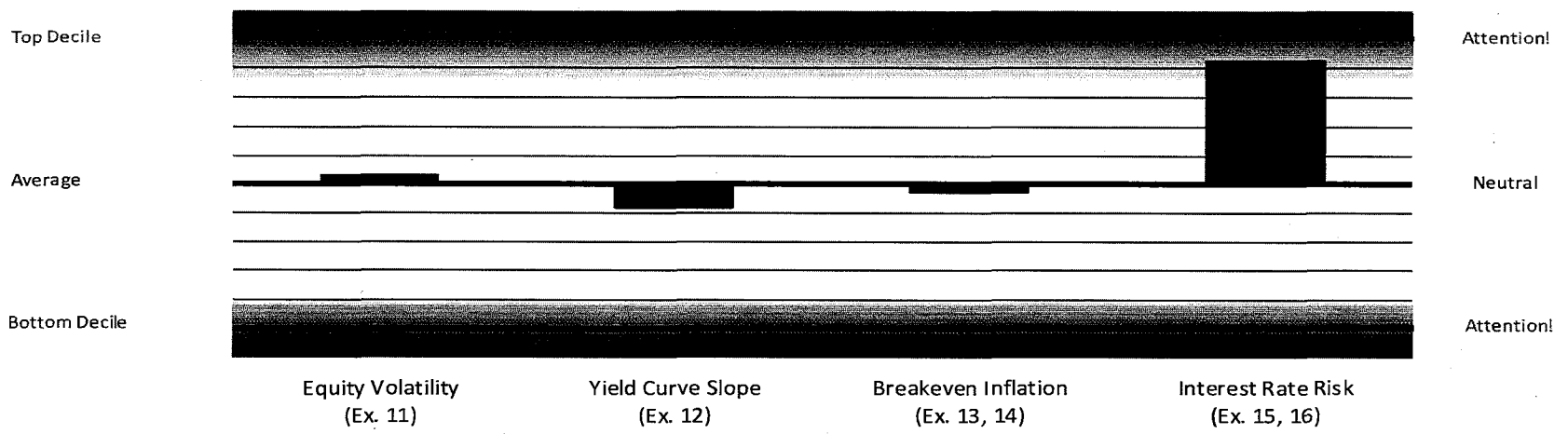
<sup>1</sup> See Appendix for the rationale for selection and calculation methodology used for the risk metrics.



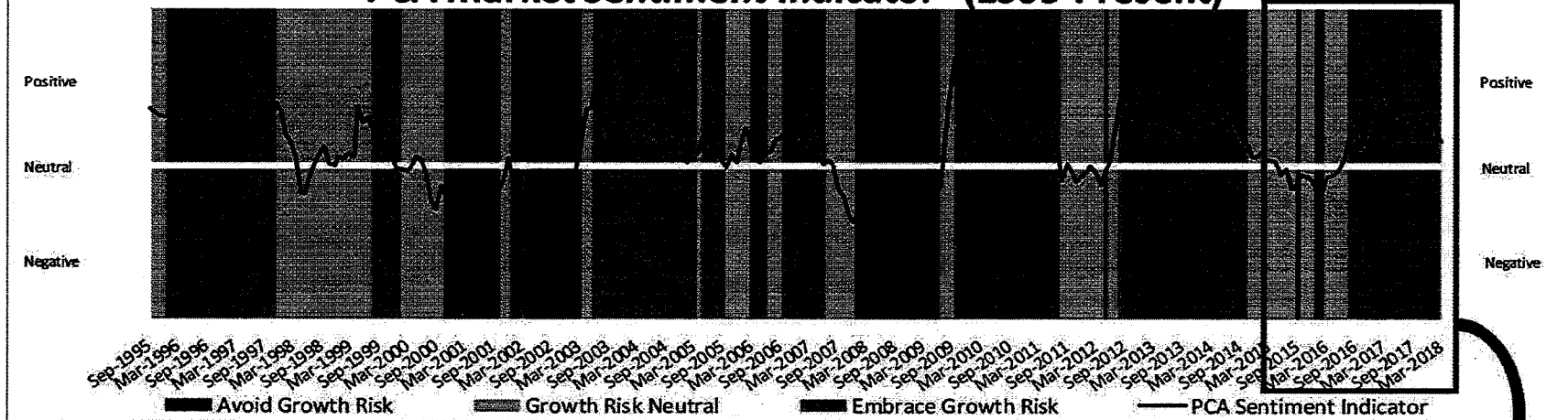
## Valuation Metrics versus Historical Range A Measure of Risk



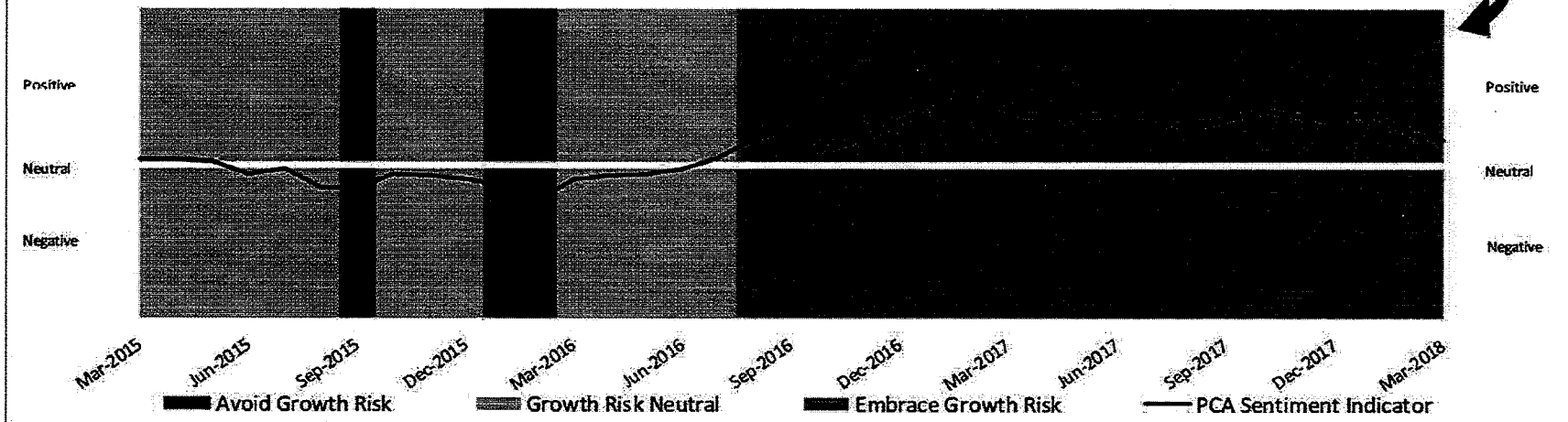
## Other Important Metrics within their Historical Ranges Pay Attention to Extreme Readings



## PCA Market Sentiment Indicator (1995-Present)



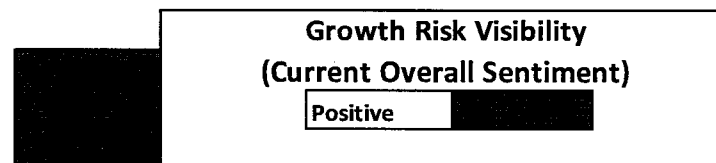
## PCA Market Sentiment Indicator - Most Recent 3-Year Period



### Information Behind Current Sentiment Reading

Bond Spread Momentum Trailing-Twelve Months  
 Equity Return Momentum Trailing-Twelve Months  
 Agreement Between Bond and Equity Momentum Measures?

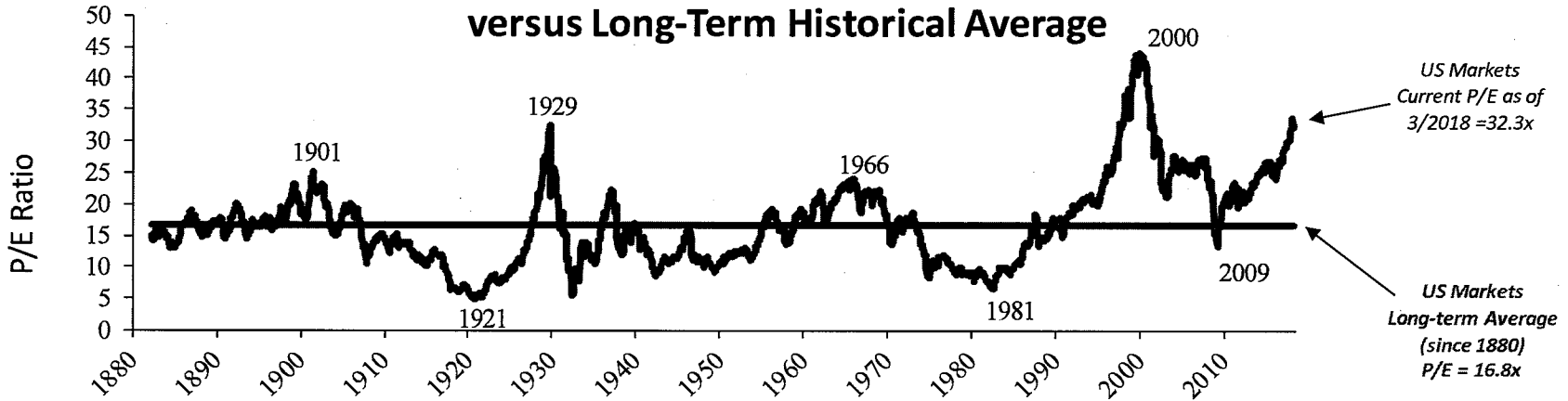
Positive  
 Positive  
 Agree



## Developed Public Equity Markets

Exhibit 1

### U.S. Equity Market P/E Ratio<sup>1</sup> versus Long-Term Historical Average

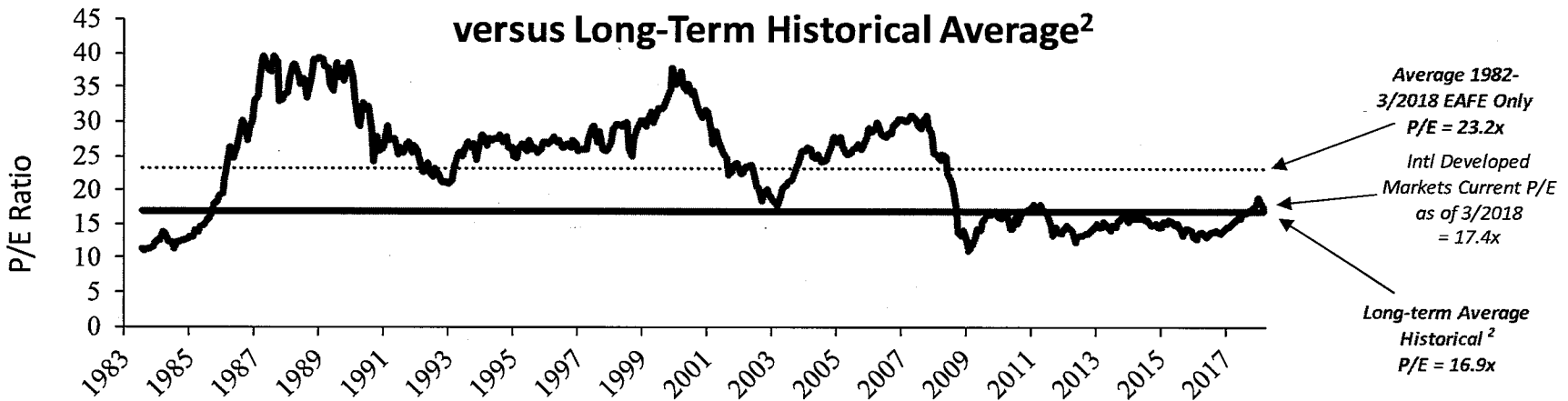


<sup>1</sup> P/E ratio is a Shiller P/E-10 based on 10 year real S&P 500 earnings over S&P 500 index level.

(Please note different time scales)

Exhibit 2

### Developed ex-U.S. Equity Market P/E Ratio<sup>1</sup> versus Long-Term Historical Average<sup>2</sup>



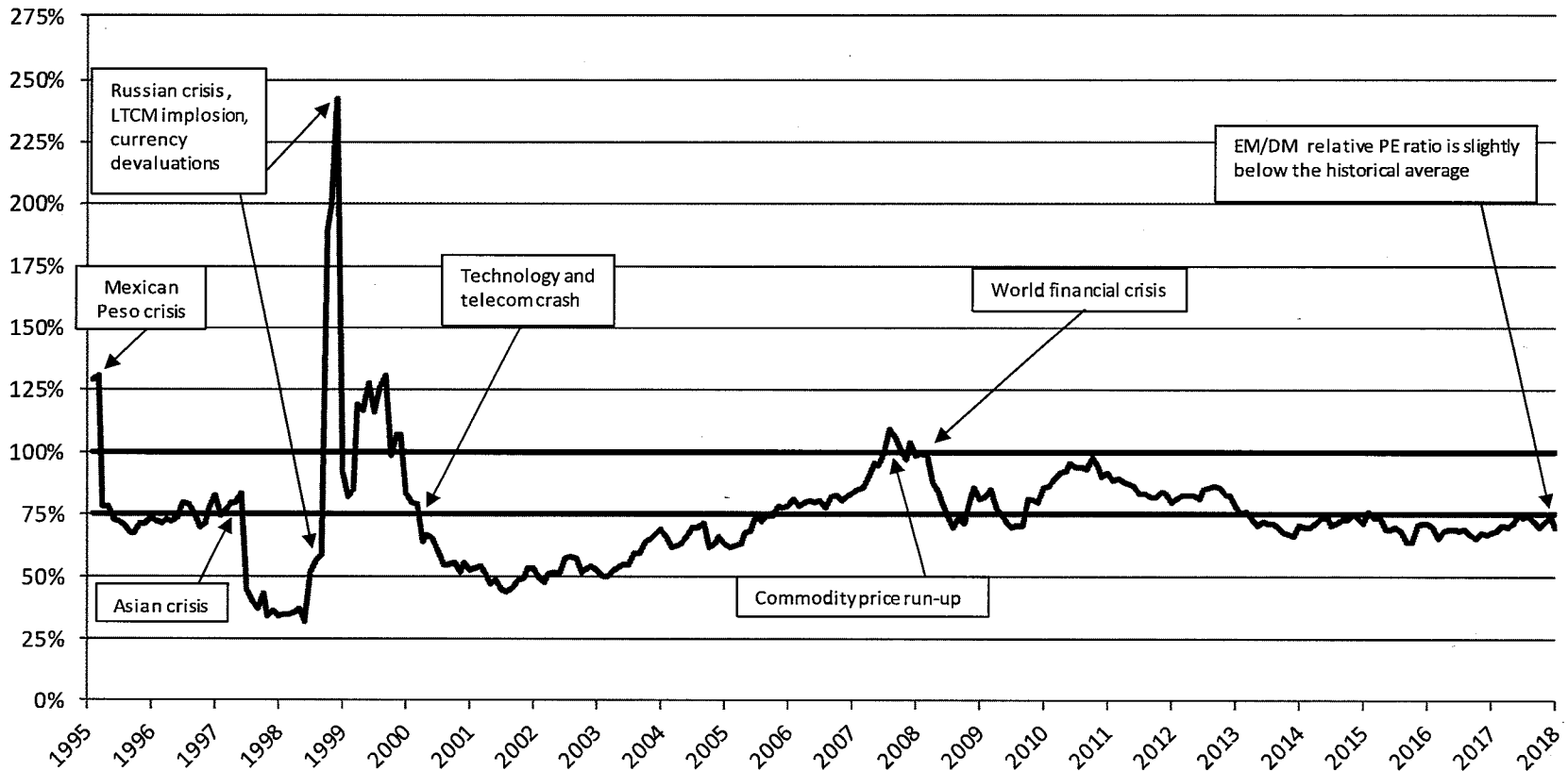
<sup>1</sup> P/E ratio is a Shiller P/E-10 based on 10 year real MSCI EAFE earnings over EAFE index level.

<sup>2</sup> To calculate the LT historical average, from 1881 to 1982 U.S. data is used as developed market proxy. From 1982 to present, actual developed ex-US market data (MSCI EAFE) is used.

## Emerging Markets Public Equity Markets

Exhibit 3

### Emerging Markets PE / Developed Markets PE (100% = Parity between PE Ratios)



Source: Bloomberg, MSCI World, MSCI EMF

— EM/DM PE

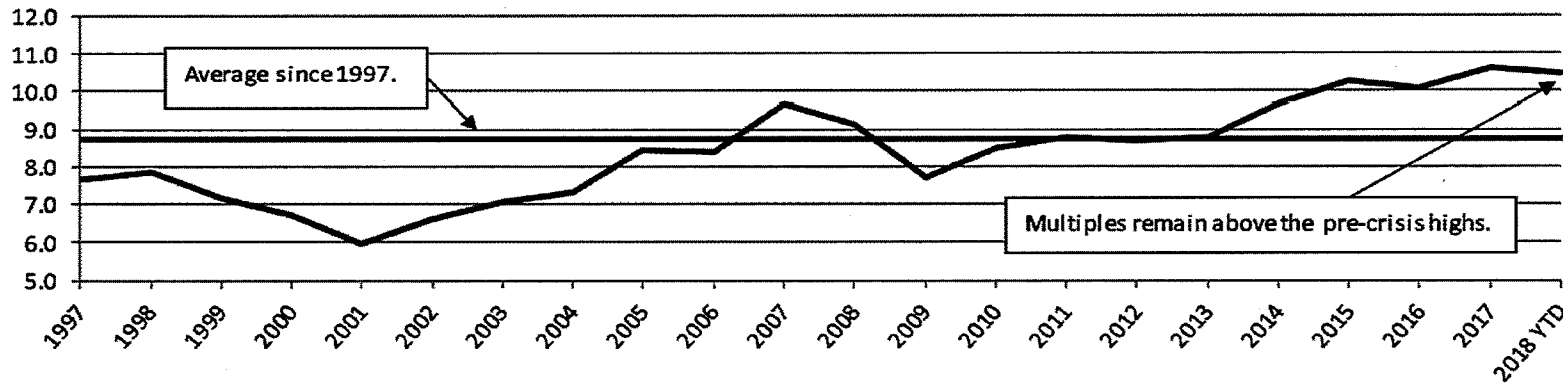
— Average EM/DM PE

— Parity

## U.S. Private Equity Markets

Exhibit 4

### Price to EBITDA Multiples Paid in LBOs

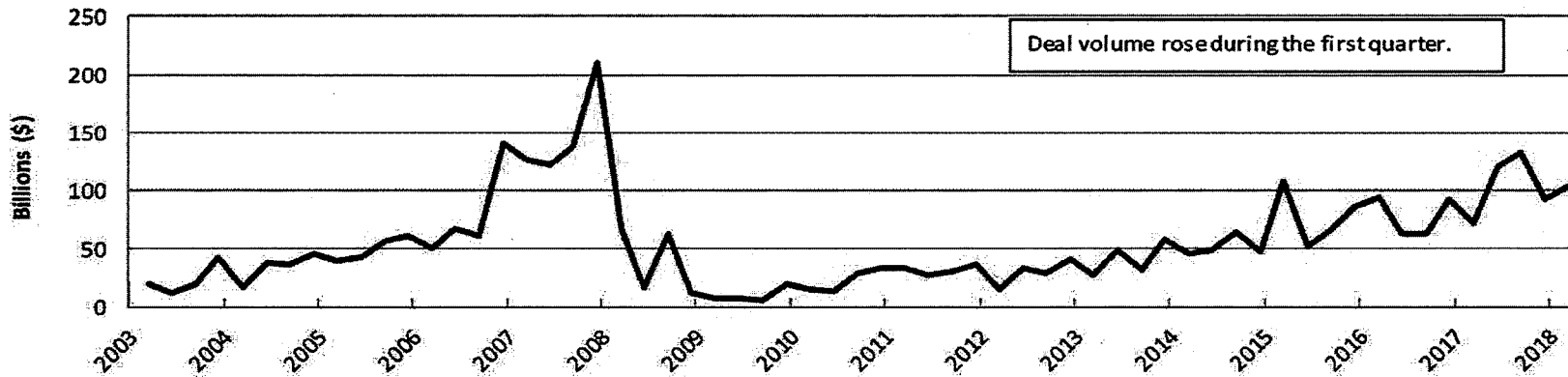


Source: S&P LCD study

(Please note different time scales)

Exhibit 5

### Disclosed U.S. Quarterly Deal Volume\*



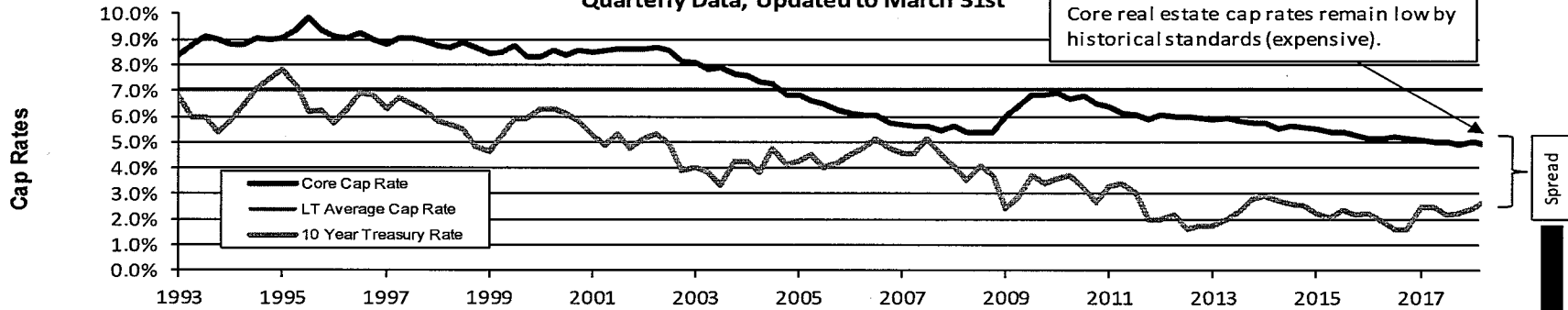
Source: Thomson Reuters Buyouts

\* quarterly total deal size (both equity and debt)

## Private Real Estate Markets

Exhibit 6

### Current Value Cap Rates<sup>1</sup> Quarterly Data, Updated to March 31st



Source: NCREIF

<sup>1</sup>A cap rate is the current annual income of the property divided by an estimate of the current value of the property. It is the current yield of the property. Low cap rates indicate high valuations.

Exhibit 7

### Core Cap Rate Spread over 10-Year Treasury Interest Rate

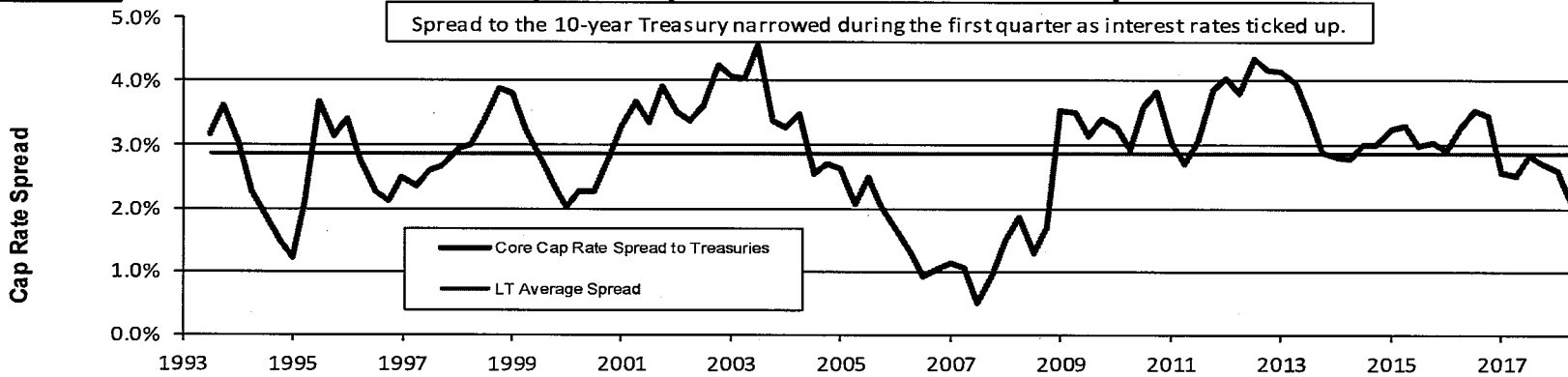
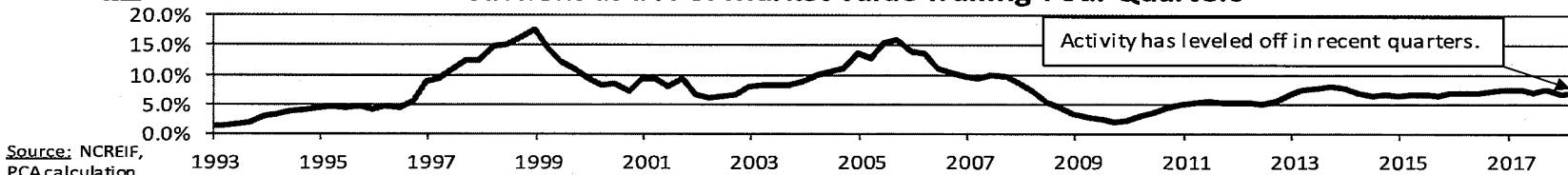


Exhibit 8

### Transactions as a % of Market Value Trailing-Four Quarters

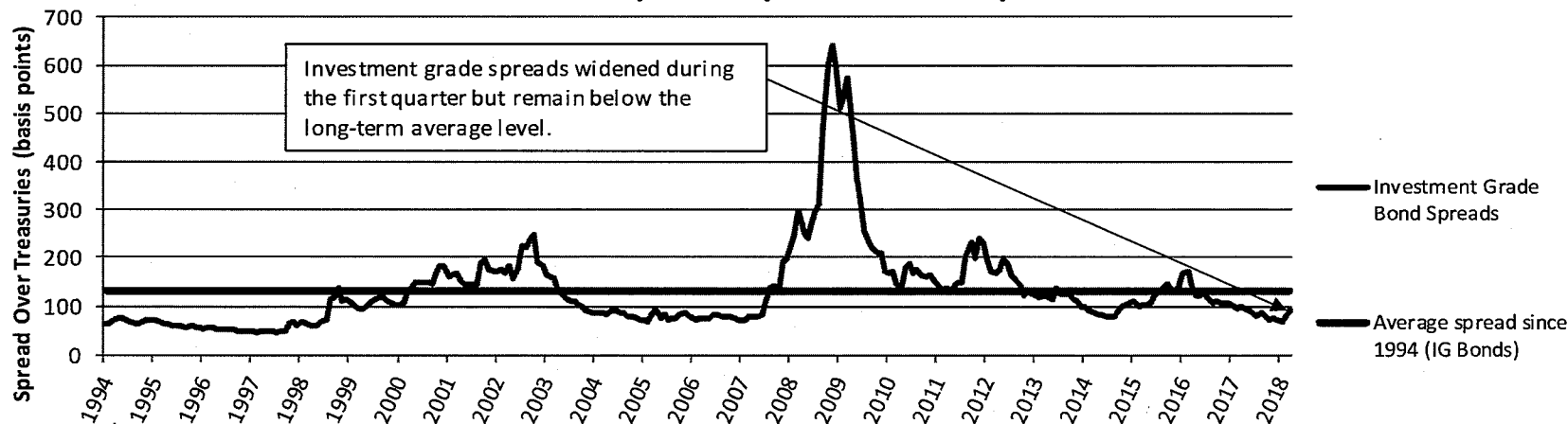


Source: NCREIF,  
PCA calculation

## Credit Markets U.S. Fixed Income

Exhibit 9

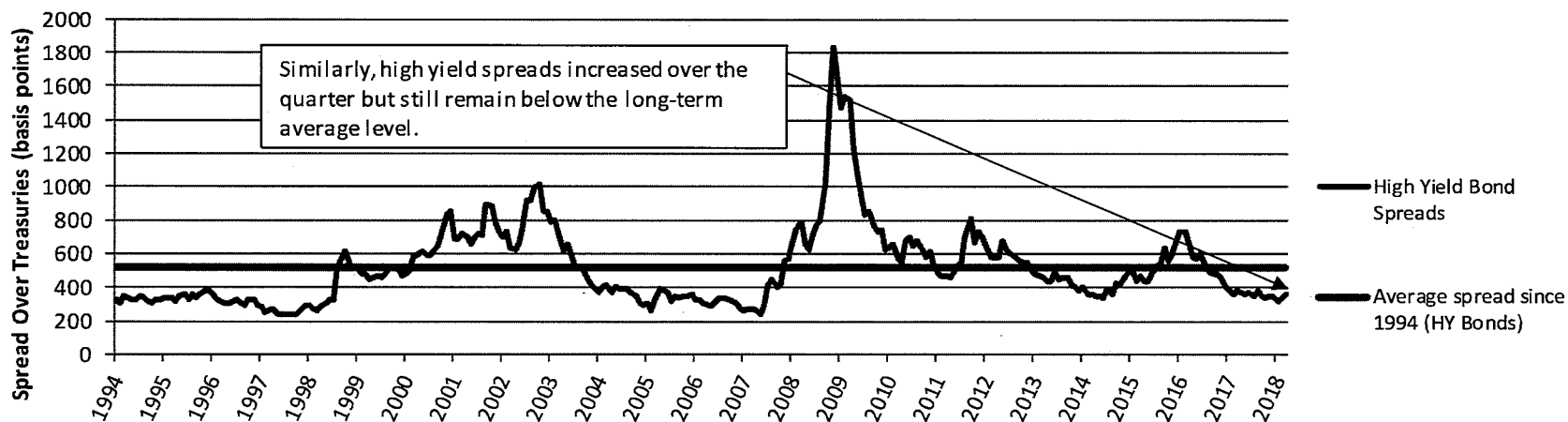
### Investment Grade Corporate Bond Spreads



Source: LehmanLive: Barclays Capital US Corporate Investment Grade Index Intermediate Component.

Exhibit 10

### High Yield Corporate Bond Spreads

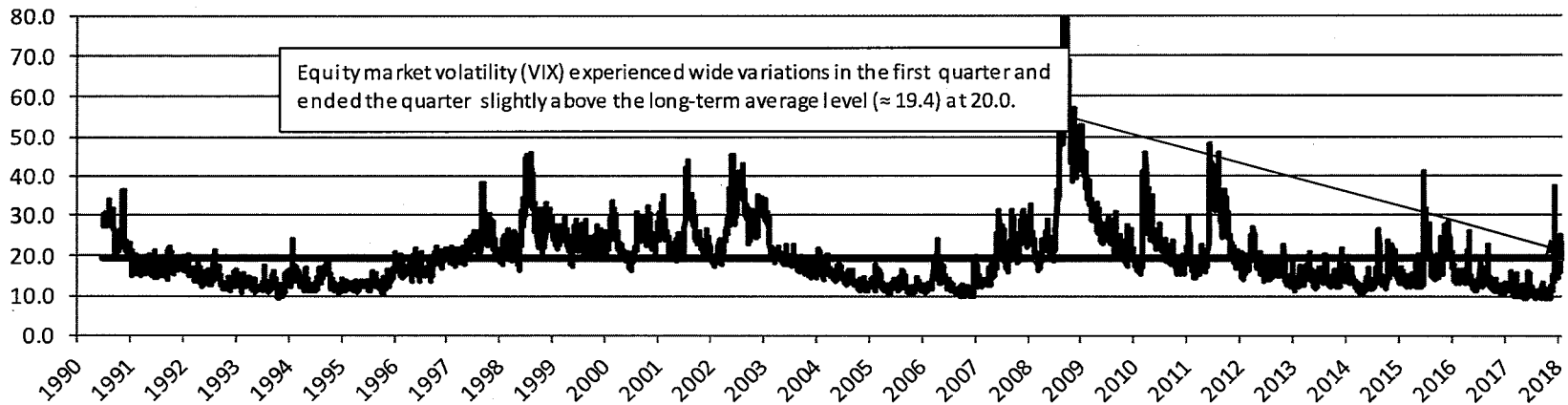


Source: LehmanLive: Barclays Capital U.S. Corporate High Yield Index.

## Other Market Metrics

Exhibit 11

### VIX - a measure of equity market fear / uncertainty

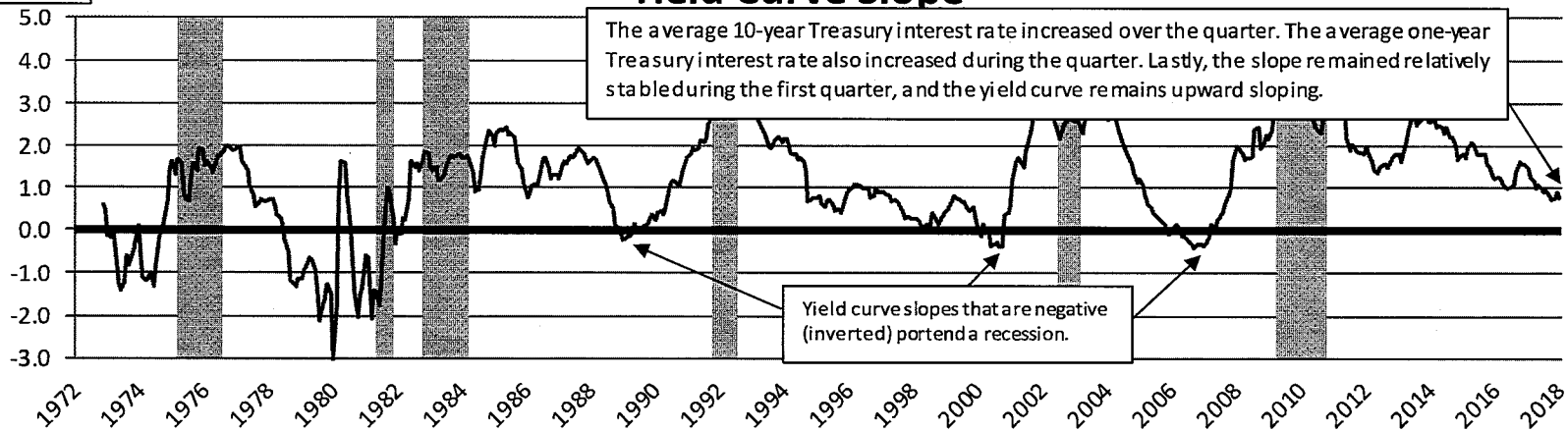


Source: <http://www.cboe.com/micro/vix/historical.aspx>

(Please note different time scales)

Exhibit 12

### Yield Curve Slope



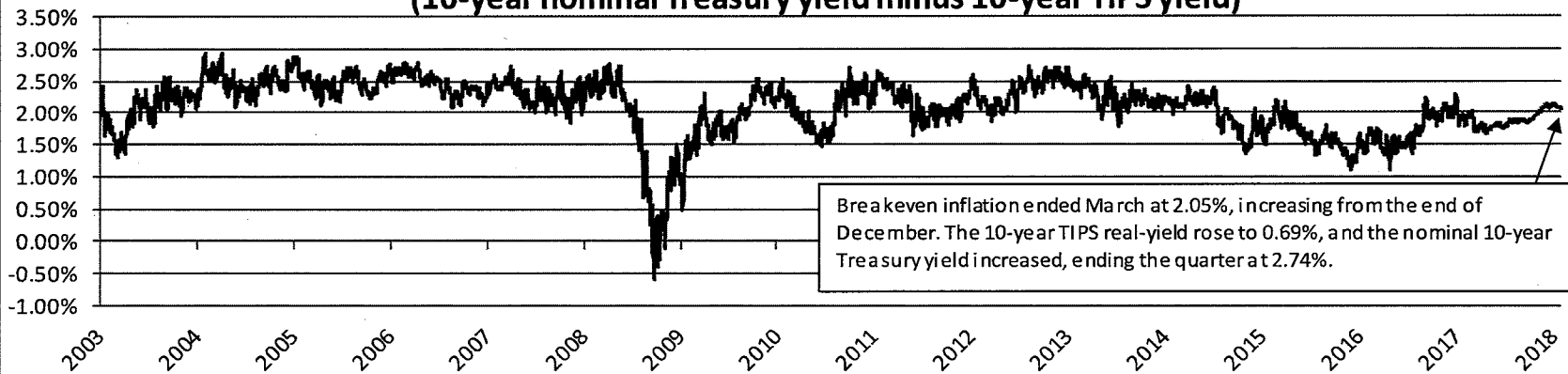
Source: [www.ustreas.gov](http://www.ustreas.gov) (10-year treasury yield minus 1-year treasury yield)



## Measures of Inflation Expectations

Exhibit 13

### 10-Year Breakeven Inflation (10-year nominal Treasury yield minus 10-year TIPS yield)



Break even inflation ended March at 2.05%, increasing from the end of December. The 10-year TIPS real-yield rose to 0.69%, and the nominal 10-year Treasury yield increased, ending the quarter at 2.74%.

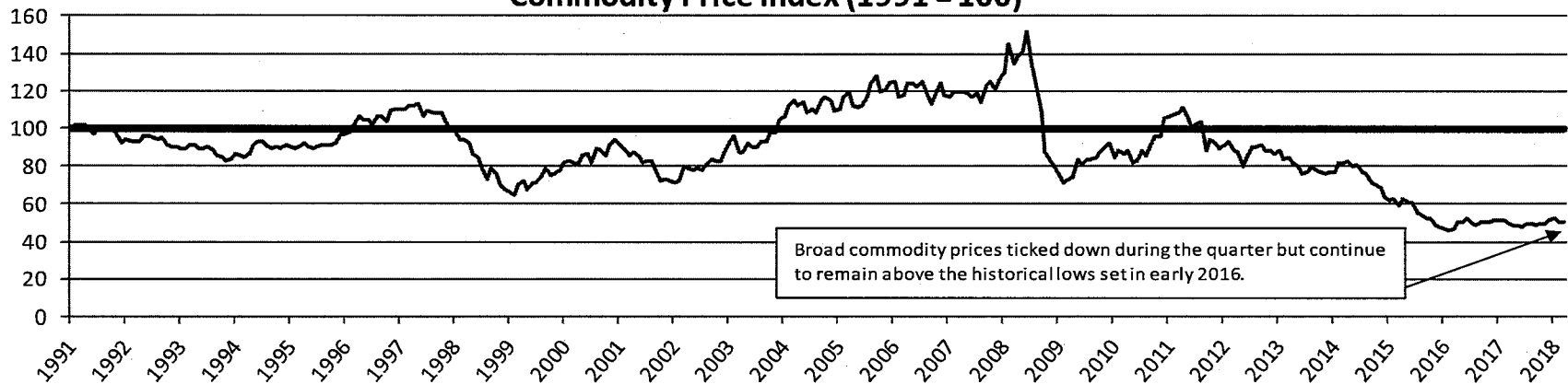
Source: [www.ustreas.gov](http://www.ustreas.gov)

Daily Yield Curve Rates (10-year nominal treasury yield minus 10-year TIPS yield)

(Please note different time scales)

Exhibit 14

### Inflation Adjusted Bloomberg Commodity Price Index (1991 = 100)



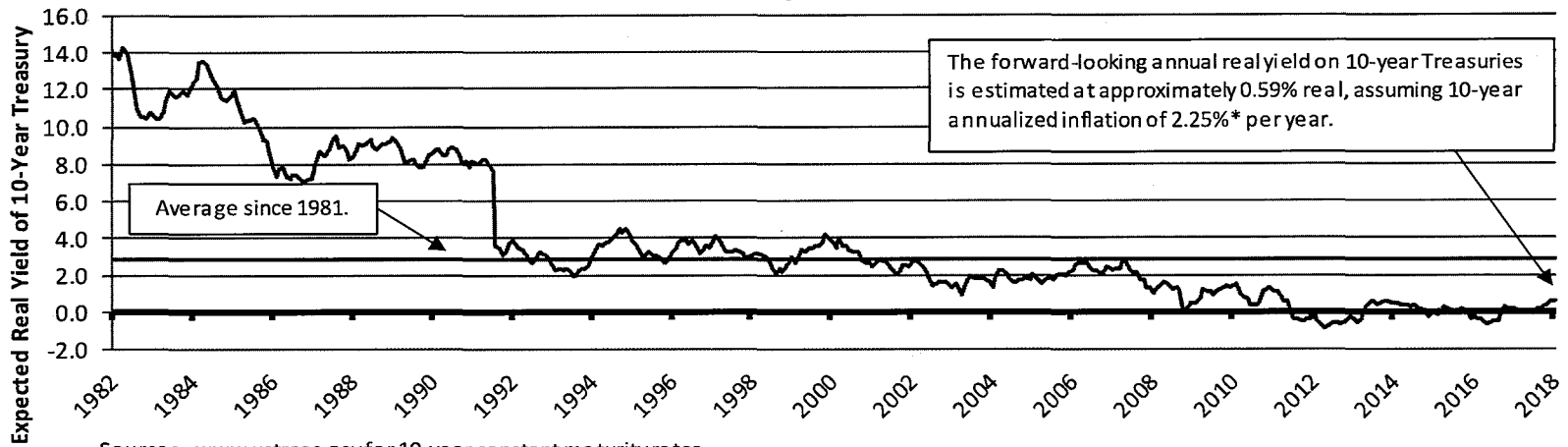
Broad commodity prices ticked down during the quarter but continue to remain above the historical lows set in early 2016.

Source: Bloomberg Commodity Index, St. Louis Fed for US CPI all urban consumers.

## Measures of U.S. Treasury Interest Rate Risk

Exhibit 15

### Estimate of 10-Year Treasury Forward-Looking Real Yield

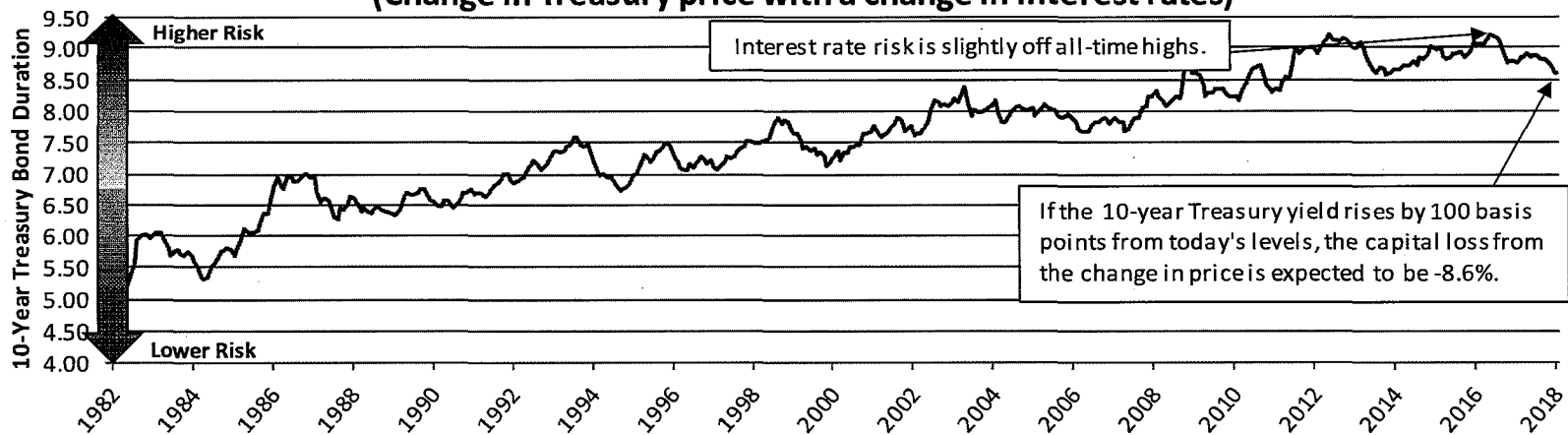


Sources: [www.ustreas.gov](http://www.ustreas.gov) for 10-year constant maturity rates

\*Federal Reserve Bank of Philadelphia survey of professional forecasts for inflation estimates

Exhibit 16

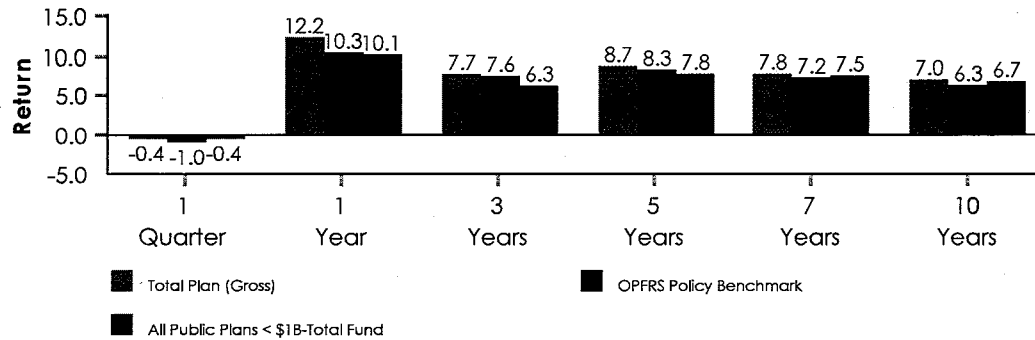
### 10-Year Treasury Duration (Change in Treasury price with a change in interest rates)



Source: [www.ustreas.gov](http://www.ustreas.gov) for 10-year constant maturity rates, calculation of duration

## Performance and Market Values As of March 31, 2018

### Investment Performance



### Portfolio Valuation (000's)

	1 Quarter	1 Year
OPFRS Total Plan		
Beginning Market Value	380,459	357,684
Net Contributions	-3,216	-23,921
Gain/Loss	-1,555	41,925
<b>Ending Market Value</b>	<b>375,693</b>	<b>375,693</b>

### Asset Class Performance (gross of fees)

	1 Quarter	1 Year	3 Years	5 Years	7 Years	10 Years
OPFRS Total Plan	-0.4	12.2	7.7	8.7	7.8	7.0
OPFRS Policy Benchmark*	-1.0	10.3	7.6	8.3	7.2	6.3
Domestic Equity	0.5	15.8	10.7	13.5	12.6	10.1
Russell 3000 (Blend)**	-0.6	13.8	10.2	13.0	12.4	9.6
International Equity	-0.6	20.1	7.8	7.9	5.7	3.5
MSCI ACWI Ex US (Blend)^	-1.1	17.0	6.7	6.4	4.7	3.2
Fixed Income	-0.9	3.1	2.4	2.5	3.7	4.5
Bloomberg Barclays Universal (Blend)^^^	-1.4	1.5	1.7	2.2	3.3	4.0
Covered Calls	-2.7	7.8	8.5	-	-	-
CBOE BXM	-1.6	6.9	7.2	-	-	-
Cash	0.4	1.3	0.7	0.4	0.3	-
Citigroup 3 Month T-Bill Index	0.3	1.1	0.5	0.3	0.2	-

\* Starting on 5/1/2016, Policy Benchmark consists of 48% Russell 3000, 12% MSCI ACWI ex U.S., 20% BC Universal, 20% CBOE BXM

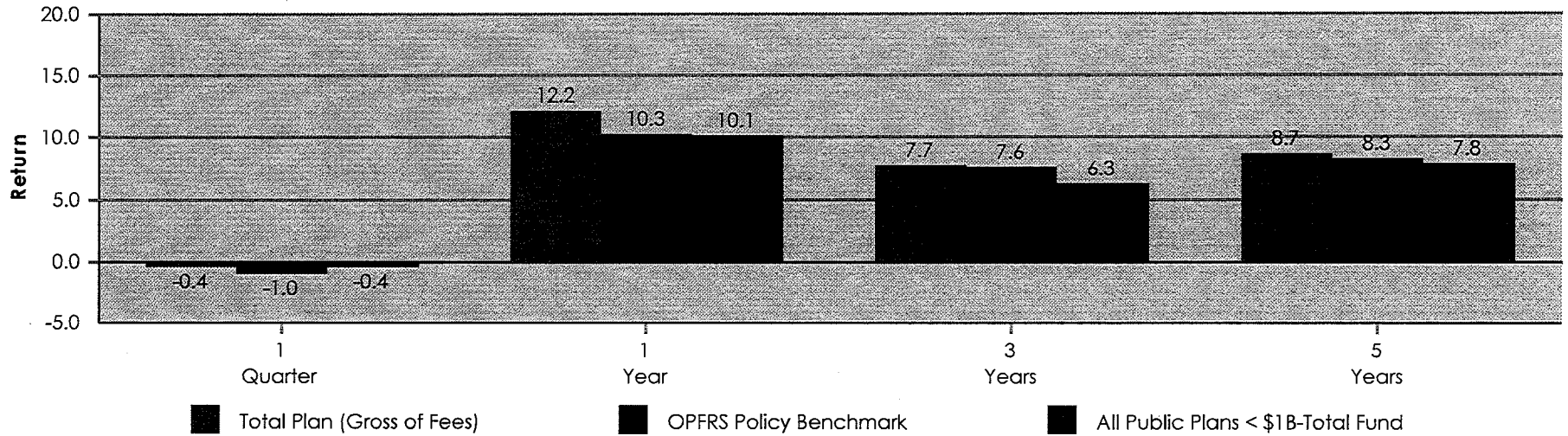
\*\* Domestic Equity Benchmark consists of S&P 500 thru 3/31/98, 10% R1000, 20% R1000V, 5% RMC from 4/1/98 - 12/31/04, and Russell 3000 from 1/1/05 to present

^ International Equity Benchmark consists of MSCI EAFE thru 12/31/04, and MSCI ACWI x US thereafter.

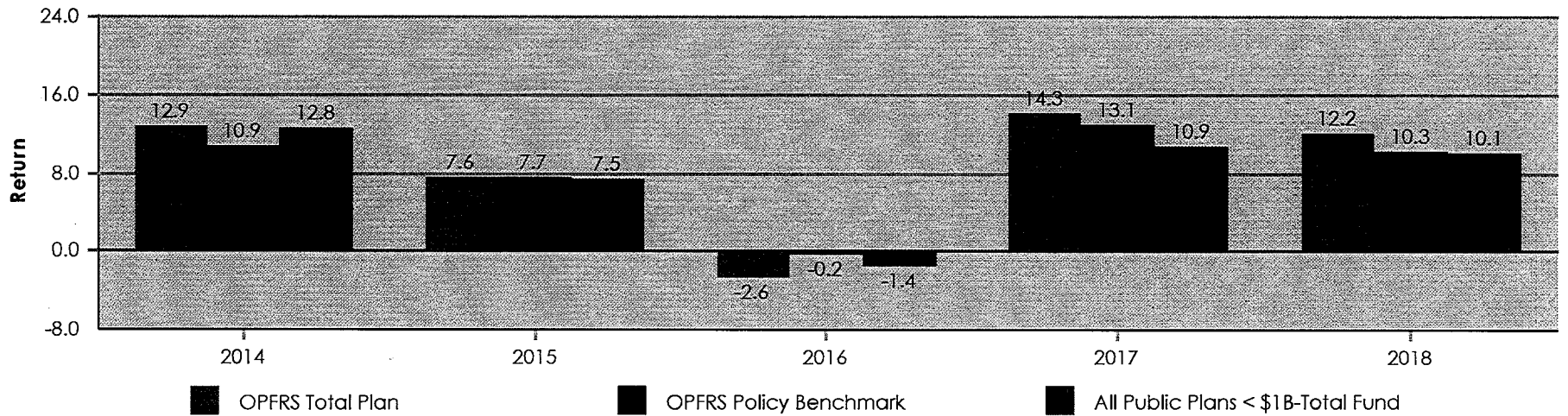
^^ Fixed Income Benchmark consists of Bbg BC Aggregate prior to 4/1/06, and Bbg BC Universal thereafter.

**OPFRS Portfolio Relative Performance Results**  
**As of March 31, 2018**

**Trailing Period Performance (annualized)**



**12-month Performance- As of March 31, 2018**



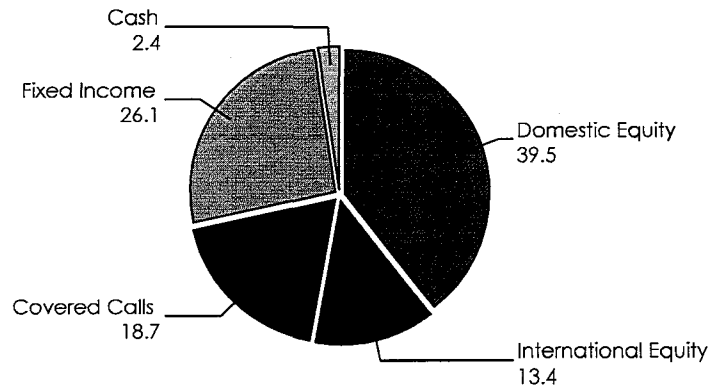
**Actual vs. Target Allocation**  
**As of March 31, 2018**

	Asset Allocation (\$000)	Asset Allocation (%)	Target Allocation* (%)	Variance (%)
OPFRS Total Plan	375,693	100.0	100.0	0.0
Domestic Equity	148,261	39.5	48.0	-8.5
International Equity	50,215	13.4	12.0	1.4
Total Fixed Income	97,876	26.1	20.0	6.1
Covered Calls	70,373	18.7	20.0	-1.3
Cash	8,968	2.4	0.0	2.4

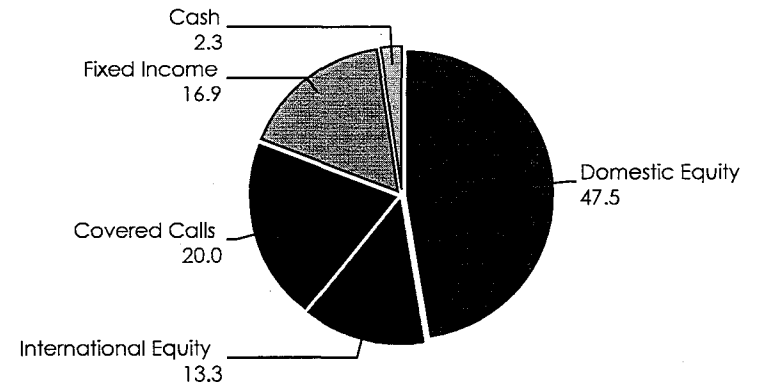
\*Target weightings reflect the Plan's evolving asset allocation (effective 3/31/2014).

**Actual Asset Allocation Comparison**

**March 31, 2018 : \$375,692,944**



**December 31, 2017 : \$380,457,349**



## Manager Performance - Gross of Fees

As of March 31, 2018

### Domestic Equity

Manager - Style	Mkt Value (\$000)	1 Quarter	1 Year	3 Years	5 Years	Since Inception*	Inception Date
<b>Large Cap Core</b>							
Northern Trust Russell 1000 Index	76,075	-0.7	13.9	10.4	13.2	14.3	06/2010
Russell 1000 Index		-0.7	14.0	10.4	13.2	14.3	
Excess Return		0.0	-0.1	0.0	0.0	0.0	
<b>Large Cap Value</b>							
SSgA Russell 1000 Value Index	9,728	-2.8	7.1	8.0	---	7.6	11/2014
Russell 1000 Value Index		-2.8	6.9	7.9	---	7.5	
Excess Return		0.0	0.2	0.1	---	0.1	
<b>Large Cap Growth</b>							
SSgA Russell 1000 Growth Index	10,460	1.4	21.2	12.9	---	13.2	11/2014
Russell 1000 Growth Index		1.4	21.3	12.9	---	13.2	
Excess Return		0.0	-0.1	0.0	---	0.0	
<b>Mid Cap Core</b>							
EARNEST Partners - Active	29,467	0.1 (27)	17.5 (16)	12.8 (4)	14.3 (20)	9.7 (32)	04/2006
Russell Midcap Index		-0.5	12.2	8.0	12.1	8.6	
Excess Return		0.6	5.3	4.8	2.2	1.1	
<b>Small Cap Value</b>							
NWQ - Active	9,883	-1.0 (31)	10.5 (31)	8.8 (49)	13.4 (17)	8.1 (71)	02/2006
Russell 2000 Value Index		-2.6	5.1	7.9	10.0	6.7	
Excess Return		1.6	5.4	0.9	3.4	1.4	
<b>Small Cap Growth</b>							
Rice Hall James	12,647	7.2 (12)	---	---	---	20.7 (15)	07/2017
Russell 2000 Growth Index		2.3	---	---	---	13.6	
Excess Return		4.9	---	---	---	7.1	

Over the latest three-month period ending March 31, 2018, All three of OPFRS's active Domestic Equity managers outperformed their respective benchmarks.

All of OPFRS's passive Domestic Equity mandates performed in-line with their respective benchmarks.

**Northern Trust**, the Plan's passive large cap core transition account, continues to perform in-line with its benchmark over all time periods measured. This performance is within expectations for a passive mandate.

**SSgA Russell 1000 Value**, the Plan's passive large cap value account, has continued to perform within expectations for a passive mandate.

## Manager Performance - Gross of Fees

As of March 31, 2018

### Domestic Equity

**SSgA Russell 1000 Growth**, the Plan's passive large cap growth account, has continued to perform within expectations for a passive mandate.

**EARNEST Partners**, the Plan's mid cap core manager, outperformed its Russell Midcap benchmark by 0.6%. The portfolio has outperformed its benchmark over the 1-, 3-, and 5-year periods by 5.3%, 4.8%, and 2.2%, respectively.

**NWQ**, the Plan's small cap value manager, outperformed the Russell 2000 Value Index by 1.6% over the latest quarter. The portfolio also continues to outperform its benchmark over the 1-, 3-, and 5-year periods by 5.4%, 0.9%, and 3.4%, respectively.

**Rice Hall James**, the Plan's new small cap growth manager had another strong quarter, returning 7.2% over the 3-month period, outperforming the Russell 2000 Growth Index by 4.9%.

## Manager Performance - Gross of Fees

As of March 31, 2018

### International Equity

Manager - Style	Mkt Value (\$000)	1 Quarter	1 Year	3 Years	5 Years	Since Inception	Inception Date
<b>Active International</b>							
Fisher Investments	17,586	-1.0 (56)	18.4 (32)	6.7 (49)	7.5 (61)	5.6 (77)	04/2011
MSCI AC World ex USA		-1.1	17.0	6.7	6.4	4.7	
Excess Return		0.1	1.4	0.0	1.1	0.9	
Hansberger	17,866	0.6 (33)	26.3 (16)	10.6 (18)	9.3 (28)	5.4 (70)	02/2006
MSCI AC World ex USA		-1.1	17.0	6.7	6.4	4.6	
Excess Return		1.7	9.3	3.9	2.9	0.8	
<b>Passive International</b>							
SSgA	14,762	-1.4	15.2	5.9	6.8	7.7	08/2002
MSCI EAFE Index		-1.4	15.3	6.0	7.0	7.8	
Excess Return		0.0	-0.1	-0.1	-0.2	-0.1	

Over the latest three-month period ending March 31, 2018, both of OPFRS's active International Equity managers outperformed their respective benchmarks.

The **SSgA** account has performed roughly in-line with its benchmark over all time periods measured. This performance is within expectations for a passive mandate.

**Hansberger**, one of OPFRS' active international equity managers, outperformed the MSCI ACWI x US Index during the quarter by 1.7%. Hansberger continues to earn impressive returns over the 12-month period, outperforming its benchmark by 9.3% with an absolute return of 26.3%. Hansberger has also outperformed over the 3- and 5-year periods by 3.9% and 2.9%, respectively.

**Fisher**, one of OPFRS' active international equity managers, outperformed the MSCI ACWI x US Index by 0.1% during the quarter. Over the latest 1- and 5-year periods the fund has outperformed its benchmark by 1.4% and 1.1%, respectively, while matching its benchmark over the 3-year period.



## Manager Performance - Gross of Fees

As of March 31, 2018

### Fixed Income

Manager - Style	Mkt Value (\$000)	1 Quarter	1 Year	3 Years	5 Years	Since Inception	Inception Date
<b>Core Fixed Income</b>							
Ramirez	67,707	-1.2 (29)	2.9 (4)	---	---	3.1 (8)	01/2017
Bmbg. Balc. U.S. Aggregate Index		-1.5	1.2	---	---	1.6	
Excess Return		0.3	1.7	---	---	1.5	
<b>Core-Plus Fixed Income</b>							
Reams	22,398	-1.1 (38)	1.4 (94)	1.6 (83)	2.0 (93)	5.5 (58)	02/1998
Bbg Barclays Universal (Blend)		-1.4	1.5	1.7	2.2	5.0	
Excess Return		0.3	0.1	0.1	0.2	0.5	
<b>High Yield / Bank Loans</b>							
DDJ Capital	7,771	2.6 (4)	10.9 (3)	7.7 (6)	---	7.9 (6)	02/2015
ICE BofAML High Yield Master II		0.9	3.7	5.2	---	5.5	
Excess Return		3.5	7.2	2.5	---	2.4	

Over the latest three-month period, ending March 31, 2018, all three of OPFRS's active Fixed Income managers outperformed their respective benchmarks.

**Ramirez**, the Plan's core fixed income manager, produced an excess quarterly return of 30 basis points by returning (1.2%) compared to the Bbg BC US Aggregate return of (1.5%). Over the latest 1-year period, Ramirez has returned 2.9% and outperformed its benchmark by 1.7%.

**Reams**, the Plan's core plus fixed income manager, outperformed its benchmark, the Bbg BC Universal, by 30 basis points over the quarter. During the latest 1- and 3-year period, Reams underperformed its benchmark by (10) basis points, and underperformed by (20) basis points over the 5-year period.

**DDJ**, the Plan's High Yield & Bank Loan manager, outperformed its benchmark, the BofAML US High Yield Master II index, by 3.5% over the most recent quarter. The DDJ portfolio has returned 10.9% over the latest 1-year period, outperforming the benchmark by 7.2%, and has outperformed by 2.5% over the 3-year period.

**Manager Performance - Gross of Fees**

As of March 31, 2018

**Fixed Income**

## Manager Performance - Gross of Fees

As of March 31, 2018

### Covered Calls

Manager - Style	Mkt Value (\$000)	1 Quarter	1 Year	3 Years	5 Years	Since Inception	Inception Date
<b>Covered Calls Composite</b>							
Covered Calls	70,373	-2.7	7.8	8.5	--	8.0	04/2014
CBOE BXM		-1.6	6.9	7.2	--	6.6	
Excess Return		-1.1	0.9	1.3	--	1.4	
<b>CC - Passive Allocation</b>							
Parametric BXM	35,162	-3.2	5.8	7.5	--	6.9	04/2014
CBOE BXM		-1.6	6.9	7.2	--	6.6	
Excess Return		-1.6	-1.1	0.3	--	0.3	
<b>CC - Active Allocation</b>							
Parametric DeltaShift	35,211	-2.3	9.8	8.9	--	10.0	04/2014
CBOE BXM		-1.6	6.9	7.2	--	6.6	
Excess Return		0.7	2.9	1.7	--	3.4	

During the latest three-month period ending March 31, 2018, OPFRS' aggregate Covered Calls portfolio has underperformed its benchmark by (1.1%).

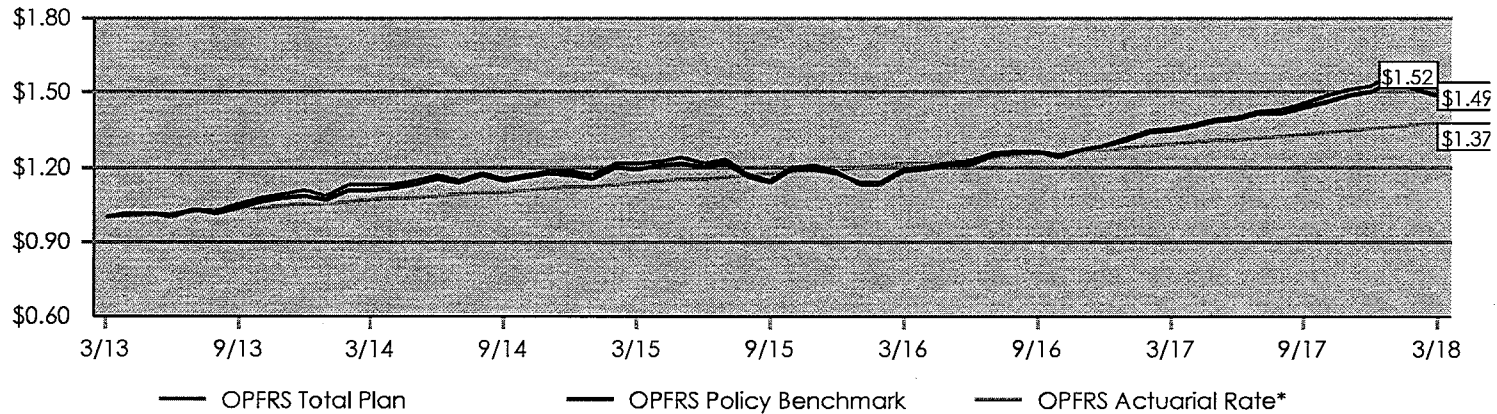
**Parametric BXM Portfolio**, the Plan's passive covered calls allocation underperformed its CBOE BXM index by (1.6%) over the most recent quarter. Over the most recent 1-year period, the portfolio has underperformed its benchmark by (1.1%), while outperforming over the 3-year period by 0.3%

**Parametric Delta Shift Portfolio**, the Plan's active covered calls allocation has underperformed the CBOE BXM benchmark by (0.7%) over the most recent quarter, but has outperformed the benchmark by 2.9% and 1.7% over the most recent 1- and 3-year periods, respectively.

# OPFRS Total Portfolio 5-Year Performance

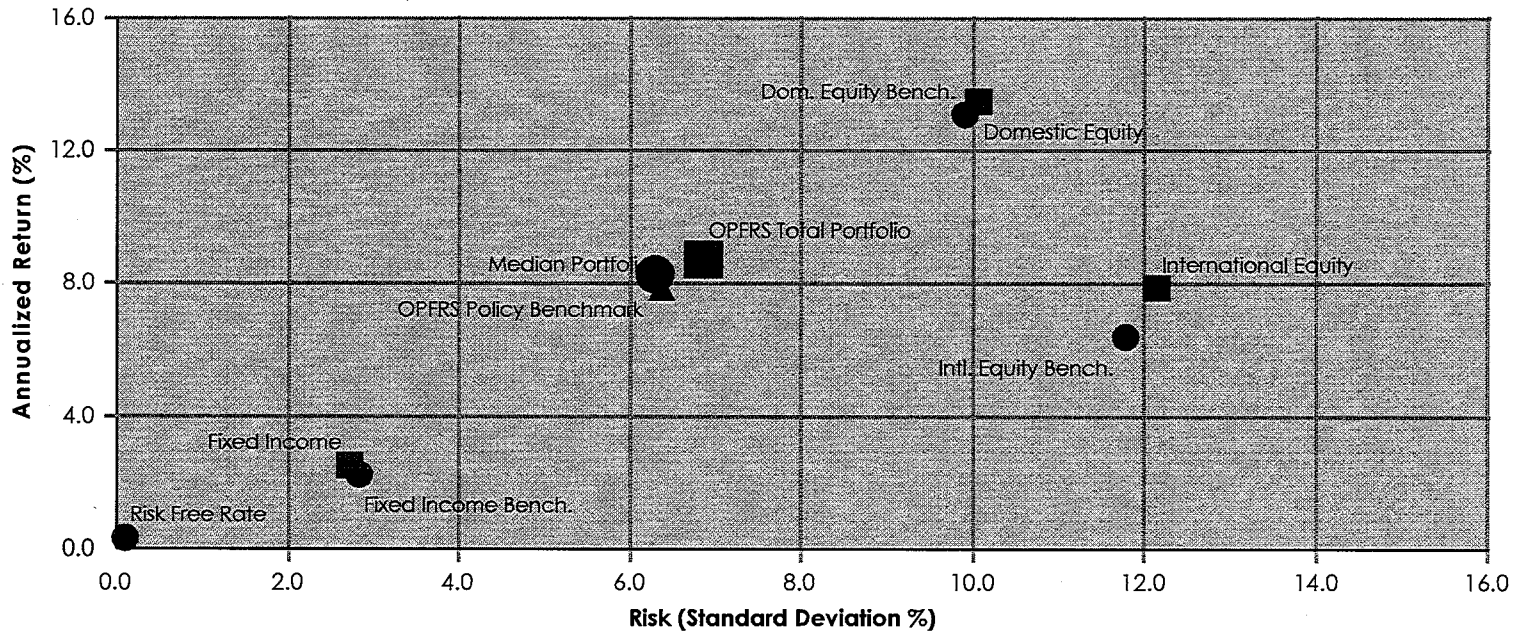
As of March 31, 2018

### Growth of \$1 (5-year)

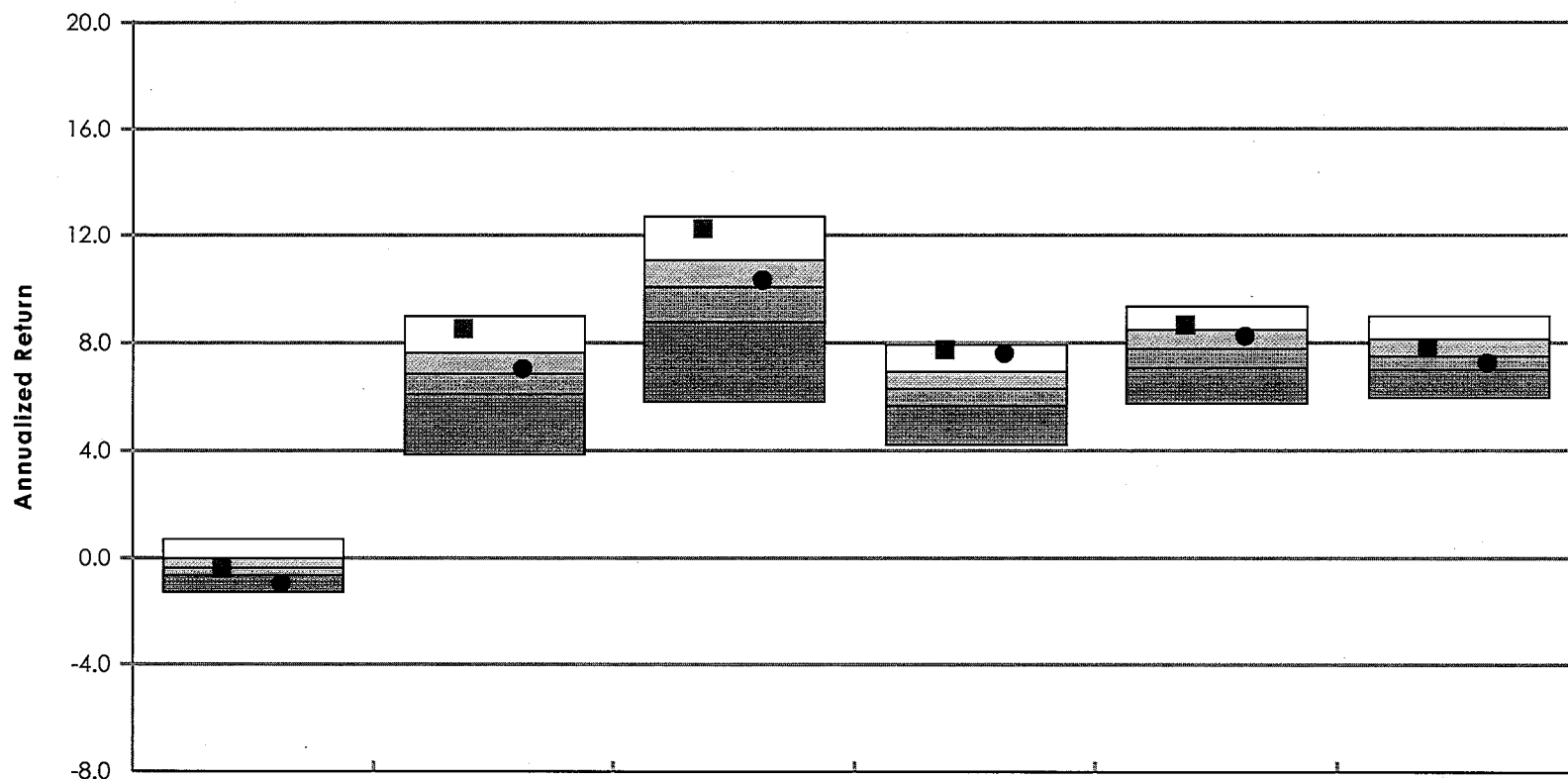


\* The actuarial expected rate of return was 8% through 6/30/2009, 7.5% through 6/30/2010, 7% through 6/30/2011, 6.75% through 6/30/2014, and 6.5% currently

### Risk/Return Performance (5-year)



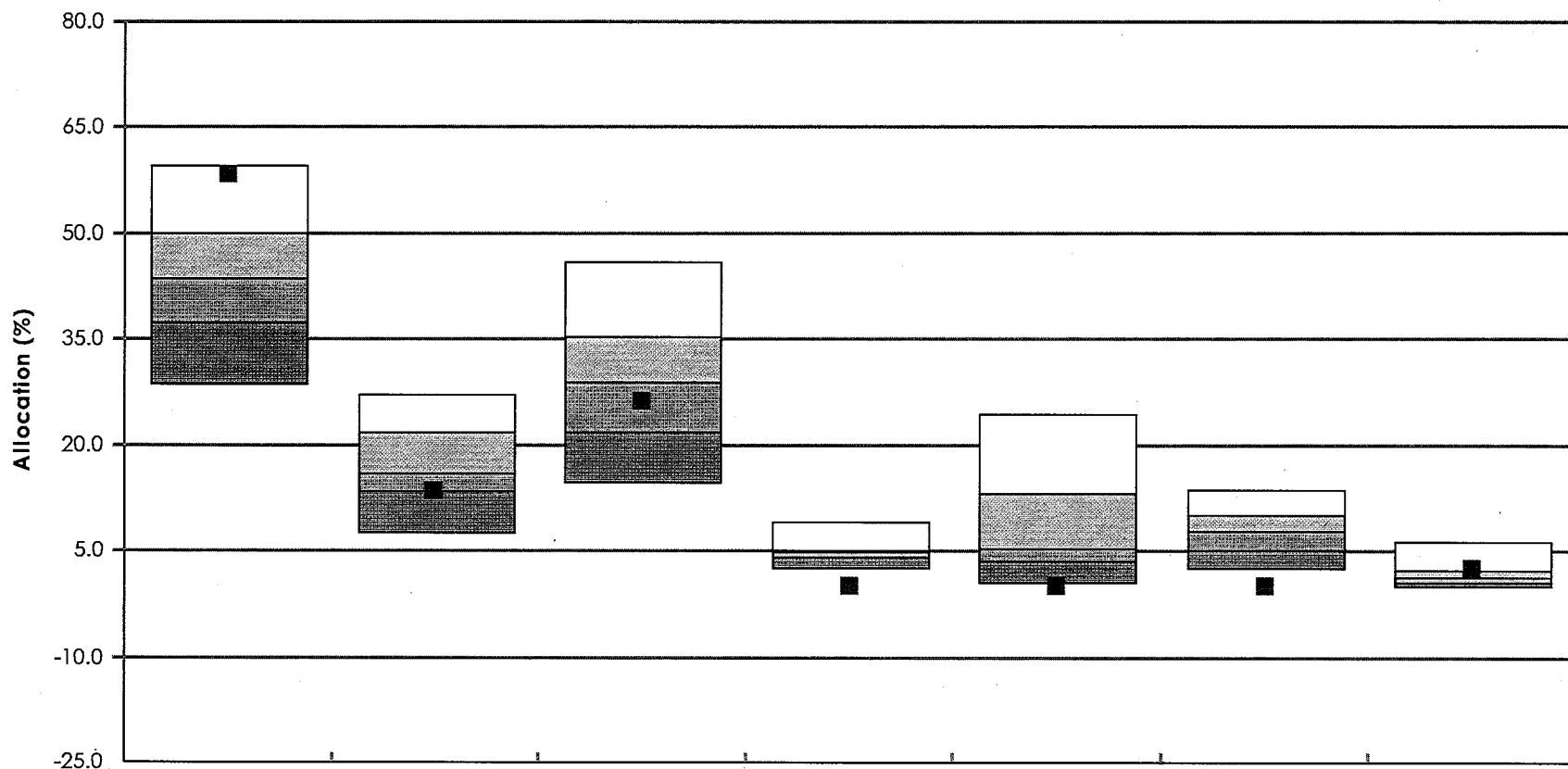
**Plan Sponsor Peer Group Analysis**  
As of March 31, 2018



	1 Quarter	Fiscal YTD	1 Year	3 Years	5 Years	7 Years
■ <b>OPFRS Total Plan</b>	<b>-0.4 (56)</b>	<b>8.5 (10)</b>	<b>12.2 (9)</b>	<b>7.7 (8)</b>	<b>8.7 (19)</b>	<b>7.8 (38)</b>
● <b>OPFRS Policy Benchmark</b>	<b>-1.0 (89)</b>	<b>7.0 (46)</b>	<b>10.3 (44)</b>	<b>7.6 (9)</b>	<b>8.3 (35)</b>	<b>7.2 (65)</b>
5th Percentile	0.7	9.1	12.7	7.9	9.4	9.0
1st Quartile	0.0	7.7	11.1	6.9	8.5	8.2
<b>Median</b>	<b>-0.4</b>	<b>6.9</b>	<b>10.1</b>	<b>6.3</b>	<b>7.8</b>	<b>7.5</b>
3rd Quartile	-0.7	6.1	8.8	5.7	7.1	7.0
95th Percentile	-1.3	3.9	5.9	4.2	5.7	6.0
Population	534	527	522	490	475	460

Parenttheses contain percentile rankings.  
Calculation based on monthly periodicity.

**Plan Sponsor TF Asset Allocation  
As of March 31, 2018**



	US Equity	Intl. Equity	US Fixed Income	Intl. Fixed Income	Alternative Inv.	Real Estate	Cash
■ OPFRS Total Plan	58.2 (7)	13.4 (75)	26.1 (61)	0.0	0.0 (100)	0.0	2.4 (22)
5th Percentile	59.7	27.0	46.0	9.1	24.3	13.6	6.2
1st Quartile	50.0	21.8	35.4	5.2	13.1	10.1	2.2
Median	43.6	15.9	28.8	4.7	5.3	7.8	1.2
3rd Quartile	37.4	13.3	21.7	4.1	3.6	5.0	0.6
95th Percentile	28.4	7.7	14.6	2.6	0.4	2.6	0.1
Population	541	504	535	144	135	325	477

Parenteses contain percentile rankings.  
Calculation based on monthly periodicity.

**Monitoring/Probation Status**

**As of March 31, 2018**  
**Return vs. Benchmark since Corrective Action**

Portfolio	Status	Concern	Months Since Corrective Action	Performance <sup>^</sup> Since Corrective Action	Date of Corrective Action*
Reams	On Watch	Organizational	10	0.0%	5/31/2017
BBC BC Universal (Blend)			10	0.1%	
Hansberger	On Watch	Organizational	4	16.5%	11/30/2017
MSCI ACWI ex-USA			4	10.8%	

<sup>^</sup> Annualized performance if over one year.

\* Approximate date based on when Board voted to either monitor a manager at a heightened level or place it on probation.

**Investment Performance Criteria**  
**For Manager Monitoring/Probation Status**

Asset Class	Short-term (rolling 12 mth periods)	Medium-term (rolling 36 mth periods)	Long-term (60 + months)
<b>Active Domestic Equity</b>	Fd return < bench return – 3.5%	Fd annlzd return < bench annlzd return – 1.75% for 6 consecutive months	VRR < 0.97 for 6 consecutive months
<b>Active International Equity</b>	Fd return < bench return – 4.5%	Fd annlzd return < bench annlzd return – 2.0% for 6 consecutive months	VRR < 0.97 for 6 consecutive months
<b>Passive International Equity</b>	Tracking Error > 0.50%	Tracking Error > 0.45% for 6 consecutive months	Fd annlzd return < bench annlzd return – 0.40% for 6 consecutive months
<b>Fixed Income</b>	Fd return < bench return – 1.5%	Fd annlzd return < bench annlzd return – 1.0% for 6 consecutive months	VRR < 0.98 for 6 consecutive months

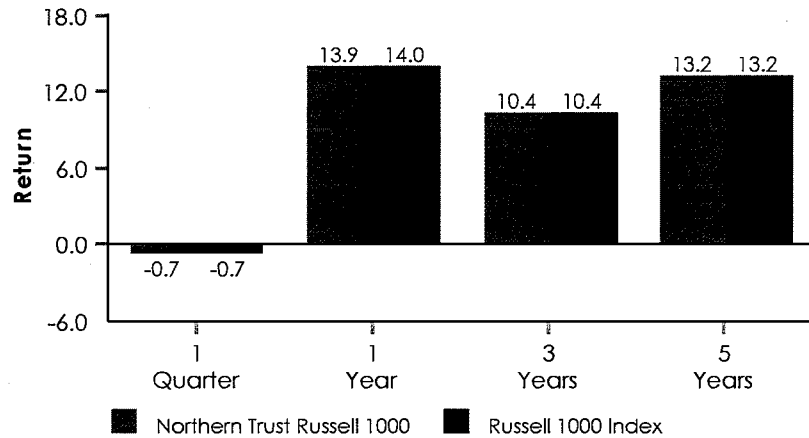
VRR – Value Relative Ratio – is calculated as: manager cumulative return / benchmark cumulative return.

# Northern Trust Russell 1000 - gross of fees

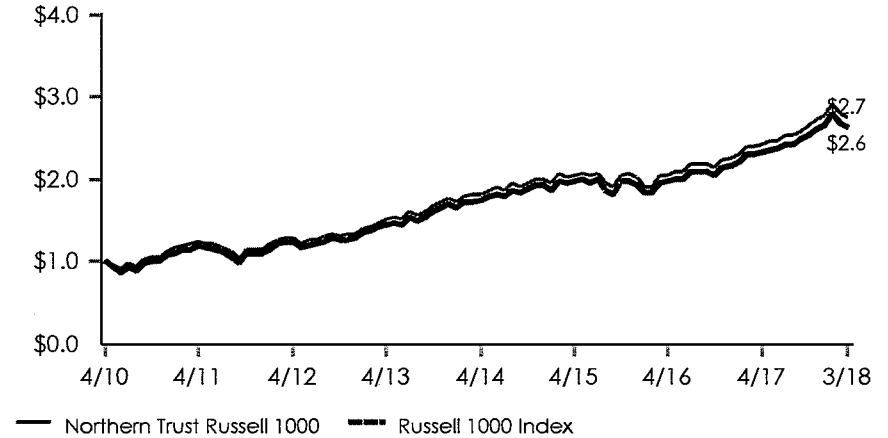
As of March 31, 2018

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Market Capture	Down Market Capture	Inception Date
Northern Trust Russell 1000	0.98	0.96	0.35	1.13	1.42	0.99	99.50	94.36	05/01/2010
Russell 1000 Index	0.00	1.00	-	1.05	0.00	1.00	100.00	100.00	05/01/2010

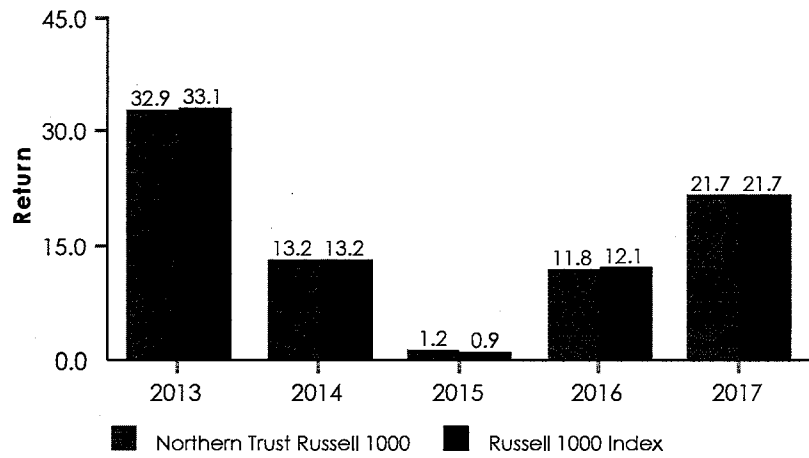
## Trailing Period Performance



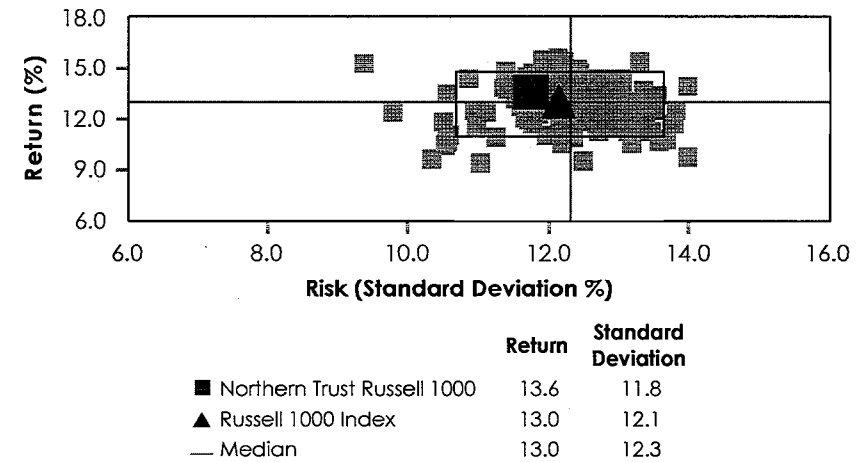
## Growth of \$1 - Since Inception



## Calendar Year Performance



## Risk/Return - Since Inception



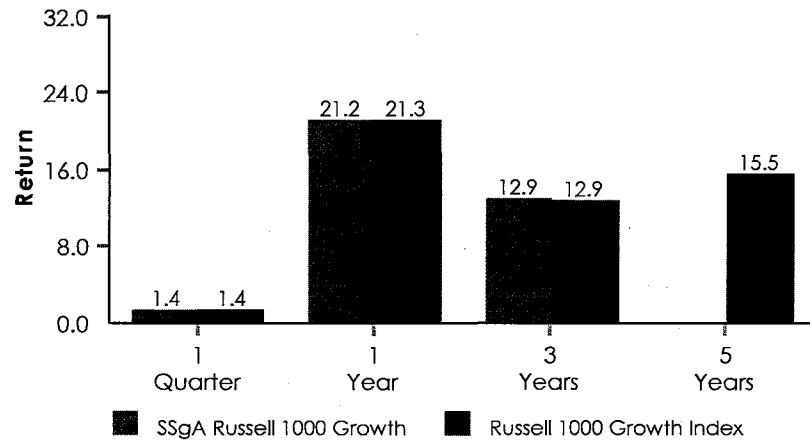


# SSgA Russell 1000 Growth - gross of fees

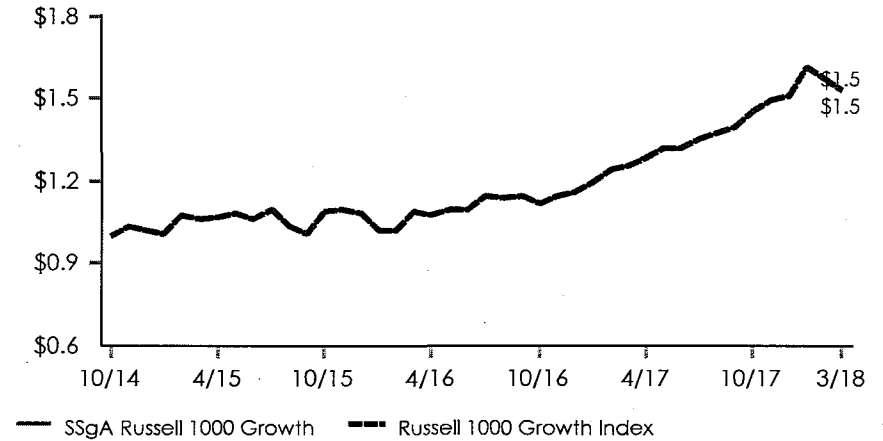
As of March 31, 2018

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Market Capture	Down Market Capture	Inception Date
SSgA Russell 1000 Growth	0.01	1.00	0.19	1.16	0.04	1.00	100.02	99.96	11/01/2014
Russell 1000 Growth Index	0.00	1.00	-	1.15	0.00	1.00	100.00	100.00	11/01/2014

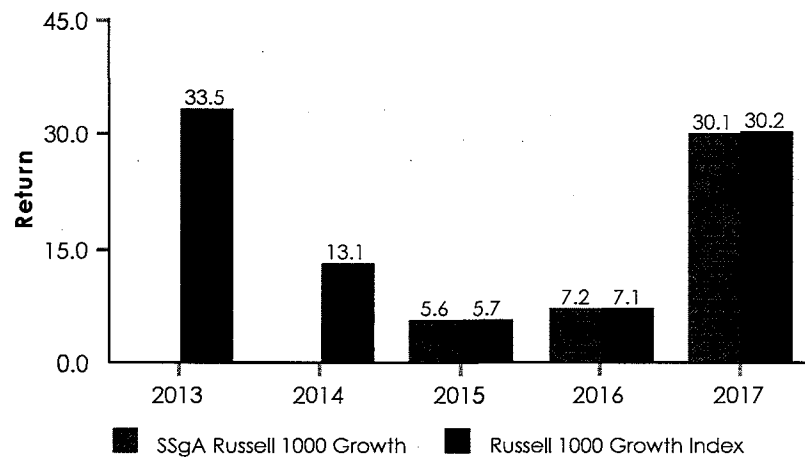
## Trailing Period Performance



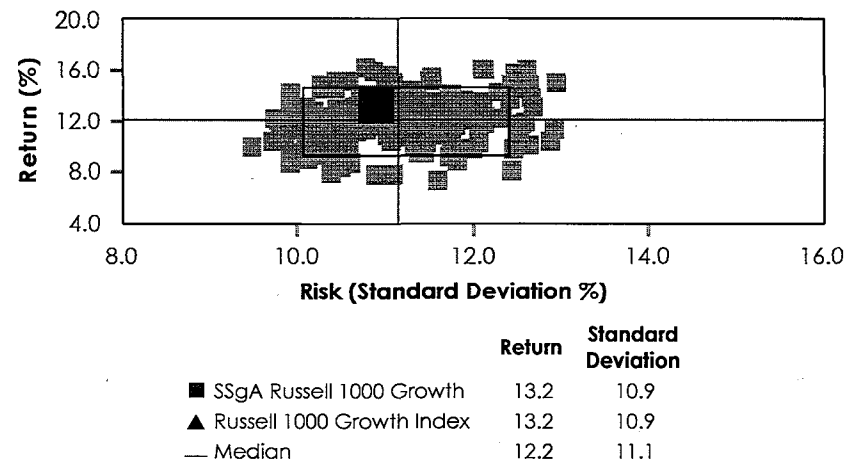
## Growth of \$1 - Since Inception



## Calendar Year Performance



## Risk/Return - Since Inception

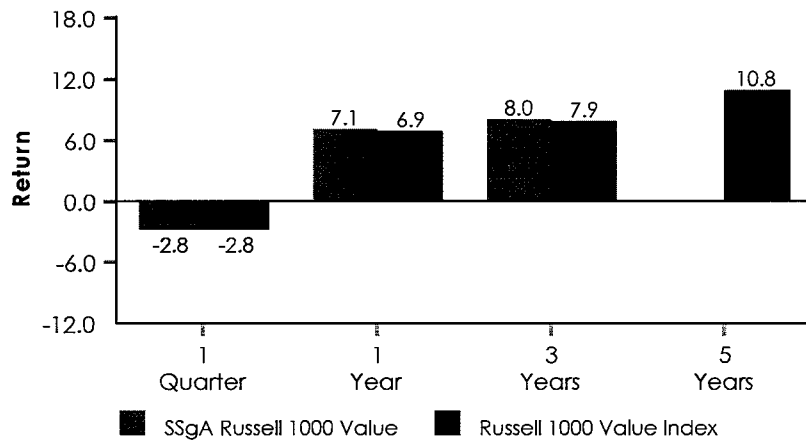


# SSgA Russell 1000 Value - gross of fees

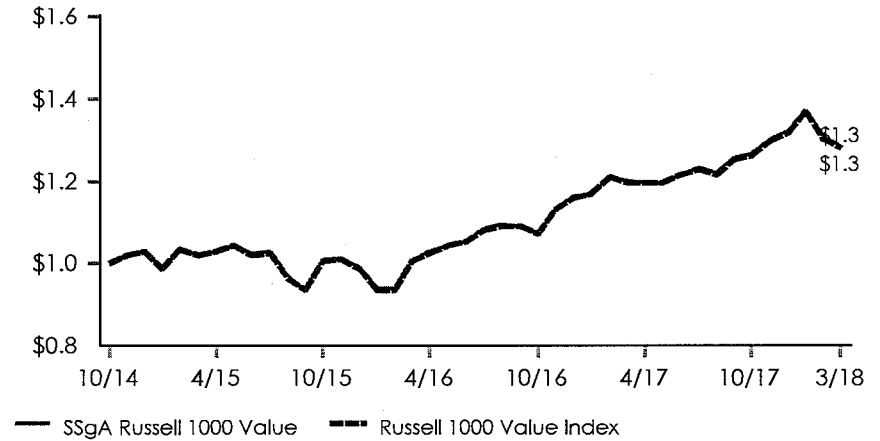
As of March 31, 2018

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Market Capture	Down Market Capture	Inception Date
SSgA Russell 1000 Value	0.11	1.00	1.52	0.73	0.07	1.00	100.24	99.41	11/01/2014
Russell 1000 Value Index	0.00	1.00	-	0.71	0.00	1.00	100.00	100.00	11/01/2014

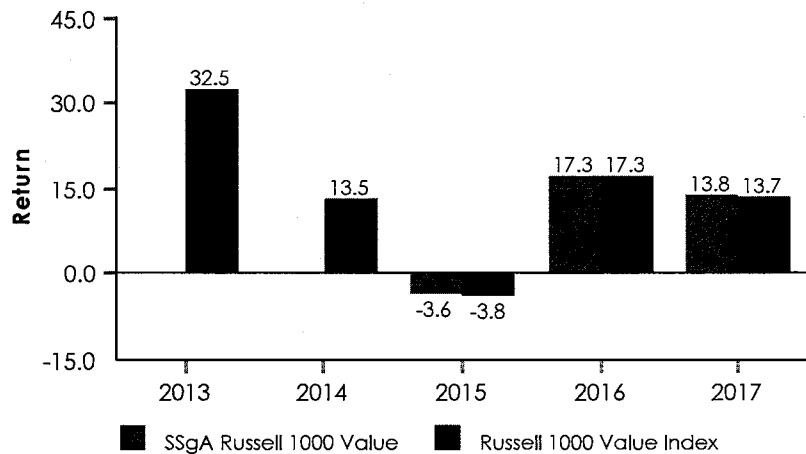
## Trailing Period Performance



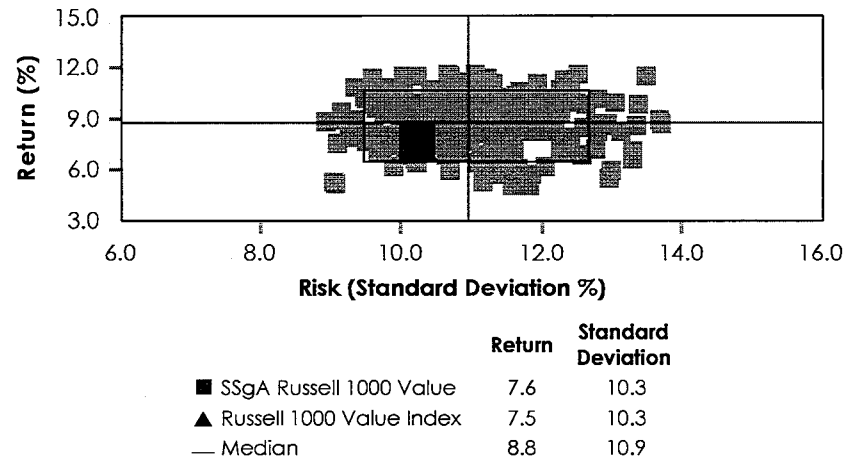
## Growth of \$1 - Since Inception



## Calendar Year Performance



## Risk/Return - Since Inception

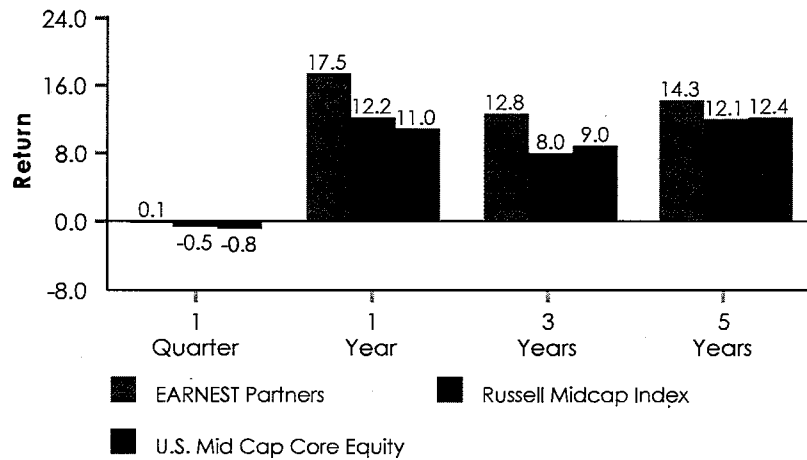


# EARNEST Partners - gross of fees

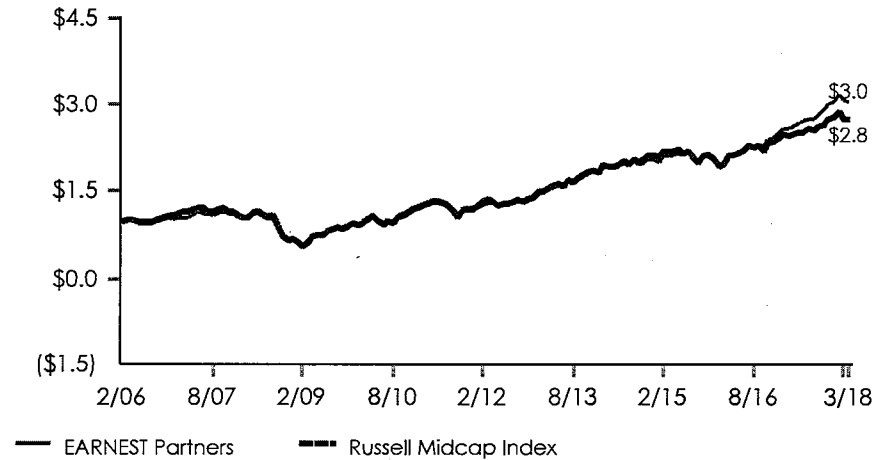
As of March 31, 2018

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Market Capture	Down Market Capture	Inception Date
EARNEST Partners	0.93	0.99	0.25	0.57	3.43	0.96	100.01	94.88	03/01/2006
Russell Midcap Index	0.00	1.00	-	0.53	0.00	1.00	100.00	100.00	03/01/2006
U.S. Mid Cap Core Equity Median	-	-	-	-	-	-	-	-	-

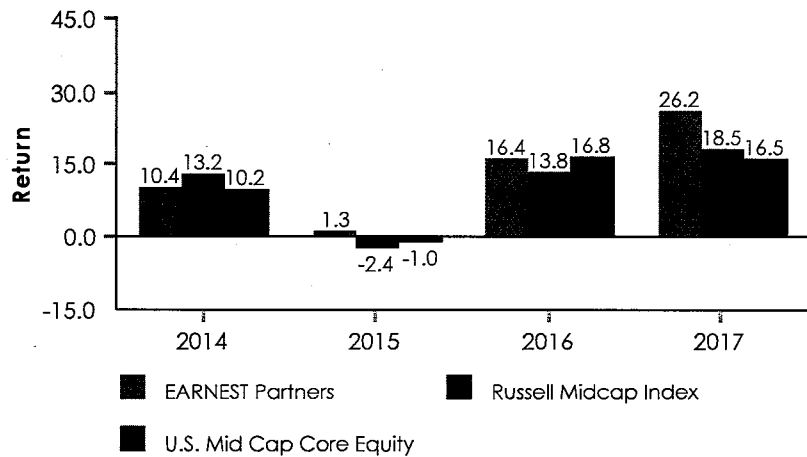
## Trailing Period Performance



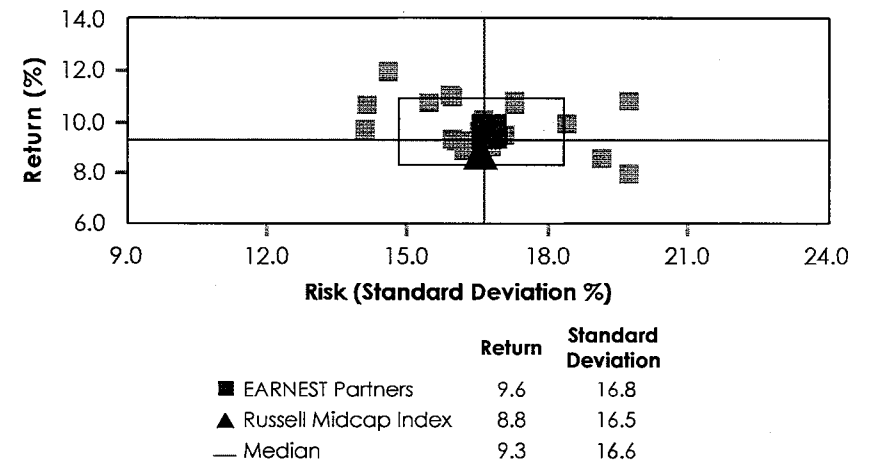
## Growth of \$1 - Since Inception



## Calendar Year Performance



## Risk/Return - Since Inception

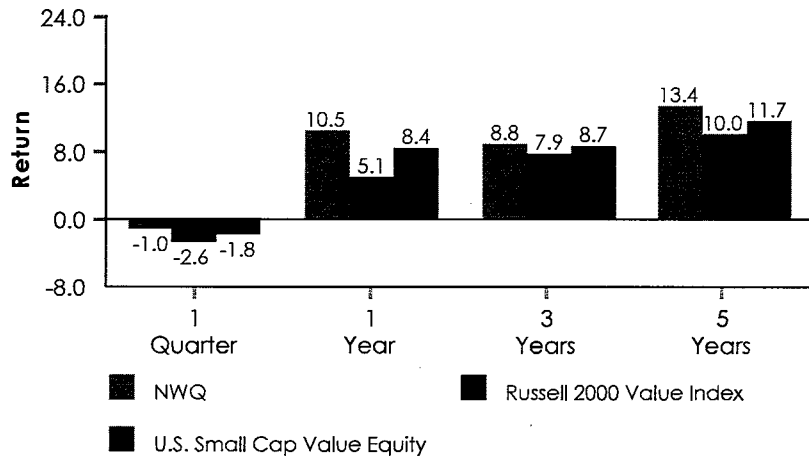


# NWQ - gross of fees

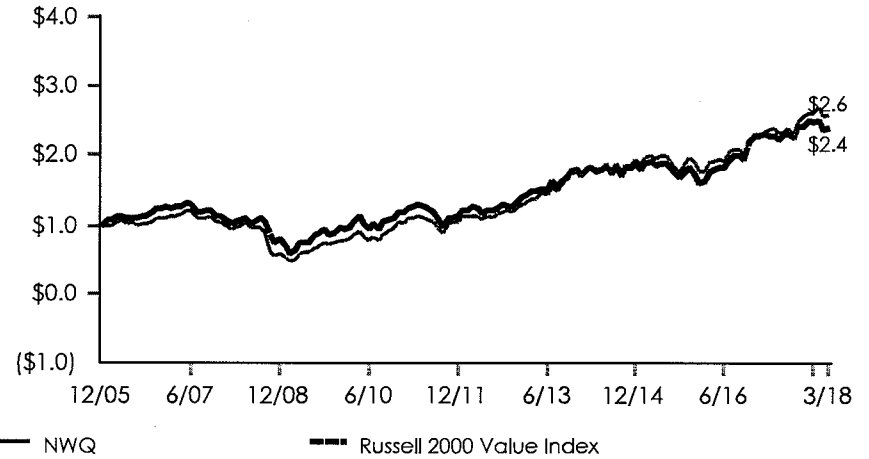
As of March 31, 2018

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Market Capture	Down Market Capture	Inception Date
NWQ	0.91	1.01	0.14	0.43	7.00	0.88	102.81	99.23	01/01/2006
Russell 2000 Value Index	0.00	1.00	-	0.42	0.00	1.00	100.00	100.00	01/01/2006
U.S. Small Cap Value Equity Median	-	-	-	-	-	-	-	-	-

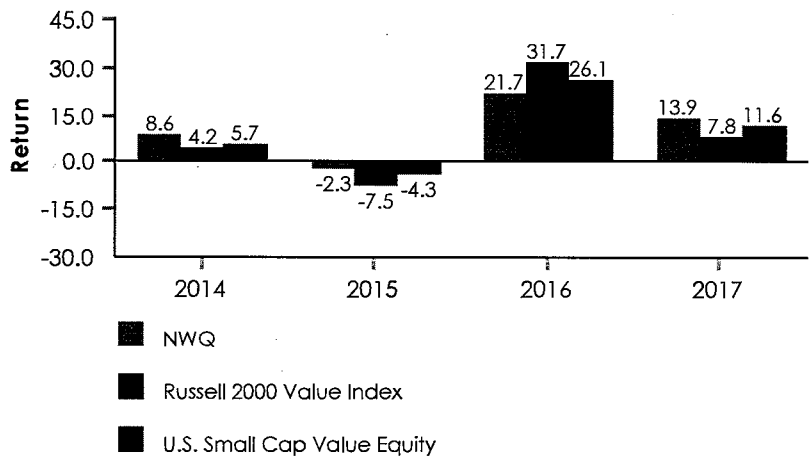
## Trailing Period Performance



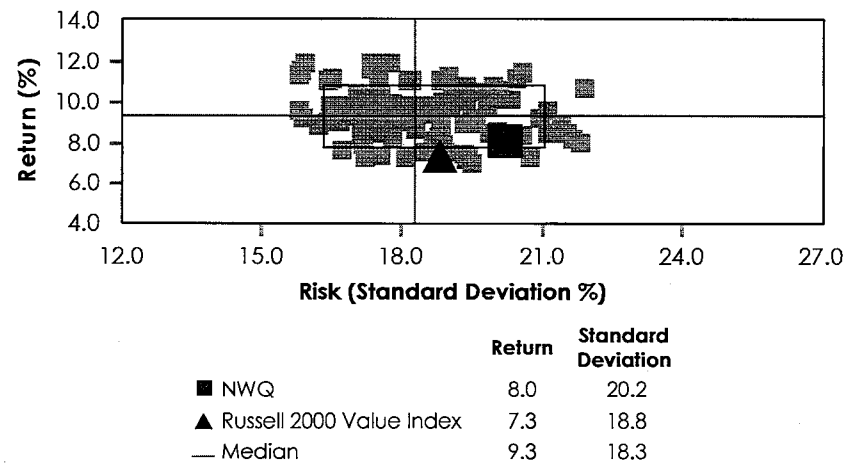
## Growth of \$1 - Since Inception



## Calendar Year Performance



## Risk/Return - Since Inception

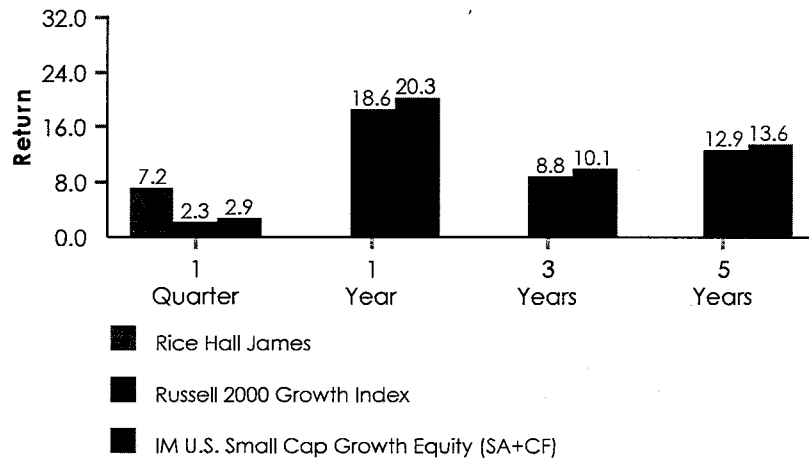


# Rice Hall James - gross of fees

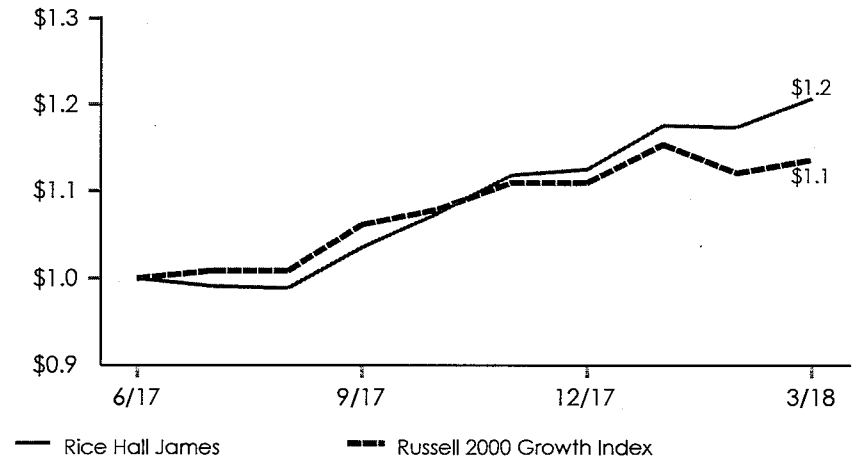
As of March 31, 2018

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Market Capture	Down Market Capture	Inception Date
Rice Hall James	0.98	0.79	0.51	0.93	1.33	0.68	122.08	14.40	07/01/2017
Russell 2000 Growth Index	0.00	1.00	-	0.59	0.00	1.00	100.00	100.00	07/01/2017
IM U.S. Small Cap Growth Equity (SA+CF) Median	-	-	-	-	-	-	-	-	-

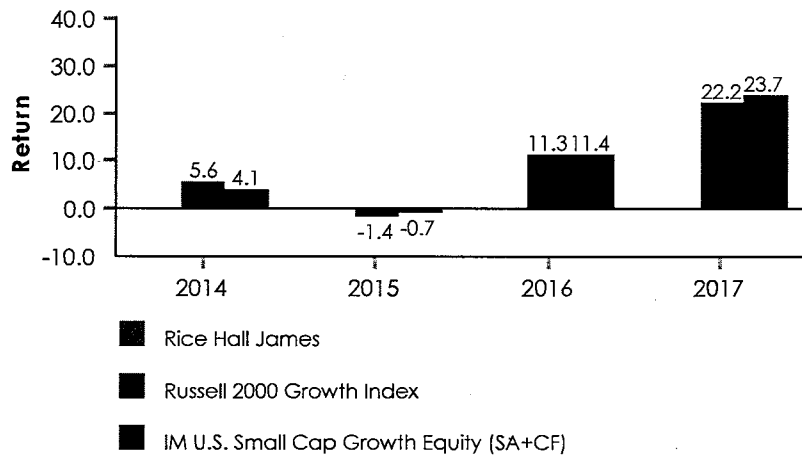
## Trailing Period Performance



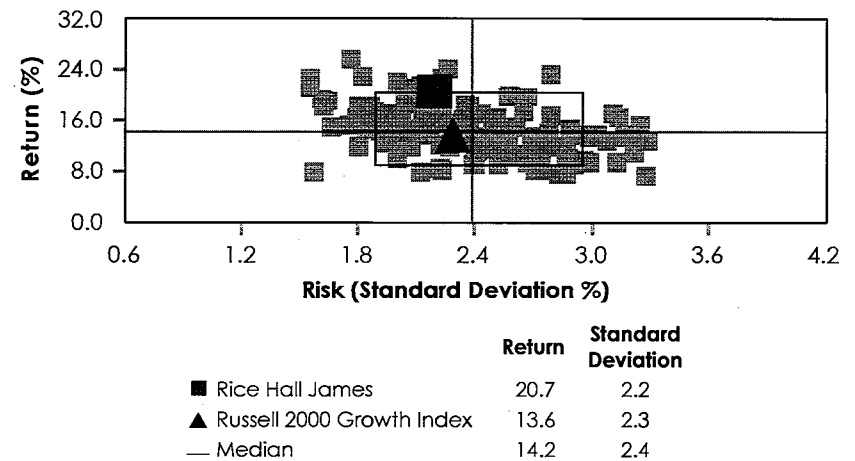
## Growth of \$1 - Since Inception



## Calendar Year Performance



## Risk/Return - Since Inception

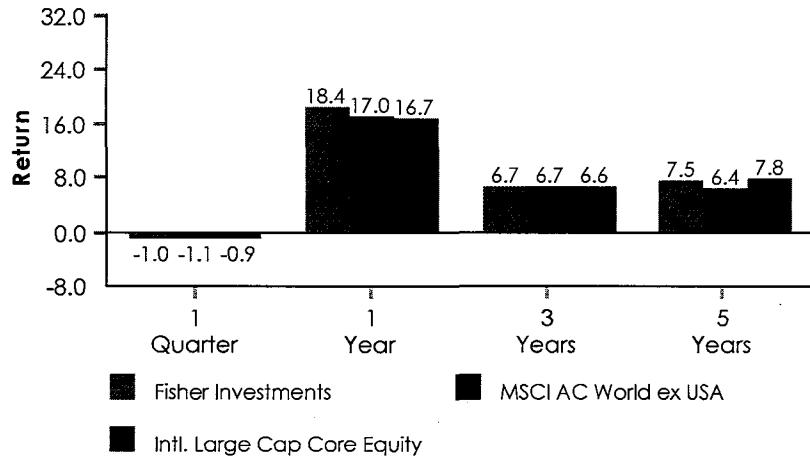


# Fisher Investments - gross of fees

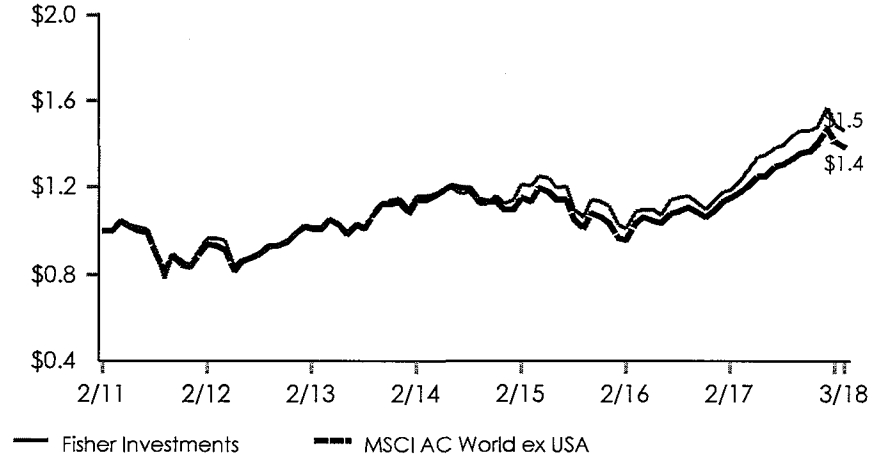
As of March 31, 2018

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Market Capture	Down Market Capture	Inception Date
Fisher Investments	0.55	1.09	0.29	0.41	3.57	0.95	106.82	102.65	03/01/2011
MSCI AC World ex USA	0.00	1.00	-	0.38	0.00	1.00	100.00	100.00	03/01/2011
Intl. Large Cap Core Equity Median	-	-	-	-	-	-	-	-	-

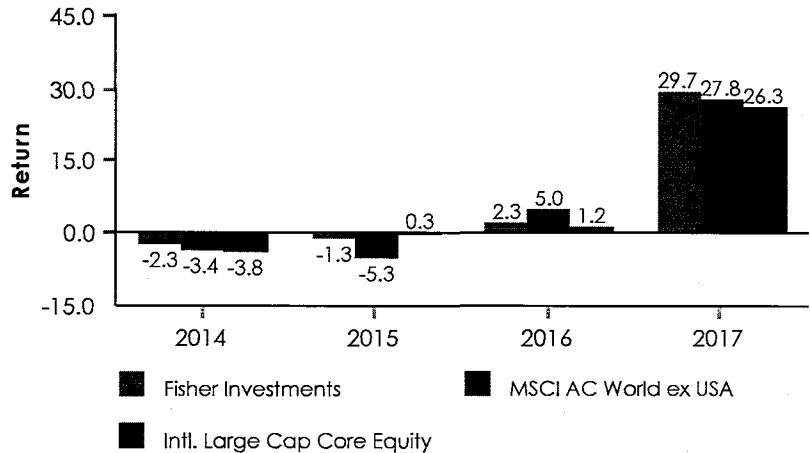
## Trailing Period Performance



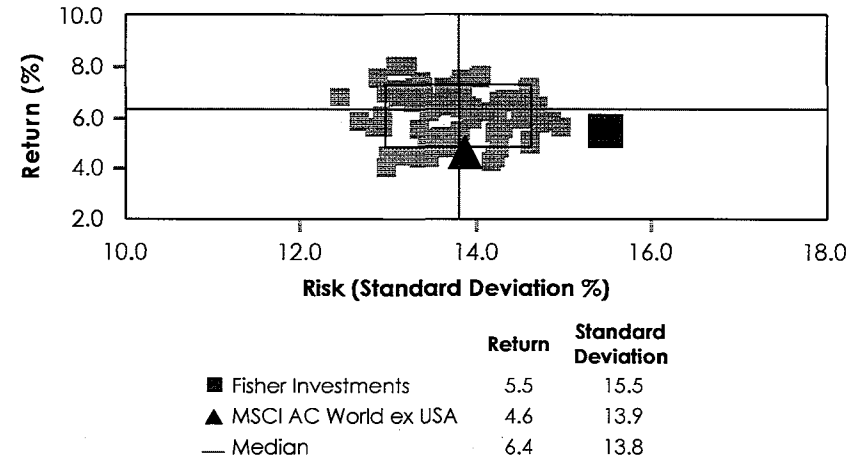
## Growth of \$1 - Since Inception



## Calendar Year Performance



## Risk/Return - Since Inception

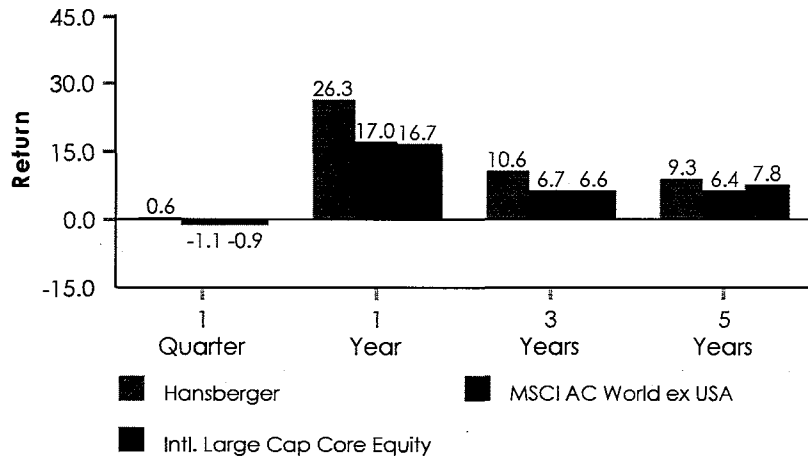


# Hansberger - gross of fees

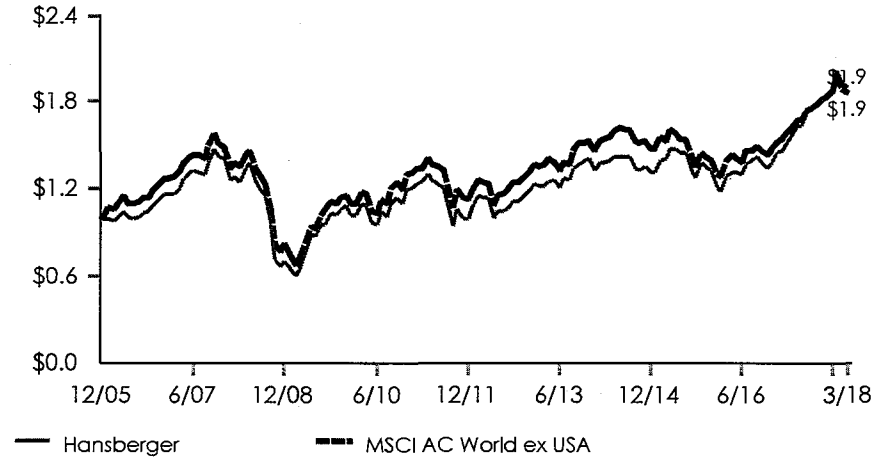
As of March 31, 2018

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Market Capture	Down Market Capture	Inception Date
Hansberger	0.06	1.08	0.13	0.31	4.44	0.95	105.42	104.38	01/01/2006
MSCI AC World ex USA	0.00	1.00	-	0.31	0.00	1.00	100.00	100.00	01/01/2006
Intl. Large Cap Core Equity Median	-	-	-	-	-	-	-	-	-

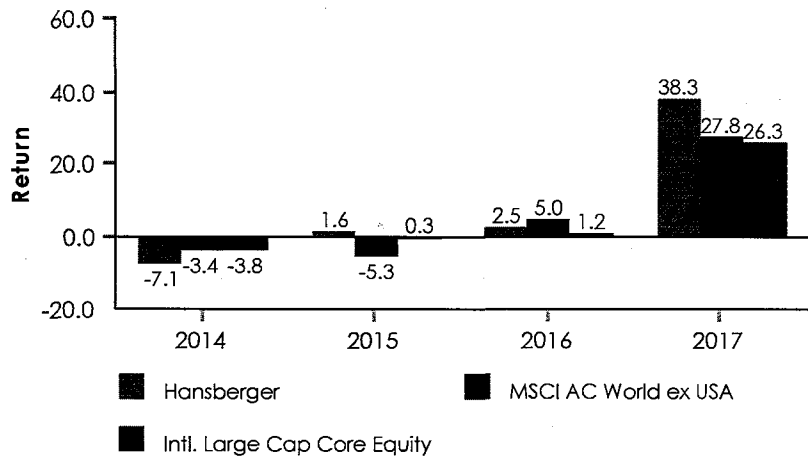
## Trailing Period Performance



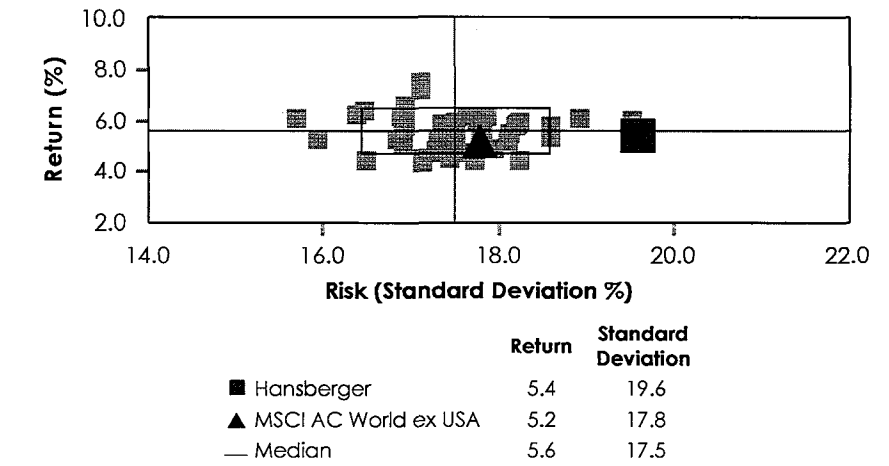
## Growth of \$1 - Since Inception



## Calendar Year Performance



## Risk/Return - Since Inception

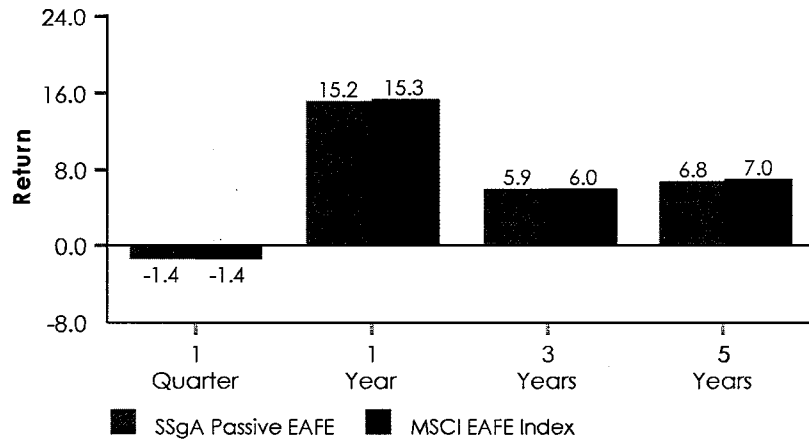


# SSgA Passive EAFE - gross of fees

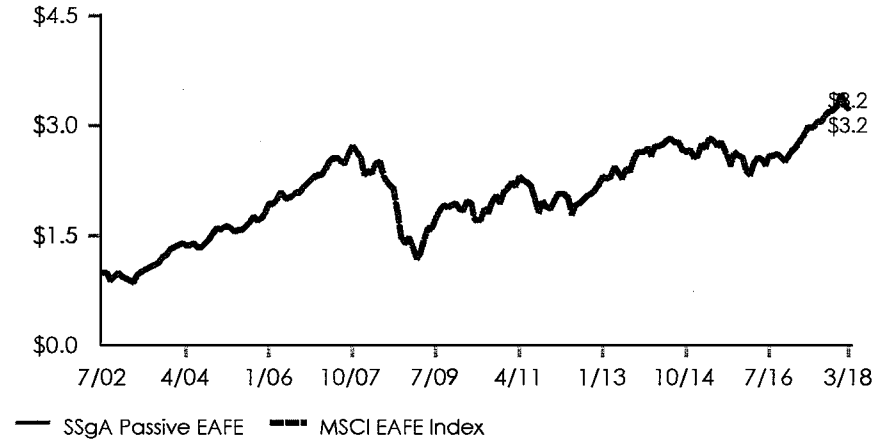
As of March 31, 2018

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Market Capture	Down Market Capture	Inception Date
SSgA Passive EAFE	0.01	0.99	-0.14	0.46	0.44	1.00	99.28	99.26	08/01/2002
MSCI EAFE Index	0.00	1.00	-	0.46	0.00	1.00	100.00	100.00	08/01/2002

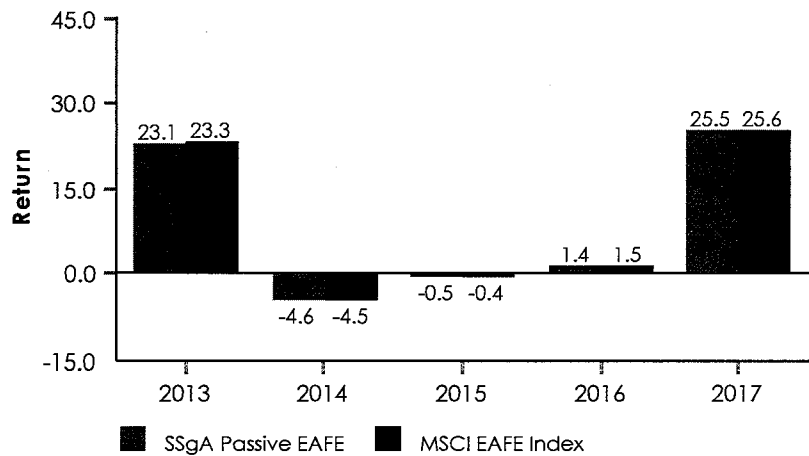
## Trailing Period Performance



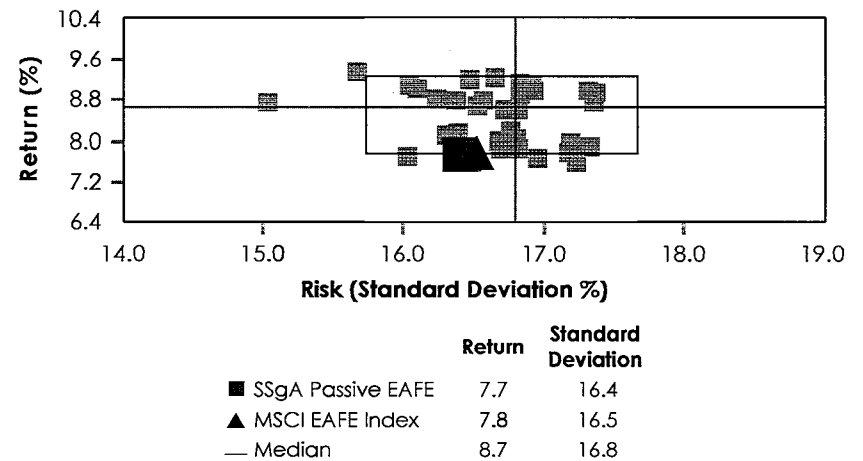
## Growth of \$1 - Since Inception



## Calendar Year Performance



## Risk/Return - Since Inception



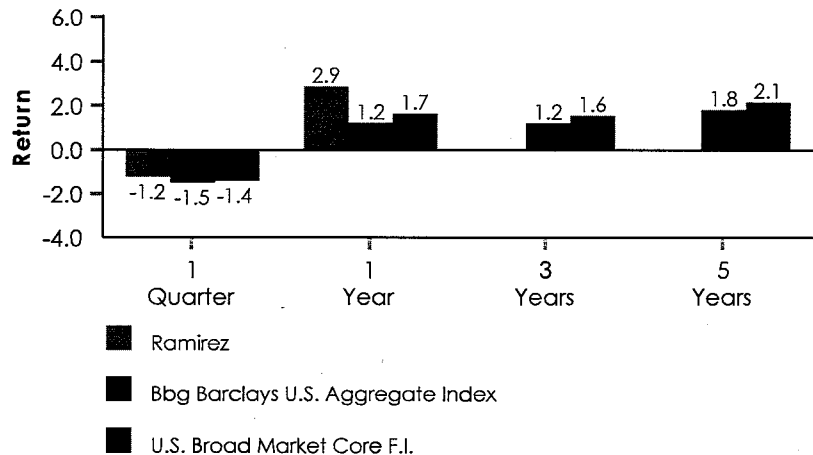


# Ramirez - gross of fees

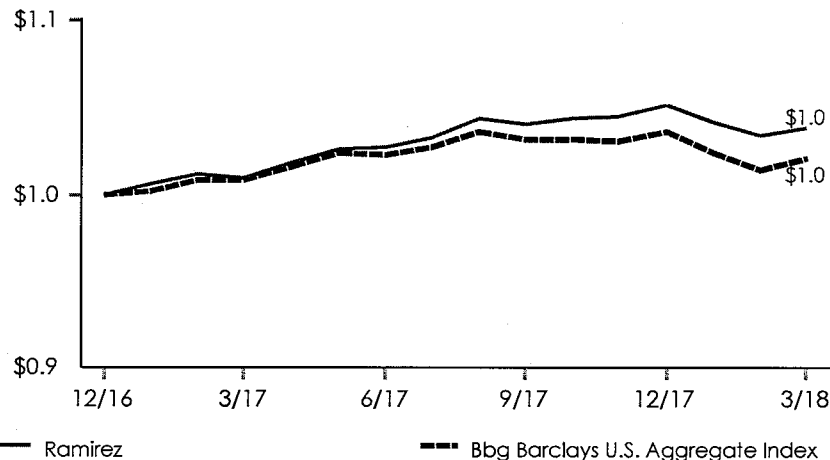
As of March 31, 2018

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Market Capture	Down Market Capture	Inception Date
Ramirez	1.55	0.93	2.75	1.03	0.52	0.94	120.61	73.28	01/01/2017
Bbg Barclays U.S. Aggregate Index	0.00	1.00	-	0.32	0.00	1.00	100.00	100.00	01/01/2017
U.S. Broad Market Core F.I. Median	-	-	-	-	-	-	-	-	-

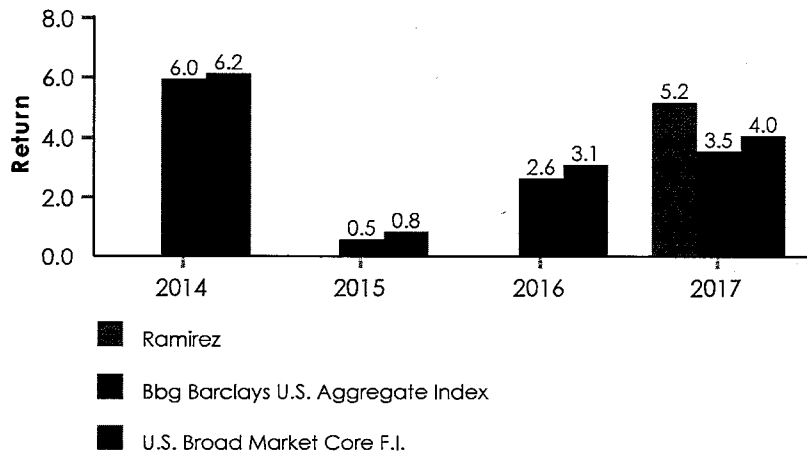
## Trailing Period Performance



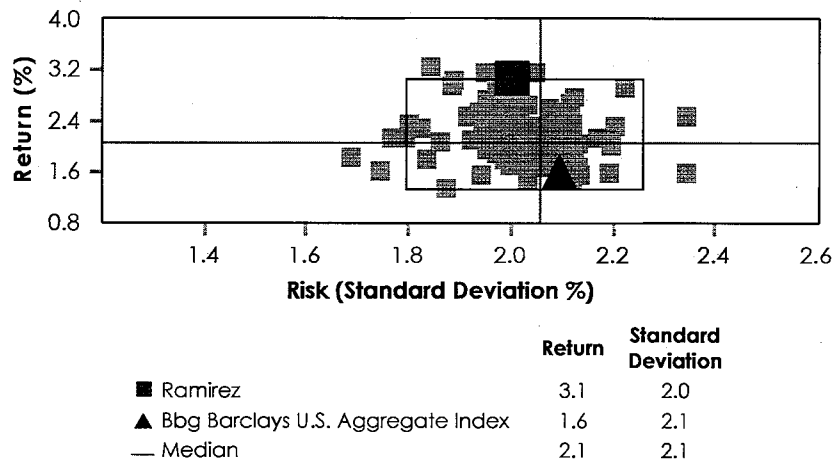
## Growth of \$1 - Since Inception



## Calendar Year Performance



## Risk/Return - Since Inception

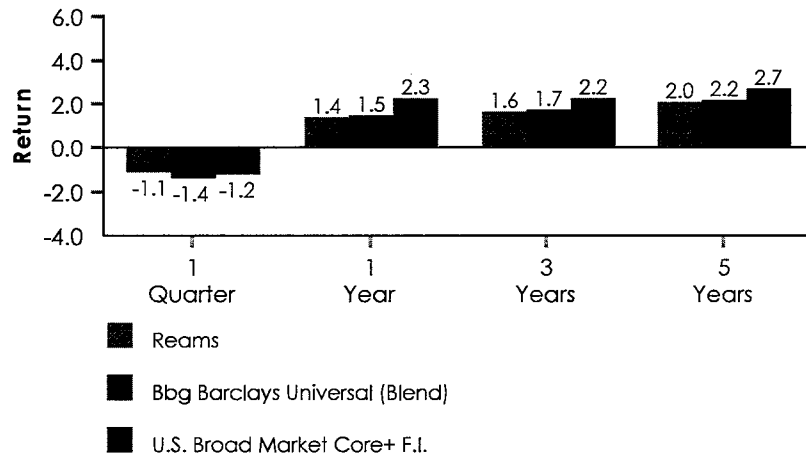


# Reams - gross of fees

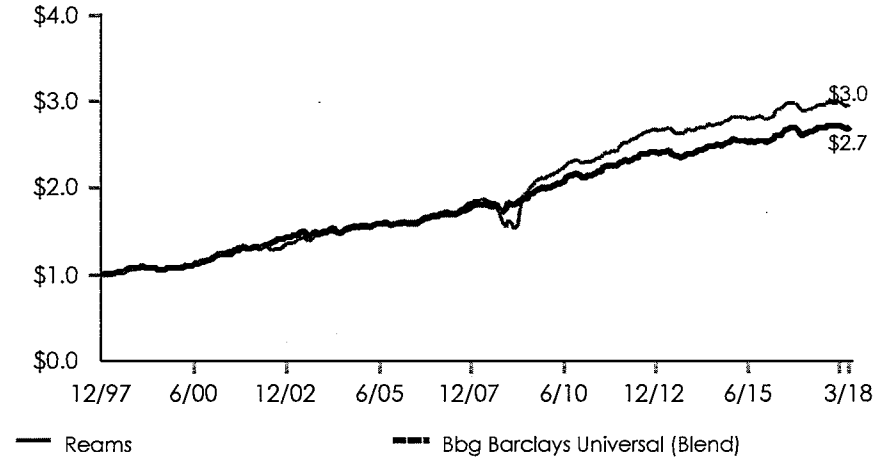
As of March 31, 2018

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Market Capture	Down Market Capture	Inception Date
Reams	0.28	1.06	0.14	0.66	4.06	0.44	108.87	103.81	01/01/1998
Bbg Barclays Universal (Blend)	0.00	1.00	-	0.89	0.00	1.00	100.00	100.00	01/01/1998
U.S. Broad Market Core+ F.I. Median	-	-	-	-	-	-	-	-	-

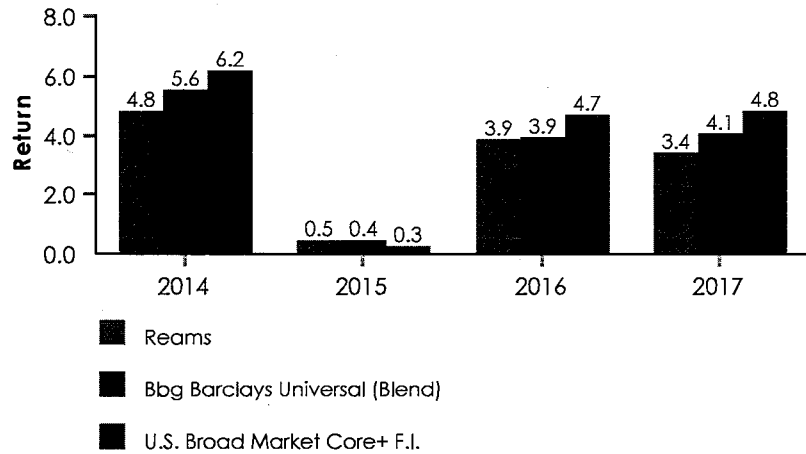
## Trailing Period Performance



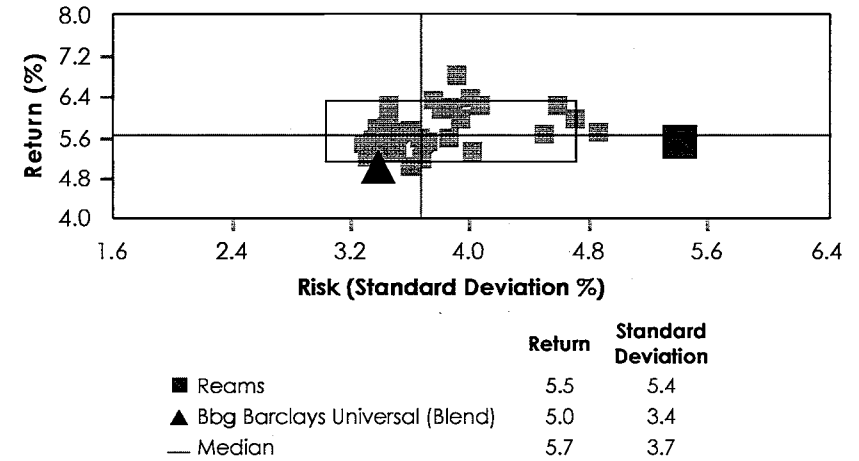
## Growth of \$1 - Since Inception



## Calendar Year Performance



## Risk/Return - Since Inception

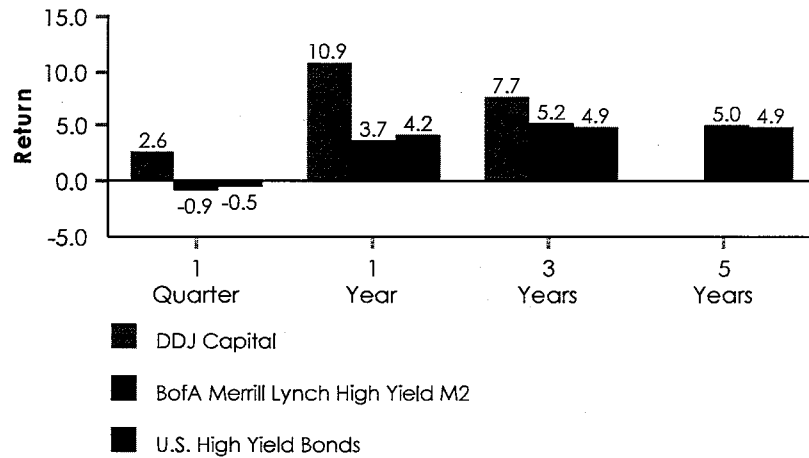


# DDJ Capital - gross of fees

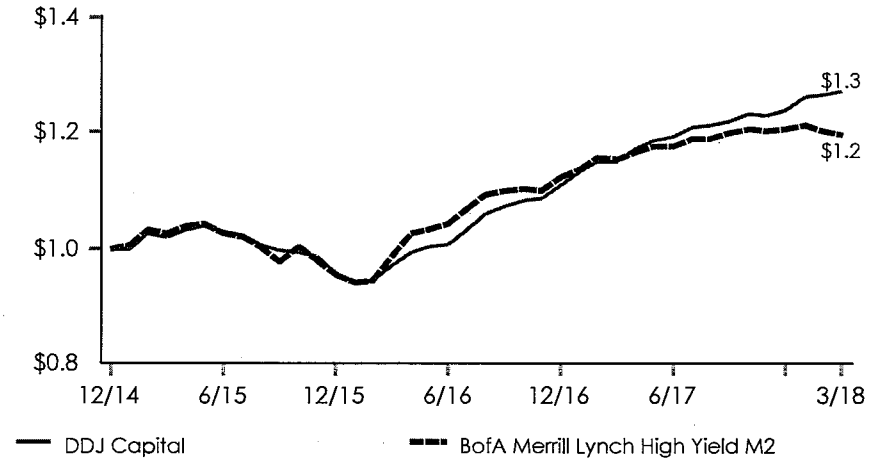
As of March 31, 2018

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Market Capture	Down Market Capture	Inception Date
DDJ Capital	3.62	0.71	0.65	1.55	2.95	0.71	100.42	61.66	01/01/2015
BofA Merrill Lynch High Yield M2	0.00	1.00	-	0.94	0.00	1.00	100.00	100.00	01/01/2015
U.S. High Yield Bonds Median	-	-	-	-	-	-	-	-	-

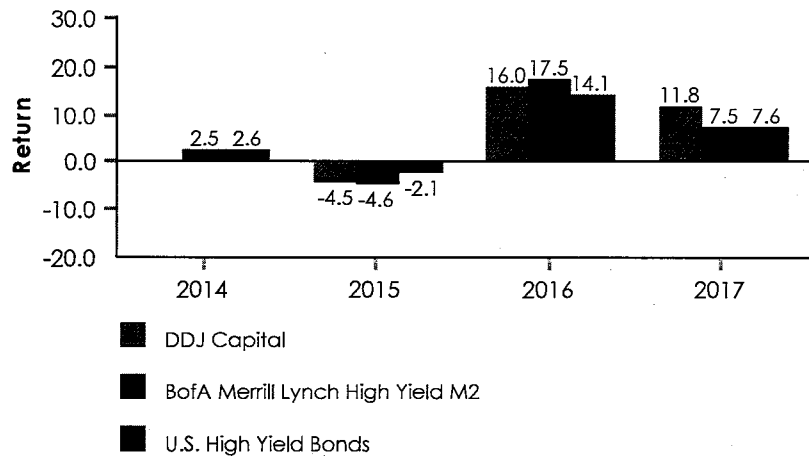
## Trailing Period Performance



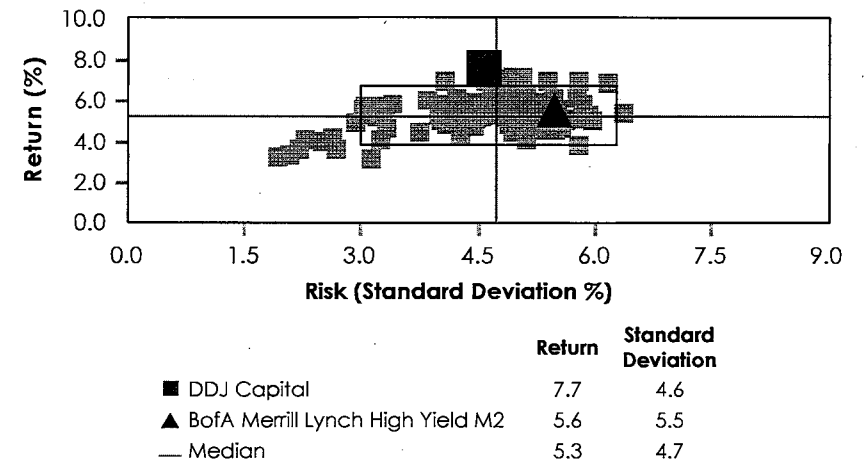
## Growth of \$1 - Since Inception



## Calendar Year Performance



## Risk/Return - Since Inception

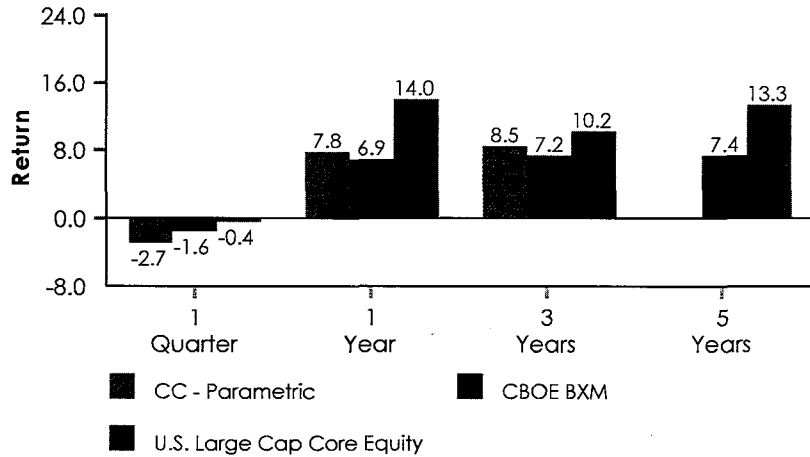


# CC - Parametric - gross of fees

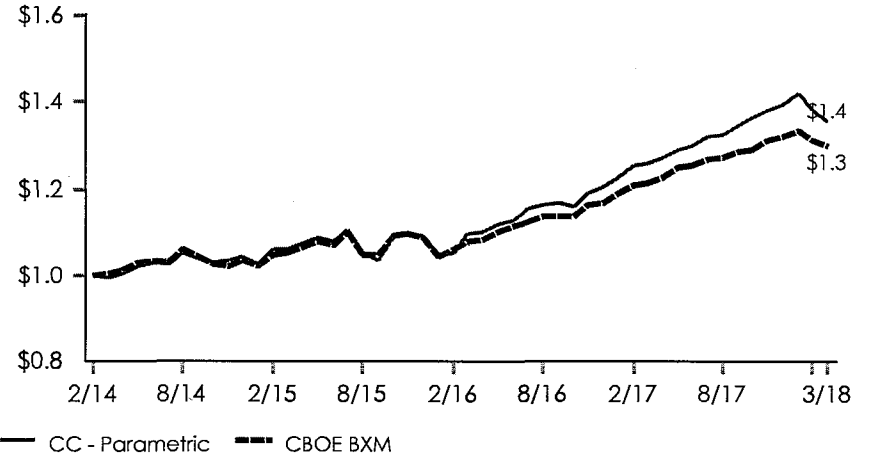
As of March 31, 2018

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Market Capture	Down Market Capture	Inception Date
CC - Parametric	0.58	1.09	0.50	1.14	2.27	0.88	115.49	112.66	03/01/2014
CBOE BXM	0.00	1.00	-	1.11	0.00	1.00	100.00	100.00	03/01/2014
U.S. Large Cap Core Equity Median	-	-	-	-	-	-	-	-	-

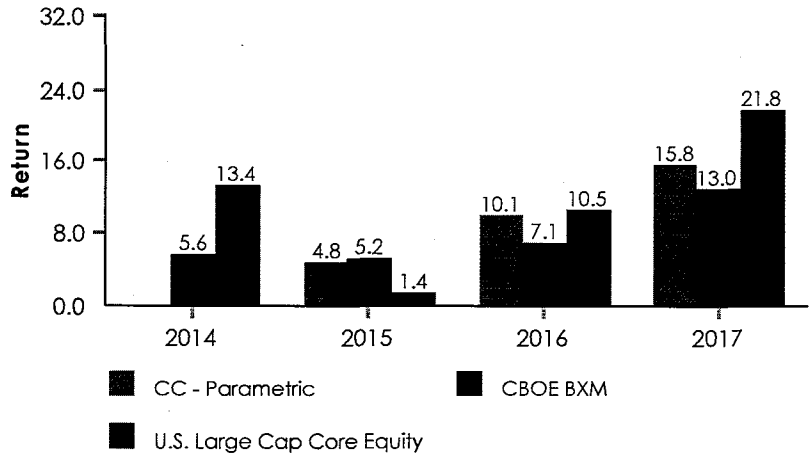
## Trailing Period Performance



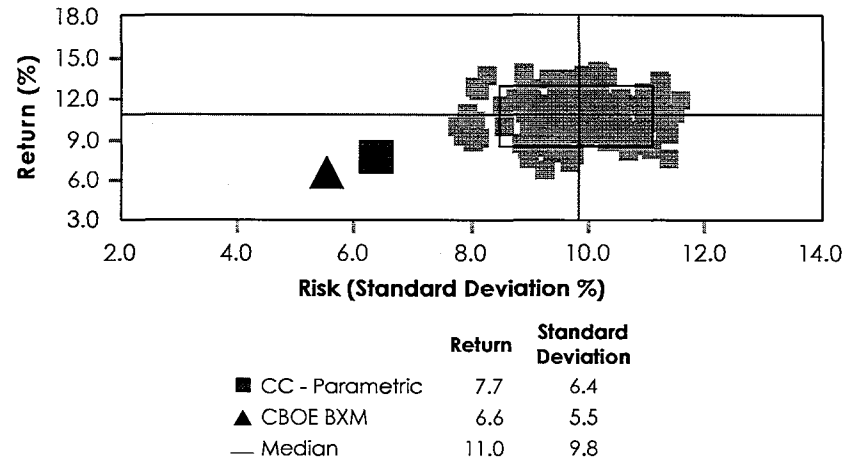
## Growth of \$1 - Since Inception



## Calendar Year Performance

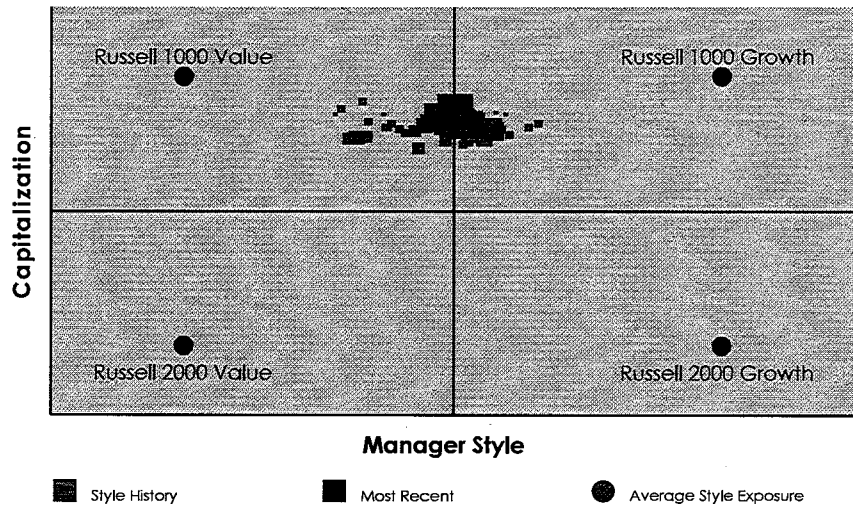


## Risk/Return - Since Inception

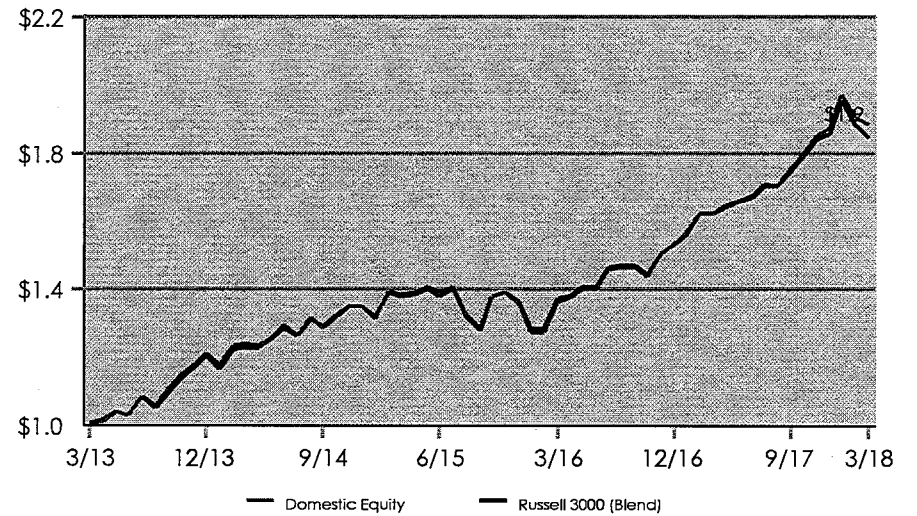


**Domestic Equity Analysis**  
As of March 31, 2018

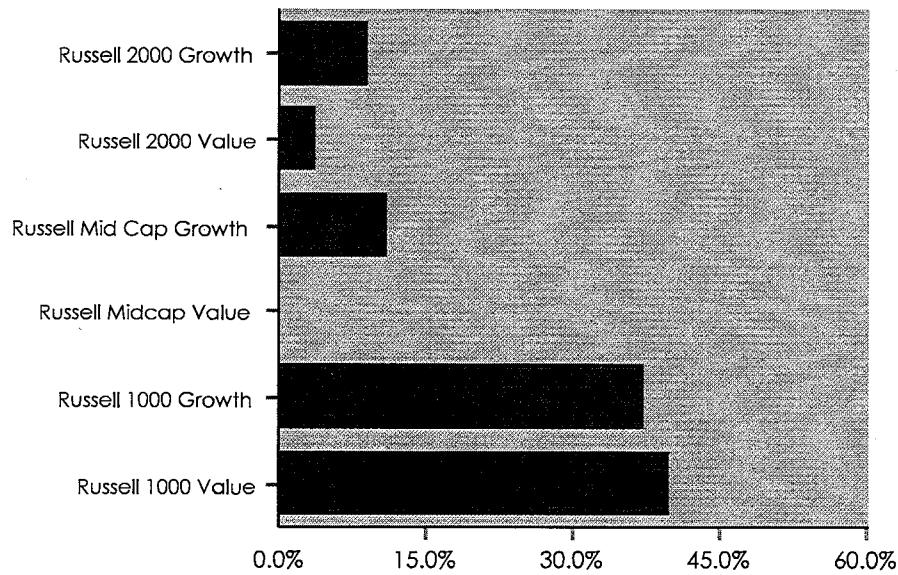
**Style Map (5-Year)**



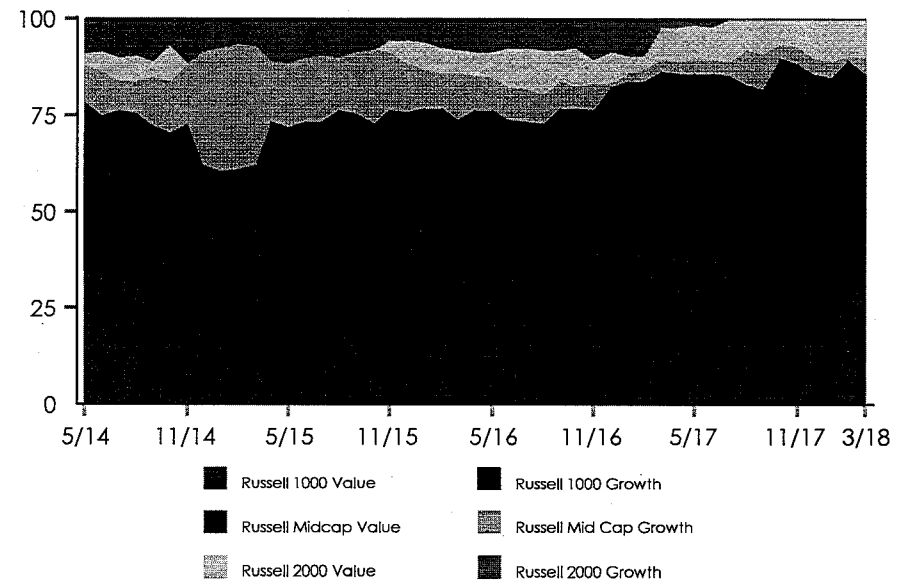
**Growth of \$1 (5-Year)**



**Style Exposure**

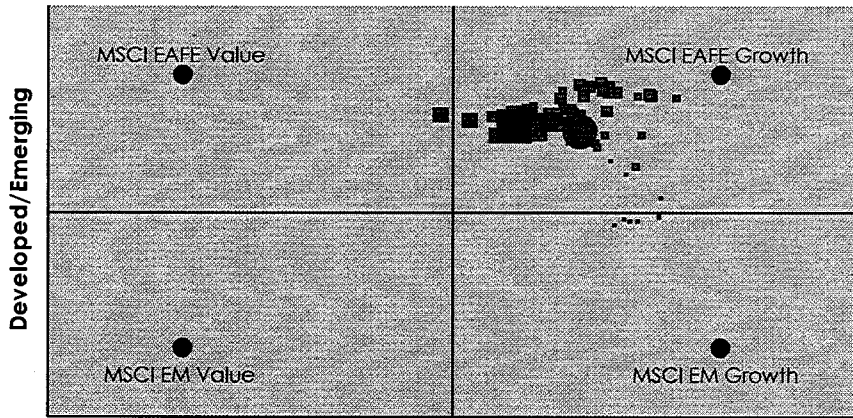


**Style History (5-Year)**



**International Equity Analysis**  
As of March 31, 2018

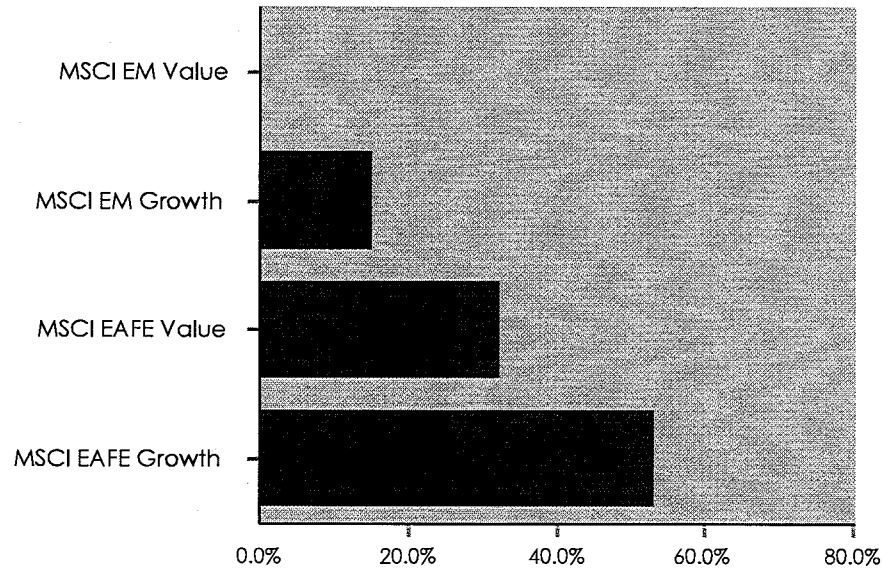
**Style Map (5-Year)**



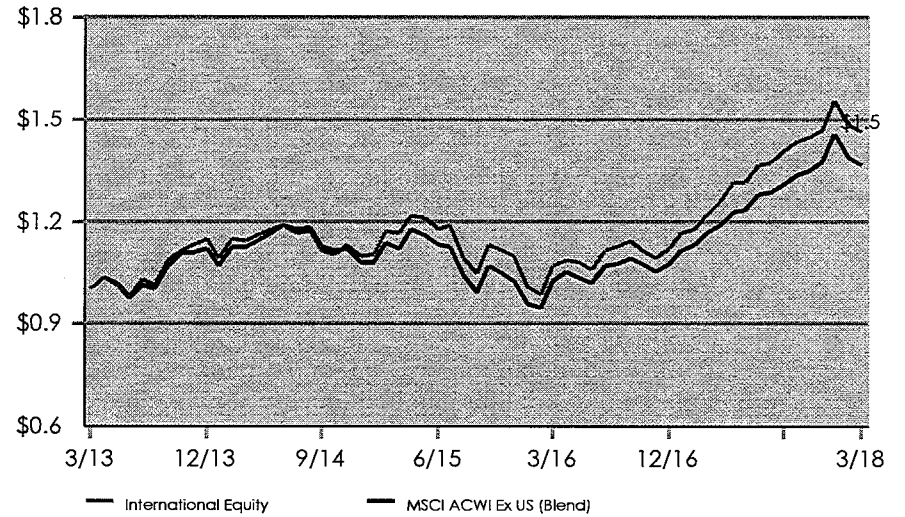
**Manager Style**

■ Style History      ■ Mar-2018      ● Average Style Exposure

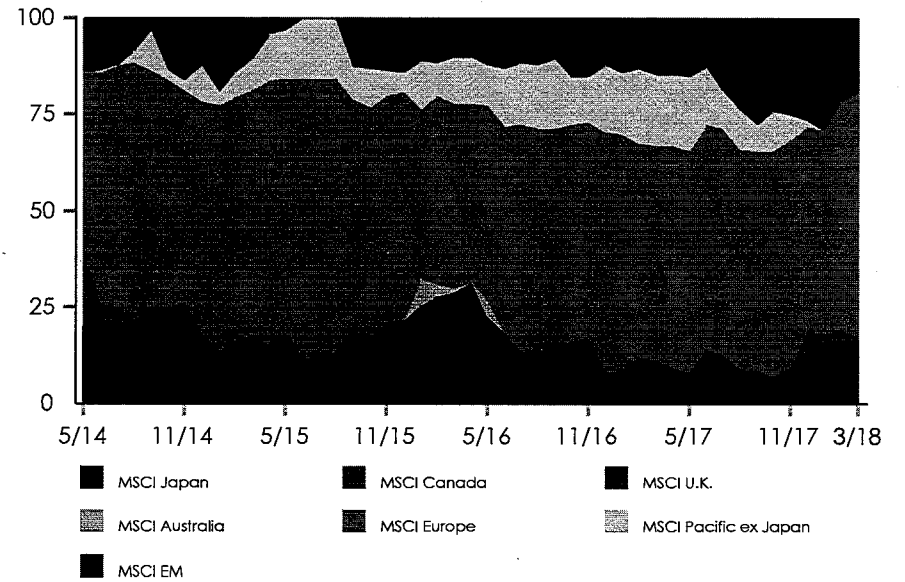
**Style Exposure**



**Growth of \$1 (5-Year)**

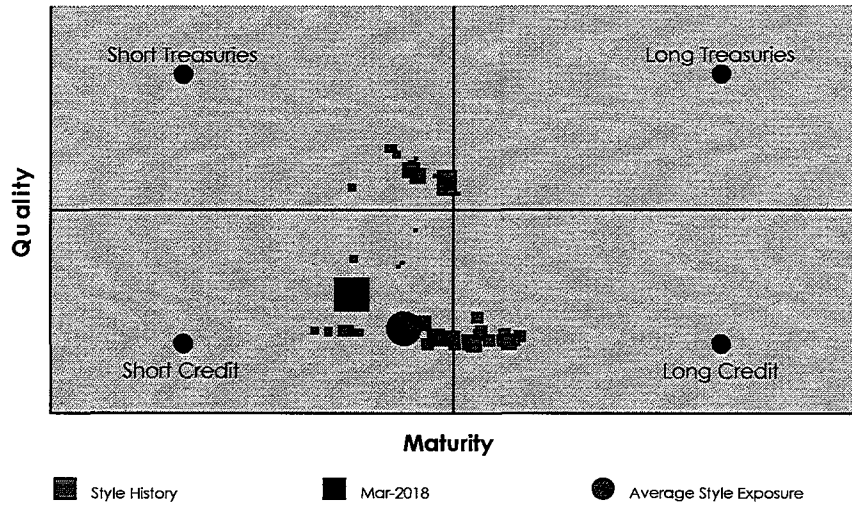


**Style History (5-Year)**

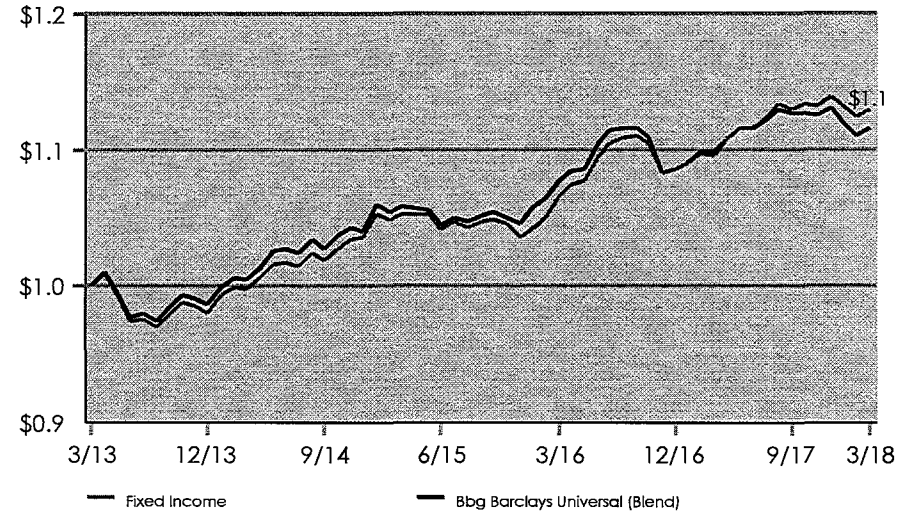


# Fixed Income Analysis As of March 31, 2018

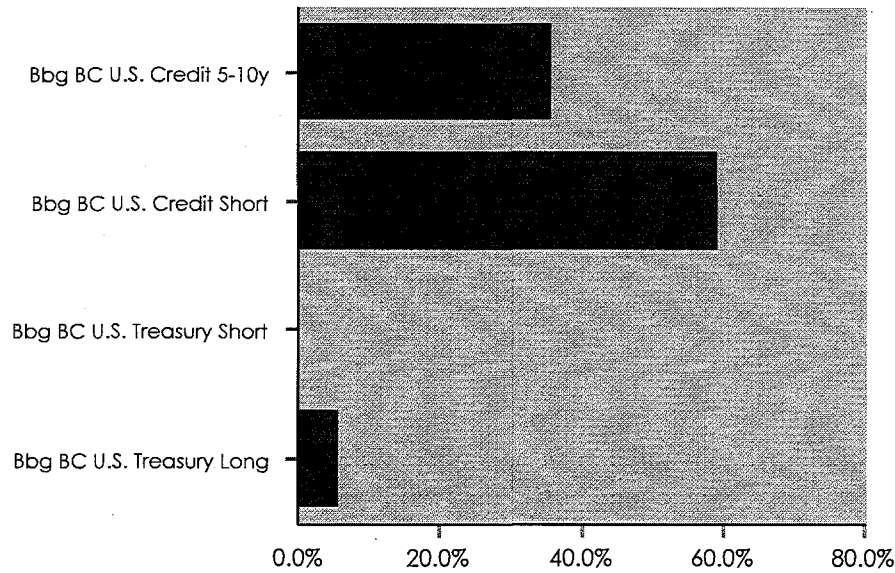
Style Map (5-Year)



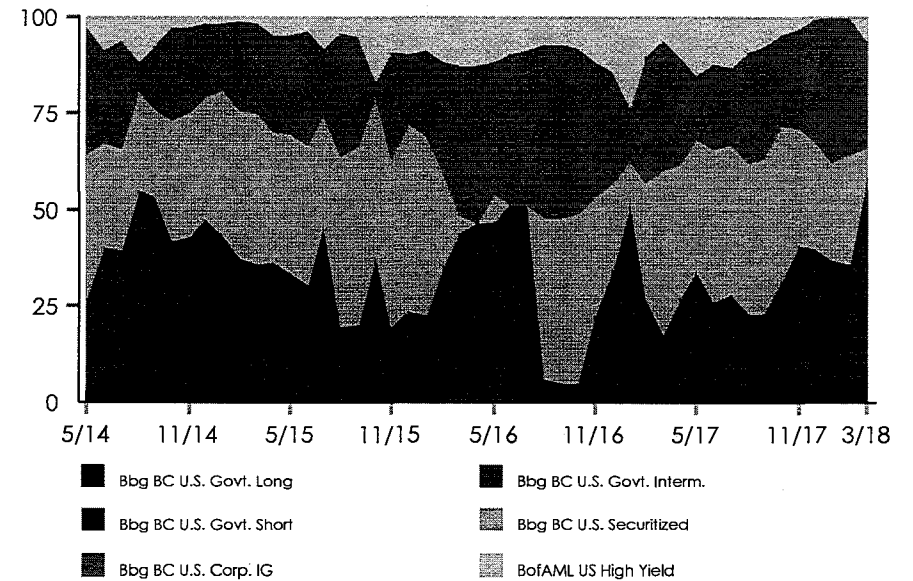
Growth of \$1 (5-Year)



Style Exposure



Style History (5-Year)



## Glossary

### **Alpha**

The premium an investment earns above a set standard. This is usually measured in terms of a common index (i.e., how the stock performs independent of the market). An Alpha is usually generated by regressing excess return on the S&P 500 excess return.

### **Annualized Performance**

The annual rate of return that when compounded (t) times generates the same (t) period holding return as actually occurred from periods (1) to period (t).

### **Batting Average**

Percentage of periods a portfolio outperforms a given index.

### **Beta**

The measure of an asset's risk in relation to the Market (for example, the S&P 500) or to an alternative benchmark or factors. Roughly speaking, a security with a Beta of 1.5 will have moved, on average, 1.5 times the market return.

### **Bottom-up**

A management style that de-emphasizes the significance of economic and market cycles, focusing instead on the analysis of individual stocks.

### **Dividend Discount Model**

A method to value the common stock of a company that is based on the present value of the expected future dividends.

### **Growth Stock**

Common stock of a company that has an opportunity to invest money and earn more than its opportunity cost of capital.

### **Information Ratio**

The ratio of annualized expected residual return to residual risk. A central measurement for active management, value added is proportional to the square of the information ratio.

### **R - Squared**

Square of the correlation coefficient. The proportion of the variability in one series that can be explained by the variability of one or more other series in a regression model. A measure of the quality of fit. 100% R-square means a perfect predictability.

### **Standard Deviation**

The square root of the variance. A measure of dispersion of a set of data from its mean

### **Sharpe Ratio**

A measure of a portfolio's excess return relative to the total variability of the portfolio.

### **Style Analysis**

A returns-based analysis using a multi-factor attribution model. The model calculates a product's average exposure to particular investment styles over time (i.e., the products normal style benchmark).

### **Top-Down**

Investment style that begins with an assessment of the overall economic environment and makes a general asset allocation decision regarding various sectors of the financial markets and various industries.

### **Tracking Error**

The standard deviation of the difference between the returns of a portfolio and an appropriate benchmark.

### **Turnover**

For mutual funds, a measure of trading activity during the previous year, expressed as a percentage of the average total assets of the fund. A turnover rate of 25% means that the value of trades represented (1/4) of the assets of the fund.

### **Value Stock**

Stocks with low price/book ratios or price/earnings ratios. Historically, value stocks have enjoyed higher average returns than growth stocks (stocks with high price/book or price/earnings ratios) in a variety of countries.



## Benchmark Definitions

**Bloomberg Barclays Capital Universal:** includes market coverage by the Aggregate Bond Index fixed rate debt issues, which are rated investment grade or higher by Moody's Investor Services, Standard and Poor's Corporation, or Fitch Investor's Service, in that order with all issues having at least one year to maturity and an outstanding par value of at least \$100 million) and includes exposures to high yield CMBS securities. All returns are market value weighted inclusive of accrued interest.

**MSCI ACWI x US:** MSCI ACWI (All Country World Index) Free excluding US (gross dividends): is a free-floating adjusted market capitalization index designed to measure equity performance in the global developed and emerging markets. As of April 2002, the index consisted of 49 developed and emerging market country indices.

**MSCI EAFE (Europe, Australasia, Far East):** is a free float-adjusted market capitalization index that is designed to measure developed market equity performance, excluding the US & Canada.

**Russell 1000:** measures the performance of the 1,000 largest securities in the Russell 3000 Index. Russell 1000 is highly correlated with the S&P 500 Index and capitalization-weighted.

**Russell 1000 Growth:** measures the performance of those Russell 1000 securities with a greater-than-average growth orientation. Securities in this index tend to exhibit higher price-to-book and price-earnings ratios, lower dividend yields and higher forecasted growth values than the Value universe.

**Russell 1000 Value:** measures the performance of those Russell 1000 securities with a less-than-average growth orientation. Securities in this index tend to exhibit lower price-to-book and price-earnings ratios, higher dividend yields and lower forecasted growth values than the Growth universe.

**Russell Mid-Cap:** measures the performance of the smallest 800 companies in the Russell 1000 Index, as ranked by total market capitalization.

**Russell 2000:** measures the performance of the 2,000 smallest securities in the Russell 3000 Index. Russell 2000 is market capitalization-weighted.

**Russell 2000 Growth:** measures the performance of those Russell 2000 securities with a greater-than-average growth orientation. Securities in this index tend to exhibit higher price-to-book and price-to-earnings ratios.

**Russell 2000 Value:** measures the performance of those Russell 2000 securities with a less-than-average growth orientation. Securities in this index tend to exhibit lower price-to-book and price-to-earnings ratios.

**CBOE BXM:** measures the performance of a hypothetical buy-write strategy on the S&P 500 Index.

**BofA ML U.S. High Yield Master II:** Tracks the performance of US dollar denominated below investment grade rated corporate debt publically issued in the US domestic market. To qualify for inclusion in the index, securities must have a below investment grade rating (based on an average of Moody's, S&P, and Fitch) and an investment grade rated country of risk (based on an average of Moody's, S&P, and Fitch foreign currency long term sovereign debt ratings). Each security must have greater than 1 year of remaining maturity, a fixed coupon schedule, and a minimum amount outstanding of \$100 million.

## RISK METRIC DESCRIPTION – Rationale for selection and calculation methodology

### **US Equity Markets:**

Metric: P/E ratio = Price / "Normalized" earnings for the S&P 500 Index

To represent the price of US equity markets, we have chosen the S&P 500 index. This index has the longest published history of price, is well known, and also has reliable, long-term, published quarterly earnings. The price=P of the P/E ratio is the current price of the market index (the average daily price of the most recent full month for the S&P 500 index). Equity markets are very volatile. Prices fluctuate significantly during normal times and extremely during periods of market stress or euphoria. Therefore, developing a measure of earnings power (E) which is stable is vitally important, if the measure is to provide insight. While equity prices can and do double, or get cut in half, real earnings power does not change nearly as much. Therefore, we have selected a well known measure of real, stable earnings power developed by Yale Professor Robert Shiller known as the Shiller E-10. The calculation of E-10 is simply the average real annual earnings over the past 10 years. Over 10 years, the earnings shenanigans and boom and bust levels of earnings tend to even out (and often times get restated). Therefore, this earnings statistic gives a reasonably stable, slow-to-change estimate of average real earnings power for the index. Professor Shiller's data and calculation of the E-10 are available on his website at <http://www.econ.yale.edu/~shiller/data.htm>. We have used his data as the base for our calculations. Details of the theoretical justification behind the measure can be found in his book *Irrational Exuberance* [Princeton University Press 2000, Broadway Books 2001, 2nd ed., 2005].

### **Developed Equity Markets Excluding the US:**

Metric: P/E ratio = Price / "Normalized" earnings for the MSCI EAFE Index

To represent the price of non-US developed equity markets, we have chosen the MSCI EAFE index. This index has the longest published history of price for non-US developed equities. The price=P of the P/E ratio is the current price of the market index (the average daily price of the most recent full month for the MSCI EAFE index). The price level of this index is available starting in December 1969. Again, for the reasons described above, we elected to use the Shiller E-10 as our measure of earnings (E). Since 12/1972, a monthly price earnings ratio is available from MSCI. Using this quoted ratio, we have backed out the implied trailing-twelve month earnings of the EAFE index for each month from 12/1972 to the present. These annualized earnings are then inflation adjusted using CPI-U to represent real earnings in US dollar terms for each time period. The Shiller E-10 for the EAFE index (10 year average real earnings) is calculated in the same manner as detailed above.

However, we do not believe that the pricing and earnings history of the EAFE markets are long enough to be a reliable representation of pricing history for developed market equities outside of the US. Therefore, in constructing the Long-Term Average Historical P/E for developed ex-US equities for comparison purposes, we have elected to use the US equity market as a developed market proxy, from 1881 to 1982. This lowers the Long-Term Average Historical P/E considerably. We believe this methodology provides a more realistic historical comparison for a market with a relatively short history.

### **Emerging Market Equity Markets**

Metric: Ratio of Emerging Market P/E Ratio to Developed Market P/E Ratio

To represent the Emerging Markets P/E Ratio, we have chosen the MSCI Emerging Market Free Index, which has P/E data back to January 1995 on Bloomberg. To represent the Developed Markets PE Ratio, we have chosen the MSCI World Index, which also has data back to January 1995 on Bloomberg. Although there are issues with published, single time period P/E ratios, in which the denominator effect can cause large movements, we feel that the information contained in such movements will alert investors to market activity that they will want to interpret.

## RISK METRIC DESCRIPTION – Rationale for selection and calculation methodology

### **US Private Equity Markets:**

Metrics: S&P LCD Average EBITDA Multiples Paid in LBOs and US Quarterly Deal Volume

The Average Purchase Price to EBITDA multiples paid in LBOs is published quarterly by S&P in their LCD study. This is the total price paid (both equity and debt) over the trailing-twelve month EBITDA (earnings before interest, taxes, depreciation and amortization) as calculated by S&P LCD. This is the relevant, high-level pricing metric that private equity managers use in assessing deals. Data is published monthly.

US quarterly deal volume for private equity is the total deal volume in \$ billions (both equity and debt) reported in the quarter by Thomson Reuters Buyouts. This metric gives a measure of the level of activity in the market. Data is published quarterly.

### **U.S Private Real Estate Markets:**

Metrics: US Cap rates and Annual US Real Estate Deal Volume

Real estate cap rates are a measure of the price paid in the market to acquire properties versus their annualized income generation before financing costs (NOI=net operating income). The data is published by NCREIF. We chose to use current value cap rate. These are capitalization rates from properties that were revalued during the quarter. While this data does rely on estimates of value and therefore tends to be lagging, (estimated prices are slower to rise and slow to fall than transaction prices), the data series goes back to 1979, providing a long data series for valuation comparison. Data is published quarterly.

Annual US real estate deal volume is the total deal transaction volume in \$ billions (both equity and debt) reported by Real Capital Analytics during the trailing-twelve months. This metric gives the level of activity in the market. Data is published monthly.

### **Measure of Equity Market Fear / Uncertainty**

Metric: VIX – Measure of implied option volatility for U.S. equity markets

The VIX is a key measure of near-term volatility conveyed by implied volatility of S&P 500 index option prices. VIX increases with uncertainty and fear. Stocks and the VIX are negatively correlated. Volatility tends to spike when equity markets fall.

### **Measure of Monetary Policy**

Metric: Yield Curve Slope

We calculate the yield curve slope as the 10 year treasury yield minus the 1 year treasury yield. When the yield curve slope is zero or negative, this is a signal to pay attention. A negative yield curve slope signals lower rates in the future, caused by a contraction in economic activity. Recessions are typically preceded by an inverted (negatively sloped) yield curve. A very steep yield curve (2 or greater) indicates a large difference between shorter-term interest rates (the 1 year rate) and longer-term rates (the 10 year rate). This can signal expansion in economic activity in the future, or merely higher future interest rates.

## RISK METRIC DESCRIPTION – Rationale for selection and calculation methodology

### Definition of “extreme” metric readings

A metric reading is defined as “extreme” if the metric reading is in the top or bottom decile of its historical readings. These “extreme” reading should cause the reader to pay attention. These metrics have reverted toward their mean values in the past.

### Credit Markets US Fixed Income:

Metric: Spreads

The absolute level of spreads over treasuries and spread trends (widening / narrowing) are good indicators of credit risk in the fixed income markets. Spreads incorporate estimates of future default, but can also be driven by technical dislocations in the fixed income markets. Abnormally narrow spreads (relative to historical levels) indicate higher levels of valuation risk, wide spreads indicate lower levels of valuation risk and / or elevated default fears. Investment grade bond spreads are represented by the Barclays Capital US Corporate Investment Grade Index Intermediate Component. The high yield corporate bond spreads are represented by the Barclays Capital US Corporate High Yield Index.

### Measures of US Inflation Expectations

Metrics: Breakeven Inflation and Inflation Adjusted Commodity Prices

Inflation is a very important indicator impacting all assets and financial instruments. Breakeven inflation is calculated as the 10 year nominal treasury yield minus the 10 year real yield on US TIPS (treasury inflation protected securities). Abnormally low long-term inflation expectations are indicative of deflationary fears. A rapid rise in breakeven inflation indicates acceleration in inflationary expectations as market participants sell nominal treasuries and buy TIPS. If breakeven inflation continues to rise quarter over quarter, this is a signal of inflationary worries rising, which may cause Fed action and / or dollar decline.

Commodity price movement (above the rate of inflation) is an indication of anticipated inflation caused by real global economic activity putting pressure on resource prices. We calculate this metric by adjusted in the Dow Jones UBS Commodity Index (formerly Dow Jones AIG Commodity Index) by US CPI-U. While rising commodity prices will not necessarily translate to higher US inflation, higher US inflation will likely show up in higher commodity prices, particularly if world economic activity is robust.

These two measures of anticipated inflation can, and often are, conflicting.

### Measures of US Treasury Bond Interest Rate Risk

Metrics: 10-Year Treasury Forward-Looking Real Yield and 10-Year Treasury Duration

The expected annualized real yield of the 10 year US Treasury Bond is a measure of valuation risk for US Treasuries. A low real yield means investors will accept a low rate of expected return for the certainty of receiving their nominal cash flows. PCA estimates the expected annualized real yield by subtracting an estimate of expected 10 year inflation (produced by the Survey of Professional Forecasters as collected by the Federal Reserve Bank of Philadelphia), from the 10 year Treasury constant maturity interest rate.

Duration for the 10-Year Treasury Bond is calculated based on the current yield and a price of 100. This is a measure of expected percentage movements in the price of the bond based on small movements in percentage yield. We make no attempt to account for convexity.

## RISK METRIC DESCRIPTION – Rationale for selection and calculation methodology

### **What is the PCA Market Sentiment Indicator (PMSI)?**

The PMSI is a measure meant to gauge the market's sentiment regarding economic growth risk. Growth risk cuts across most financial assets, and is the largest risk exposure that most portfolios bear. The PMSI takes into account the momentum (trend over time, positive or negative) of the economic growth risk exposure of publicly traded stocks and bonds, as a signal of the future direction of growth risk returns; either positive (risk seeking market sentiment), or negative (risk averse market sentiment).

### **How do I read the PCA Market Sentiment Indicator (PMSI) graph?**

Simply put, the PMSI is a color coded indicator that signals the market's sentiment regarding economic growth risk. It is read left to right chronologically. A green indicator on the PMSI indicates that the market's sentiment towards growth risk is positive. A gray indicator indicates that the market's sentiment towards growth risk is neutral or inconclusive. A red indicator indicates that the market's sentiment towards growth risk is negative. The black line on the graph is the level of the PMSI. The degree of the signal above or below the neutral reading is an indication the signal's current strength.

### **How is the PCA Market Sentiment Indicator (PMSI) Constructed?**

The PMSI is constructed from two sub-elements representing investor sentiment in stocks and bonds:

1. Stock return momentum: Return momentum for the S&P 500 Equity Index (trailing 12-months)
2. Bond yield spread momentum: Momentum of bond yield spreads (excess of the measured bond yield over the identical duration U.S. Treasury bond yield) for corporate bonds (trailing 12-months) for both investment grade bonds (75% weight) and high yield bonds (25% weight). The scale of this measure is adjusted to match that of the stock return momentum measure.

The black line reading on the graph is calculated as the average of the stock return momentum measure and the bonds spread momentum measure. The color reading on the graph is determined as follows:

1. If both stock return momentum and bond spread momentum are positive = GREEN (positive)
2. If one of the momentum indicators is positive, and the other negative = GRAY (inconclusive)
3. If both stock return momentum and bond spread momentum are negative = RED (negative)

### **What does the PCA Market Sentiment Indicator (PMSI) mean? Why might it be useful?**

There is strong evidence that time series momentum is significant and persistent. In particular, across an extensive array of asset classes, the sign of the trailing 12-month return (positive or negative) is indicative of future returns (positive or negative) over the next 12 month period. The PMSI is constructed to measure this momentum in stocks and corporate bond spreads. A reading of green or red is agreement of both the equity and bond measures, indicating that it is likely that this trend (positive or negative) will continue over the next 12 months. When the measures disagree, the indicator turns gray. A gray reading does not necessarily mean a new trend is occurring, as the indicator may move back to green, or into the red from there. The level of the reading (black line) and the number of months at the red or green reading, gives the user additional information on which to form an opinion, and potentially take action.

Momentum is defined as the persistence of relative performance. There is a significant amount of academic evidence indicating that positive momentum (e.g., strong performing stocks over the recent past continue to post strong performance into the near future) exists over near-to-intermediate holding periods. See, for example, "Understanding Momentum," *Financial Analysts Journal*, Scowcroft, Sefton, March, 2005.

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**ATTACHMENT B:  
PFRS ACTUARY VALUATION REPORT  
AS OF JULY 1, 2017**



*Classic Values. Innovative Advice*

# **Oakland Police and Fire Retirement System**

## **Actuarial Valuation Report as of July 1, 2017**

**Produced by Cheiron**

**March 2018**



## TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
Letter of Transmittal .....	i
Foreword .....	ii
Section I Executive Summary .....	1
Section II Assets .....	9
Section III Liabilities .....	14
Section IV Contributions.....	17
Section V Head Count and Benefit Payment Projections .....	19
 <u>Appendices</u>	
Appendix A Membership Information .....	21
Appendix B Statement of Actuarial Assumptions and Methods.....	25
Appendix C Summary of Plan Provisions.....	29
Appendix D Glossary .....	31

March 15, 2018

City of Oakland Police and Fire  
Retirement System Board  
150 Frank H. Ogawa Plaza  
Oakland, CA 94612

Dear Members of the Board:

At your request, we have conducted an actuarial valuation of the Oakland Police and Fire Retirement System (PFRS, the Plan) as of July 1, 2017. This report contains information on the Plan's assets and liabilities. This report also discloses the employer contributions in accordance with the funding agreement between the City of Oakland and PFRS, based on the current financial status of the Plan. Your attention is called to the Foreword in which we refer to the general approach employed in the preparation of this report.

The purpose of this report is to present the results of the annual actuarial valuation of the Plan. This report is for the use of the Retirement Board and the auditors in preparing financial reports in accordance with applicable law and accounting requirements. Any other user of this report is not an intended user and is considered a third party.

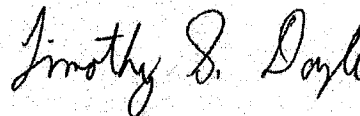
Cheiron's report was prepared solely for the Retirement Board for the purposes described herein, except that the plan auditor may rely on this report solely for the purpose of completing an audit related to the matters herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to such other users.

To the best of our knowledge, this report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys and our firm does not provide any legal services or advice.

Sincerely,  
Cheiron



Graham A. Schmidt, ASA, FCA, MAAA, EA  
Consulting Actuary



Timothy S. Doyle, ASA, MAAA, EA  
Associate Actuary

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**FOREWORD**

Cheiron has performed the actuarial valuation of the Oakland Police and Fire Retirement System (PFRS, the Plan) as of July 1, 2017. The valuation is organized as follows:

- In Section I, the **Executive Summary**, we describe the purpose of an actuarial valuation, summarize the key results found in this valuation, and disclose important trends
- The **Main Body** of the report presents details on the Plan's
  - Section II - Assets
  - Section III - Liabilities
  - Section IV- Contributions
  - Section V - Head Count and Benefit Payment Projections
- In the **Appendices**, we conclude our report with detailed information describing plan membership (Appendix A), actuarial assumptions and methods employed in the valuation (Appendix B), a summary of pertinent plan provisions (Appendix C), and a glossary of key actuarial terms (Appendix D).

The results of this report rely on future plan experience conforming to the underlying assumptions. To the extent that actual plan experience deviates from the underlying assumptions, the results would vary accordingly.

In preparing our report, we relied on information (some oral and some written) supplied by the Plan's staff. This information includes, but is not limited to, plan provisions, employee data, and financial information. We performed an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standard of Practice No. 23.

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION I – EXECUTIVE SUMMARY**

The primary purpose of the actuarial valuation and this report is to measure, describe, and identify the following as of the valuation date:

- The financial condition of the Plan,
- Past and expected trends in the financial progress of the Plan, and
- Calculation of the actuarially determined contributions for years beginning in Fiscal Year 2018-2019.

In the balance of this Executive Summary, we present (A) the basis upon which this year's valuation was completed, (B) the key findings of this valuation including a summary of all key financial results, (C) an examination of the historical trends, and (D) the projected financial outlook for the Plan.

**A. Valuation Basis**

This valuation estimates the projected employer contributions in accordance with the funding agreement dated July 1, 2012 between the City of Oakland and the PFRS. Based on that agreement, employer contributions were suspended until fiscal year 2017-2018, at which time they resumed at a level based upon the recommendation of the actuary. Section IV of this report shows the development of the employer contribution for fiscal year 2018-2019.

The Plan's funding policy is to contribute an amount equal to the sum of:

- The normal cost under the Entry Age Normal Cost Method (which is zero, as there are no active members),
- Amortization of the unfunded actuarial liability, and
- The Plan's expected administrative expenses.

This valuation was prepared based on the plan provisions shown in Appendix C. There have been no changes in plan provisions since the prior valuation.

A summary of the assumptions and methods used in the current valuation is shown in Appendix B. New mortality tables and generational improvement rates went into effect as per the June 30, 2017 experience study. The initial discount rate changed to 6% from 7%, trending down to 3.25% over 10 years. There have been no other changes to the assumptions or methods since the prior valuation.

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION I – EXECUTIVE SUMMARY**

**B. Key Findings of this Valuation**

The key results of the July 1, 2017 actuarial valuation are as follows:

- The actuarially determined employer contribution amount for Fiscal Year 2018-2019 is \$44.8 million, based on projecting the actuarial liabilities and the Actuarial Value of Assets to the end of the 2017-2018 Fiscal Year. This represents a decrease of \$1.6 million from the amount determined in the prior valuation for the same Fiscal Year.
- During the year ended June 30, 2017, the return on Plan assets was 15.09% on a market value basis net of investment expenses, as compared to the 7.00% assumption for the 2016-2017 Plan year. This resulted in a market value gain on investments of \$26.9 million. The Actuarial Value of Assets (AVA) is calculated as the expected AVA plus 20% of the difference between the Market Value and the expected AVA. This smoothed value of assets returned 8.49%, for an actuarial asset gain of \$5.0 million.
- The Plan experienced a gain on the actuarial liability of \$10.0 million, the net result of changes in the population (primarily from a higher number of beneficiary deaths than expected.) Combining the liability and asset gains, the Plan experienced a total gain of \$14.9 million.
- The Plan's smoothed funded ratio, the ratio of actuarial assets over actuarial liability, decreased from 54.0% last year to 51.2% on an AVA basis as of June 30, 2017 before any changes in assumptions. The reduction in the funded ratio is primarily the result of no contribution being made to the fund during the year. Changes in the discount rate and mortality assumptions further decreased the smoothed funded ratio from 51.2% to 49.5%.
- The Plan's funded ratio decreased from 53.7% to 52.4% on a Market Value of Assets (MVA) basis. The decrease in the Market Value funded ratio was primarily the result of the assumption changes.
- The unfunded actuarial liability (UAL) is the excess of the Plan's actuarial liability over the Actuarial Value of Assets. The Plan experienced an increase in the UAL from \$309.4 million to \$317.3 million as of July 1, 2017 before assumption changes. Changes in assumptions further increased the UAL to \$340.1 million as of July 1, 2017.
- Overall participant membership decreased compared to last year. Twenty-eight members died, 10 of whom had their benefits continue to a surviving spouse. In addition, 25 surviving beneficiaries died. There are no active members of the Plan.
- If the contribution were determined using a projected asset value based on the current market (i.e., non-smoothed) value of assets, the contribution for FY 2018-2019 would be \$42.5 million. The contribution is smaller than that determined using the projected AVA, because the current market value reflects the full amount of recent investment gains, while under the AVA projection a portion of those gains are deferred until years after FY 2018-2019.

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION I – EXECUTIVE SUMMARY**

Below we present Table I-1 which summarizes all the key results of the valuation with respect to membership, assets and liabilities, and contributions. The results are presented and compared for both the current and prior plan year.

<b>TABLE I-1</b>			
<b>Summary of Principal Plan Results</b>			
(\$ in thousands)			
	July 1, 2016	July 1, 2017	% Change
<b><u>Participant Counts</u></b>			
Active Participants	0	0	
Participants Receiving a Benefit	929	886	-4.63%
<b>Total</b>	<b>929</b>	<b>886</b>	<b>-4.63%</b>
Annual Pay of Active Members	\$ 0	\$ 0	
<b><u>Assets and Liabilities</u></b>			
Actuarial Liability (AL)	\$ 672,916	\$ 673,441	0.08%
Actuarial Value of Assets (AVA)	363,550	333,373	-8.30%
Unfunded Actuarial Liability (UAL)	\$ 309,366	\$ 340,068	9.92%
Funded Ratio (AVA)	54.0%	49.5%	-4.52%
Funded Ratio (MVA)	53.7%	52.4%	-1.29%
<b><u>Contributions</u></b>			
Employer Contribution (FY2017-18)	\$ 44,860	N/A	
Employer Contribution (FY2018-19)	\$ 46,366	\$ 44,821	-3.33%

**C. Historical Trends**

Despite the fact that for most retirement plans the greatest attention is given to the current valuation results and in particular, the size of the current unfunded actuarial liability and the employer contribution, it is important to remember that each valuation is merely a snapshot in the long-term progress of a pension fund. It is more important to judge a current year's valuation result relative to historical trends, as well as trends expected into the future.

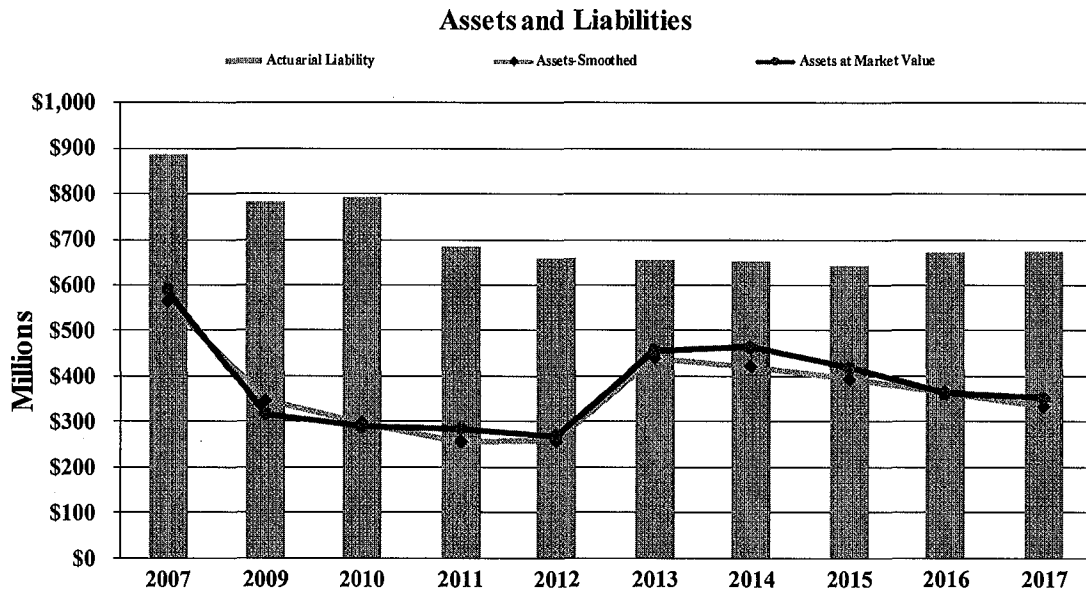
**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION I – EXECUTIVE SUMMARY**

**Assets and Liabilities**

The chart below compares the Market Value of Assets (MVA) and Actuarial Value of Assets (AVA) to the Actuarial Liabilities. The percentages shown in the table below the chart are the ratios of the Actuarial Value of Assets to the Actuarial Liability (the funded ratio). We note that for the GASB disclosure report, this ratio is now disclosed using the MVA.

The funded ratio declined from 63.7% in 2007 to 37.5% in 2011 due to negative market returns and no contributions being made in that period (\$417 million in proceeds from a POB were deposited in 1997 which acted as prepayments for 15 years of contributions). The funded ratio increased between 2012 and 2013 due to a \$210 million contribution in July 2012. The funded ratio has decreased from 67.2% to 49.5% over the last four years due to assumption changes, liability losses, new Police MOUs, and the lack of contributions since the July 2012 payment.



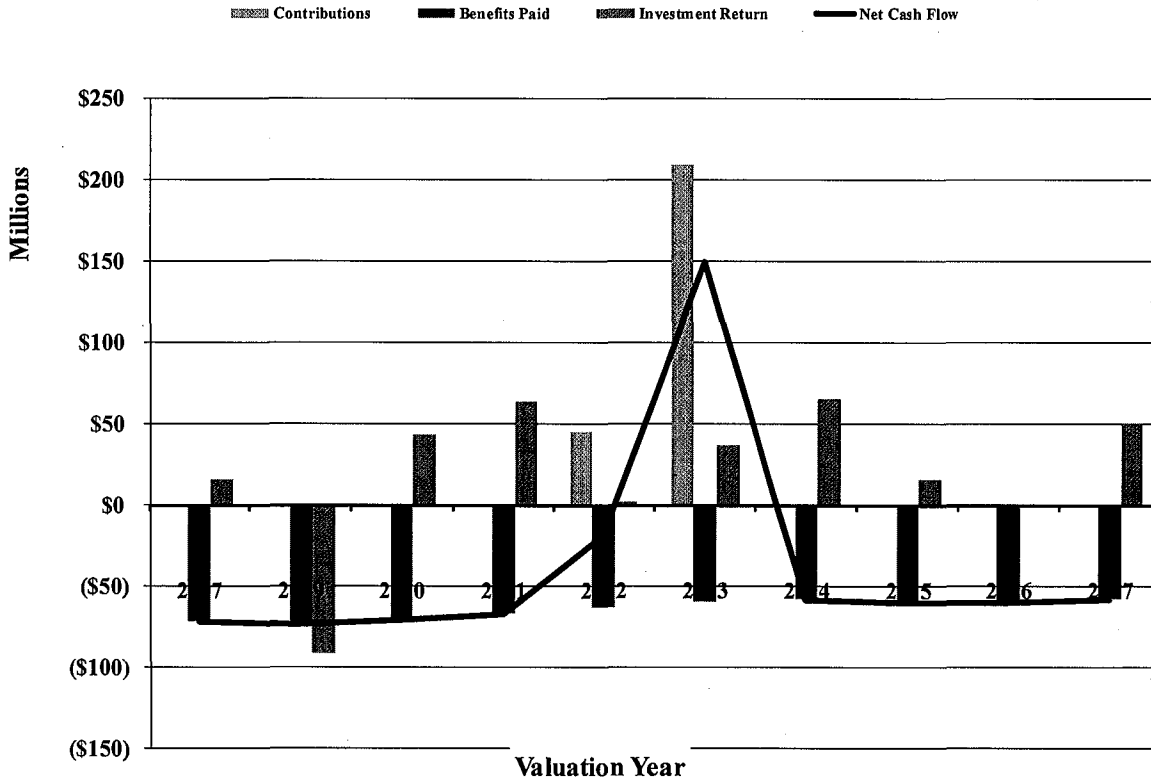
Valuation Year	2007	2009	2010	2011	2012	2013	2014	2015	2016	2017
AVA Funded Ratio	63.7%	44.4%	37.6%	37.5%	39.1%	67.2%	64.6%	61.4%	54.0%	49.5%
UAL (Millions)	\$ 322.1	\$ 435.3	\$ 494.4	\$ 426.8	\$ 401.1	\$ 215.0	\$ 230.2	\$ 247.5	\$ 309.4	\$ 340.1

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION I – EXECUTIVE SUMMARY**

**Cash Flows**

The chart below shows the Plan’s cash flow, excluding investment returns (i.e., contributions less benefit payments and expenses). This is a critical measure, as it reflects the ability to have funds available to meet benefit payments without having to make difficult investment decisions, especially during volatile markets.



The contributions, benefit payments, investment returns, and net cash flow (NCF) excluding investment returns and expenses are represented by the scale on the left. The Plan’s net cash flow has been negative five of the last six fiscal years primarily due to no contributions being made between 2007 and 2011, becoming positive in 2013 when a \$210 million contribution was made.

A negative cash flow magnifies the losses during a market decline, hindering the Plan in its ability to absorb market fluctuations. The implications of a plan in negative cash flow are that the impact of market fluctuations can be more severe: as assets are being depleted to pay benefits in down markets, there is less principal available to be reinvested during favorable return periods. The Plan is expected to remain in a negative cash flow position going forward, since the Plan is closed.



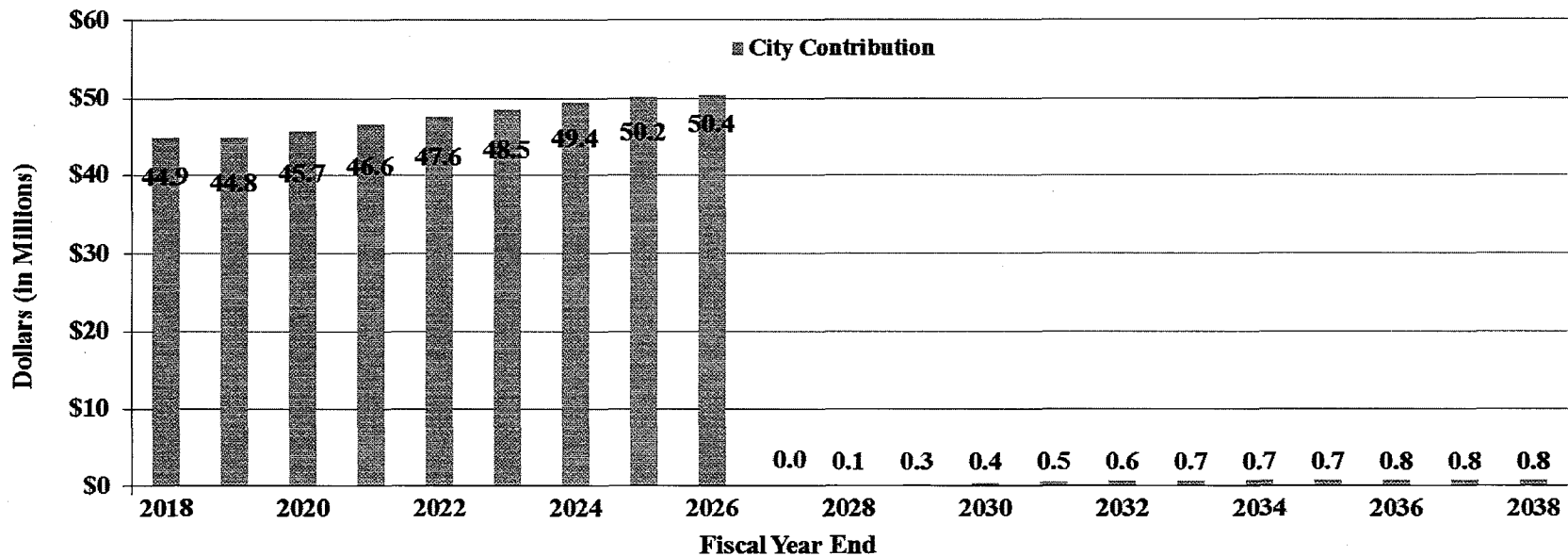
**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION I – EXECUTIVE SUMMARY**

**D. Future Expected Financial Trends**

The analysis of projected financial trends is perhaps the most important component of this valuation. In this section, we present our assessment of the implications of the July 1, 2017 valuation results in terms of benefit security (assets over liabilities) and contribution levels. All the projections in this section are based on the assumption that the Plan will exactly achieve the assumed rate of return each year (6.0% per year until 2027, then trending down to an annual return of 3.25% over 10 years).

**Projection of Employer Contributions**



The above graph shows that the City’s contributions are expected to resume in fiscal 2017-2018, starting at \$44.9 million and eventually increasing to \$50.4 million as the current unfunded liability is fully amortized. This assumes that the annual payments by the City will equal the administrative expenses, plus an amount needed to amortize the remaining unfunded liability as a level percentage of overall Safety payroll by July 1, 2026, as is required under the City’s charter.

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION I – EXECUTIVE SUMMARY**

After July 1, 2026, the UAL is expected to be fully amortized, and the contribution would generally be equal to the administrative expense, beginning in 2026-2027. However, under the current asset smoothing method there are still expected to be some deferred asset gains, which will not be recognized until after 2026; the deferred recognition of these gains is expected to offset a small portion of the administrative expenses in the final years of the graph on the previous page.

Note that the graph on the previous page does not forecast any future actuarial gains or losses or changes to the amortization policy. Even relatively modest losses relative to the assumed return could push the employer contribution over \$60 million in the next few years. We also note that the occurrence of any future gains or losses in the years leading up to or following the required full amortization date (July 1, 2026) may require a reconsideration of the funding policy for those gains or losses, as otherwise these changes would need to be recognized over an extremely short period.

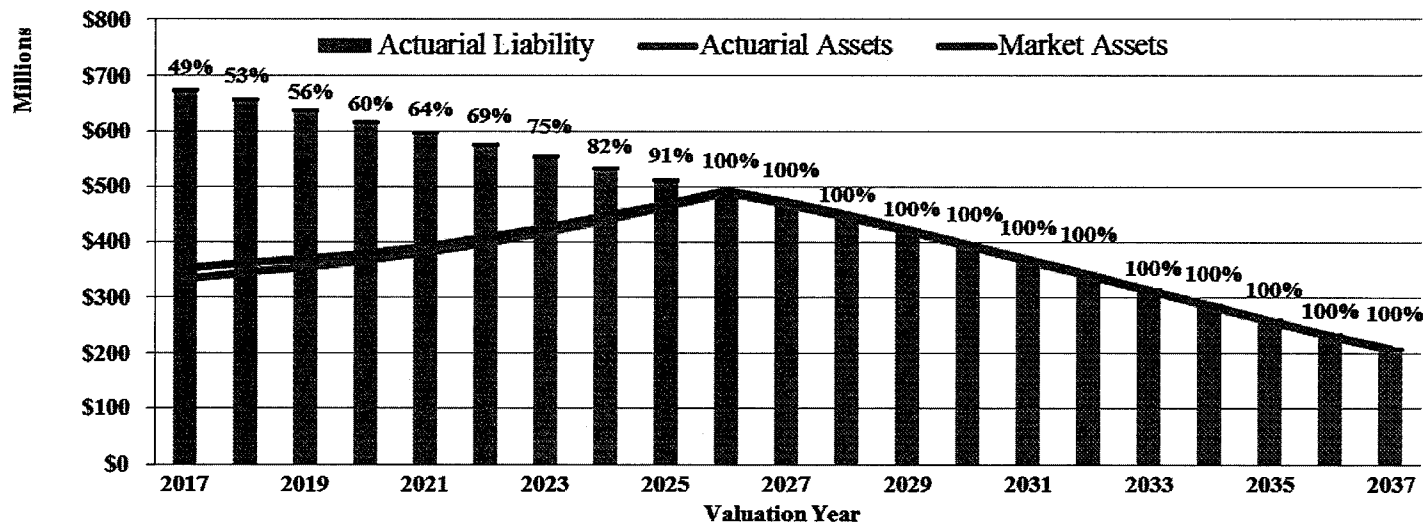
OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
 ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017

SECTION I – EXECUTIVE SUMMARY

Asset and Liability Projections:

The following graph shows the projection of assets and liabilities assuming that assets will earn the assumed rate of return each year during the projection period.

Projection of Assets and Liabilities



The graph shows that the projected funded status increases as the current unfunded liability is fully amortized, assuming all actuarial assumptions are met.

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION II – ASSETS**

Pension Plan assets play a key role in the financial operation of the Plan and in the decisions the Board may make with respect to future deployment of those assets. The level of assets, the allocation of assets among asset classes, and the methodology used to measure assets will likely impact benefit levels, employer contributions, and the ultimate security of participants' benefits.

In this section, we present detailed information on Plan assets including:

- **Disclosure** of Plan assets as of June 30, 2016 and June 30, 2017
- Statement of the **changes** in market values during the year, and
- Development of the **Actuarial Value of Assets**.

**Disclosure**

There are two types of asset values disclosed in the valuation, the market value of assets and the actuarial value of assets. The market value represents “snap-shot” or “cash-out” values which provide the principal basis for measuring financial performance from one year to the next. Market values, however, can fluctuate widely with corresponding swings in the marketplace. As a result, market values are sometimes not as suitable for long-range planning as are the actuarial value of assets which reflect smoothing of annual investment returns.

Table II-1 on the next page discloses and compares each component of the market asset value as of June 30, 2016 and June 30, 2017.

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION II – ASSETS**

**TABLE II-1  
Statement of Assets at Market Value  
June 30,  
(in thousands)**

	2016		2017
<b>Cash and Cash Equivalents:</b>	\$ 2,536	\$	3,382
<b>Receivables:</b>			
Interest Receivable	\$ 271	\$	355
Dividends Receivable	262		227
Investments Receivable	3,743		4,008
Retired Members and Beneficiaries	3,288		2,477
Miscellaneous	167		187
Total Receivables	<u>7,731</u>		<u>7,255</u>
<b>Investments, at Fair Value:</b>			
Short-term Investments	6,897		5,576
Bonds	63,787		63,600
Domestic Equities and Mutual Funds	174,113		168,467
International Equities and Mutual Funds	40,223		44,590
Alternative Investments	73,592		70,511
Securities Lending Collateral	45,042		31,042
Total Investments	<u>403,653</u>		<u>383,785</u>
Total Assets	413,920		394,422
<b>Liabilities:</b>			
Accounts Payable	42		23
Benefits Payable	4,834		4,763
Investments Payable	2,056		5,118
Accrued Investment Management Fees	335		281
Securities Lending Liabilities	45,042		31,034
Total Liabilities	<u>52,309</u>		<u>41,220</u>
<b>Market Value of Assets</b>	\$ <b>361,611</b>	\$	<b>353,203</b>

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION II – ASSETS**

**Changes in Market Value**

The components of asset change are:

- Contributions (employer and employee)
- Benefit payments
- Expenses (investment and administrative)
- Investment income (realized and unrealized)

Table II-2 shows the components of a change in the market value of assets during 2016 and 2017.

<b>TABLE II-2</b> <b>Changes in Market Values</b> <b>June 30,</b> <b>(in thousands)</b>		
	<u>2016</u>	<u>2017</u>
<b>Contributions</b>		
Contributions of Plan Members	\$ 0	\$ 0
Contributions from the City	0	0
Total Contributions	0	0
<b>Investment Income</b>		
Miscellaneous Income	3,593	70
Investment Income	(1,419)	50,159
Total Investment Income	2,174	50,229
<b>Disbursements</b>		
Benefit Payments	(58,441)	(57,376)
Administrative Expenses	(1,376)	(1,262)
Total Disbursements	(59,817)	(58,637)
<b>Net increase (Decrease)</b>	(57,643)	(8,408)
<b>Net Assets Held in Trust for Benefits:</b>		
Beginning of Year	419,254	361,611
End of Year	\$ 361,611	\$ 353,203
Approximate Return	-0.4%	15.1%

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION II – ASSETS**

**Actuarial Value of Assets (AVA)**

The actuarial value of assets represents a “smoothed” value developed by the actuary to reduce the volatile results which could develop due to short-term fluctuations in the market value of assets. For this Plan, the actuarial value of assets is calculated on a modified market-related value. The actuarial value of assets recognizes one-fifth of the difference between the expected asset value (based on the 7.00% return assumption from 2016-2017) and the actual market value each year. The actuarial value is restricted to fall between 90% and 110% of the market value.

<b>Table II-3 Development of Actuarial Value of Assets (in thousands)</b>	
1) Calculate Expected Actuarial Value of Assets	
a) Value of Actuarial Value of Assets - July 1, 2016	\$ 363,550
b) Total Contributions and Misc Income	70
c) Administrative Expense	(1,262)
d) Benefit Payments	(57,376)
e) Expected Investment Earnings	23,433
f) Value of Actuarial Value of Assets - July 1, 2017 [1a + 1b + 1c + 1d + 1e]	\$ 328,416
2) Calculate Final Actuarial Value of Assets	
a) Value of Market Value of Assets - July 1, 2017	\$ 353,203
b) Excess of MVA over Expected AVA [2a - 1f]	24,787
c) Preliminary AVA [1f + 0.2 * 2b]	333,373
d) 90% of MVA [90% * 2a]	317,883
e) 110% of MVA [110% * 2a]	388,523
3) Final Actuarial Value of Assets [2c, not less than 2d or greater than 2e]	\$ 333,373

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION II – ASSETS**

**Investment Performance**

The following table calculates the investment related gain/loss for the plan year on both a Market Value and an Actuarial Value basis. The Market Value gain/loss is an appropriate measure for comparing the actual asset performance to the previous valuation's 7.00% assumption.

<b>TABLE II-4 Asset Gain/(Loss) (in thousands)</b>		
	<b>Market Value</b>	<b>Actuarial Value</b>
<b>July 1, 2016 value</b>	<b>\$ 361,611</b>	<b>\$ 363,550</b>
Contributions of Plan Members	0	0
Contributions from the City	0	0
Miscellaneous Income	70	70
Benefit Payments	(57,376)	(57,376)
Administrative Expenses	(1,262)	(1,262)
Expected Investment Earnings (7.00%)	<u>23,298</u>	<u>23,433</u>
Expected Value June 30, 2017	<b>\$ 326,342</b>	<b>\$ 328,416</b>
Investment Gain / (Loss)	<u>26,861</u>	<u>4,957</u>
<b>July 1, 2017 value</b>	<b>353,203</b>	<b>333,373</b>
Return	15.09%	8.49%



**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION III – LIABILITIES**

In this section, we present detailed information on Plan liabilities including:

- **Disclosure** of Plan liabilities at July 1, 2016 and July 1, 2017
- Statement of **changes** in these liabilities during the year

**Disclosure**

Several types of liabilities are typically shown in an actuarial valuation report. Each type is distinguished by the people ultimately using the figures and the purpose for which they are using them. Note that these liabilities are not applicable for settlement purposes, including the purchase of annuities and the payment of lump sums.

- **Present Value of Future Benefits:** Used for measuring all future Plan obligations, the obligations of the Plan earned as of the valuation date and those to be earned in the future by current plan participants under the current Plan provisions, if all assumptions are met.
- **Actuarial Liability:** Used for funding calculations, this liability is calculated taking the Present Value of Future Benefits and subtracting the present value of future Normal Costs under an acceptable actuarial funding method. Because the Plan has no active members, the Actuarial Liability is equal to the Present Value of Future Benefits (i.e., all benefits are fully accrued).
- **Unfunded Actuarial Liability:** The excess of the Actuarial Liability over the Actuarial Value of Assets.

Table III-1 below discloses each of these liabilities for the current and prior valuations.

<b>TABLE III-1</b>		
<b>Liabilities/Net (Surplus)/Unfunded</b>		
<b>(in thousands)</b>		
	<b>July 1, 2016</b>	<b>July 1, 2017</b>
<b><u>Present Value of Future Benefits</u></b>		
Active Participant Benefits	\$ 0	\$ 0
Retiree and Inactive Benefits	<u>672,916</u>	<u>673,441</u>
<b>Present Value of Future Benefits (PVB)</b>	<b>\$ 672,916</b>	<b>\$ 673,441</b>
<b><u>Actuarial Liability</u></b>		
Present Value of Future Benefits (PVB)	\$ 672,916	\$ 673,441
Present Value of Future Normal Costs (PVFNC)	<u>0</u>	<u>0</u>
<b>Actuarial Liability (AL = PVB - PVFNC)</b>	<b>\$ 672,916</b>	<b>\$ 673,441</b>
Actuarial Value of Assets (AVA)	<u>363,550</u>	<u>333,373</u>
<b>Net (Surplus)/Unfunded (AL - AVA)</b>	<b>\$ 309,366</b>	<b>\$ 340,068</b>

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION III – LIABILITIES**

**Changes in Liabilities**

Each of the liabilities disclosed in the prior table are expected to change at each valuation. The components of that change, depending upon which liability is analyzed, can include:

- New hires since the last valuation (not applicable for this Plan)
- Benefits accrued since the last valuation (not applicable for this Plan)
- Plan amendments
- Passage of time which adds interest to the prior liability
- Benefits paid to retirees since the last valuation
- Participants retiring, terminating, dying, or receiving COLA adjustments at rates different than expected
- A change in actuarial or investment assumptions
- A change in the actuarial funding method or software

Unfunded liabilities will change because of all of the above, and also due to changes in Plan assets resulting from:

- Employer contributions different than expected
- Investment earnings different than expected
- A change in the method used to measure plan assets

<b>TABLE III-2</b>	
<b>Changes in Actuarial Liability</b>	
<b>(in thousands)</b>	
Actuarial Liability at July 1, 2016	\$ 672,916
Actuarial Liability at July 1, 2017	\$ 673,441
Liability Increase (Decrease)	\$ 525
Change due to:	
Actuarial Methods / Software Changes	\$ 0
Assumption Change	22,730
Accrual of Benefits	0
Actual Benefit Payments	(57,376)
Interest	45,130
Data Corrections	0
Actuarial Liability (Gain)/Loss	\$ (9,959)

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION III – LIABILITIES**

<b>Table III-3</b>			
<b>Liabilities by Group as of July 1, 2017</b>			
<b>(in thousands)</b>			
	<b>Police</b>	<b>Fire</b>	<b>Total</b>
<b>Actuarial Accrued Liability</b>			
Active	\$ 0	\$ 0	\$ 0
Service Retirees	257,150	89,632	346,782
Disabled Retirees	105,936	94,310	200,246
Beneficiaries	<u>69,919</u>	<u>56,494</u>	<u>126,413</u>
<b>Total Accrued Liability</b>	<b>\$ 433,005</b>	<b>\$ 240,436</b>	<b>\$ 673,441</b>

<b>TABLE III-4</b>	
<b>Development of Actuarial Gain / (Loss)</b>	
<b>(in thousands)</b>	
1. Unfunded Actuarial Liability at Start of Year (not less than zero)	\$ 309,366
2. Employer Normal Cost at Start of Year	0
3. Interest on 1. and 2. to End of Year	21,656
4. Contributions and Miscellaneous Income for Prior Year	70
5. Administrative Expenses	(1,262)
6. Interest on 4. and 5. to End of Year	(41)
7. Change in Unfunded Actuarial Liability Due to Changes in Assumptions	22,730
8. Change in Unfunded Actuarial Liability Due to Changes in Actuarial Methods	0
9. Change in Unfunded Actuarial Liability Due to Changes in Plan Design	0
10. Change in Unfunded Actuarial Liability Due to Data Corrections	0
11. Expected Unfunded Actuarial Liability at End of Year [1. + 2. + 3. - 4. - 5. - 6. + 7. + 8. + 9. + 10.]	\$ 354,984
12. Actual Unfunded Actuarial Liability at End of Year (not less than zero)	340,068
13. Unfunded Actuarial Liability Gain / (Loss) [11. - 12.]	\$ 14,917

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION IV – CONTRIBUTIONS**

In the process of evaluating the financial condition of any pension plan, the actuary analyzes the assets and liabilities to determine what level (if any) of contributions is needed to properly maintain the funding status of the Plan. Typically, the actuarial process will use a funding technique that will result in a pattern of contributions that are both stable and predictable.

For this Plan, the actuarial funding method used to determine the normal cost and the unfunded actuarial liability is the **Entry Age Normal** cost method.

The normal cost rate is determined with the normal cost percentage equal to the total Projected Value of Benefits at Entry Age, divided by Present Value of Future Salary at Entry Age. Since there are no longer any active employees, the normal cost for this plan is \$0.

The unfunded actuarial liability is the difference between the EAN actuarial liability and the actuarial value of assets. For the contribution projections, the UAL payment is based on the unfunded liability of the Plan being fully amortized by June 30, 2026, in accordance with the City Charter. Amortization payments are determined based on an assumption that payments will increase by 3.25% each year, reflecting the assumed ultimate rate of increase in overall City Safety member salaries.

An amount equal to the expected administrative expenses for the Plan is added directly to the actuarial cost calculation.

Table IV-1 on the next page shows the employer contribution amount for the 2018-2019 Fiscal Year. The projected assets and liabilities assume that all actuarial assumptions are met and that contributions are made as expected between now and June 30, 2018.

For this calculation, we have shown the contribution amount using both the projected actuarial and market value of assets. The current funding policy uses the AVA to determine the UAL and the associated amortization payment. We have included the contribution amount as determined using the current market value of assets to demonstrate what the actuarial cost would be if all deferred asset gains were fully recognized at the time the contributions commence. In both cases, the contribution is based on an assumption that the investment returns will exactly equal the assumed rate of return during the 2017-2018 Fiscal Year.

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION IV – CONTRIBUTIONS**

**TABLE IV-1  
Development of Projected 2018-2019 Employer Contribution Amount  
(in thousands)**

	Actuarial Value of Assets	Market Value of Assets
1. Value of Assets at June 30, 2017:	\$ 333,373	\$ 353,203
a. Expected Contributions and Misc Income	\$ 44,860	\$ 44,860
b. Expected Administrative Expense	\$ (979)	\$ (979)
c. Expected Benefit Payments	\$ (56,644)	\$ (56,644)
d. Expected Investment Earnings	<u>\$ 19,625</u>	<u>\$ 20,815</u>
2. Expected Value of Assets at June 30, 2018:	\$ 340,235	\$ 361,255
a. Excess of Expected MVA over Expected AVA	\$ 21,019	
b. Preliminary AVA [ Expected AVA + 20% * 2a]	\$ 344,439	
c. 90% of Expected MVA	\$ 325,129	
d. 110% of Expected MVA	\$ 397,380	
3. Final Expected AVA [2b, not less than 2c or greater than 2d]	\$ 344,439	\$ 361,255
4. Entry Age Liability at June 30, 2017:	\$ 673,441	\$ 673,441
5. Expected Benefit Payments:	\$ (56,644)	\$ (56,644)
6. Expected Interest:	<u>\$ 38,732</u>	<u>\$ 38,732</u>
7. Expected Entry Age Liability at June 30, 2018:	\$ 655,529	\$ 655,529
8. Projected Unfunded Actuarial Liability: (7) - (3)	311,090	294,275
9. Funded Ratio: (3) / (7)	52.5%	55.1%
10. Unfunded Actuarial Liability Amortization at Middle of Year as a Level Percentage of Payroll (8 Years Remaining) as of June 30, 2018:	43,814	41,446
11. Expected Administrative Expenses for Fiscal 2017-2018:	<u>\$1,007</u>	<u>\$1,007</u>
12. Total Contribution: (10) + (11)	44,821	42,453

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION V – HEADCOUNT AND BENEFIT PAYMENT PROJECTIONS**

Fiscal Year Ending June 30,	Police		Fire		Total	
	Count	Benefits (in thousands)	Count	Benefits (in thousands)	Count	Benefits (in thousands)
2018	516.0	\$ 33,561	370.0	\$ 23,082	886.0	56,644
2019	500.9	\$ 34,112	350.5	\$ 22,486	851.4	56,598
2020	485.4	\$ 34,442	331.6	\$ 21,882	816.9	56,323
2021	469.7	\$ 34,289	313.3	\$ 21,274	783.0	55,563
2022	453.9	\$ 34,086	295.7	\$ 20,663	749.6	54,748
2023	438.0	\$ 33,832	278.9	\$ 20,047	716.9	53,879
2024	422.2	\$ 33,529	262.7	\$ 19,425	684.8	52,954
2025	406.4	\$ 33,173	247.1	\$ 18,796	653.5	51,969
2026	390.6	\$ 32,759	232.1	\$ 18,157	622.7	50,916
2027	374.8	\$ 32,280	217.8	\$ 17,507	592.5	49,787
2028	358.9	\$ 31,730	203.9	\$ 16,843	562.8	48,573
2029	342.8	\$ 31,098	190.6	\$ 16,165	533.4	47,263
2030	326.6	\$ 30,377	177.8	\$ 15,469	504.3	45,847
2031	310.1	\$ 29,560	165.3	\$ 14,755	475.4	44,315
2032	293.2	\$ 28,640	153.3	\$ 14,021	446.5	42,661
2033	276.1	\$ 27,612	141.6	\$ 13,267	417.7	40,878
2034	258.7	\$ 26,476	130.3	\$ 12,493	389.0	38,970
2035	241.0	\$ 25,237	119.3	\$ 11,704	360.3	36,941
2036	223.2	\$ 23,899	108.7	\$ 10,901	331.9	34,800
2037	205.2	\$ 22,474	98.5	\$ 10,089	303.7	32,564
2038	187.4	\$ 20,976	88.6	\$ 9,275	276.0	30,251
2039	169.8	\$ 19,421	79.2	\$ 8,465	249.0	27,886
2040	152.6	\$ 17,830	70.3	\$ 7,667	222.9	25,497
2041	135.9	\$ 16,225	61.9	\$ 6,890	197.8	23,115
2042	120.0	\$ 14,630	54.0	\$ 6,140	174.0	20,769
2043	104.9	\$ 13,067	46.8	\$ 5,426	151.7	18,492
2044	90.9	\$ 11,557	40.1	\$ 4,754	131.0	16,311
2045	77.9	\$ 10,119	34.1	\$ 4,129	112.0	14,249
2046	66.1	\$ 8,770	28.8	\$ 3,556	94.9	12,326
2047	55.5	\$ 7,521	24.0	\$ 3,036	79.6	10,557

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**SECTION V – HEADCOUNT AND BENEFIT PAYMENT PROJECTIONS**

Fiscal Year Ending June 30,	Police		Fire		Total	
	Count	Benefits (in thousands)	Count	Benefits (in thousands)	Count	Benefits (in thousands)
2048	46.2	\$ 6,382	19.9	\$ 2,571	66.0	8,952
2049	37.9	\$ 5,358	16.3	\$ 2,158	54.3	7,516
2050	30.9	\$ 4,453	13.3	\$ 1,797	44.1	6,249
2051	24.9	\$ 3,663	10.7	\$ 1,485	35.5	5,147
2052	19.8	\$ 2,983	8.6	\$ 1,218	28.4	4,201
2053	15.6	\$ 2,405	6.8	\$ 993	22.4	3,398
2054	12.2	\$ 1,921	5.4	\$ 804	17.6	2,725
2055	9.5	\$ 1,521	4.2	\$ 648	13.6	2,169
2056	7.3	\$ 1,194	3.3	\$ 519	10.5	1,713
2057	5.5	\$ 930	2.5	\$ 413	8.0	1,343
2058	4.2	\$ 720	1.9	\$ 328	6.1	1,048
2059	3.1	\$ 554	1.5	\$ 259	4.6	813
2060	2.3	\$ 423	1.1	\$ 204	3.5	627
2061	1.7	\$ 321	0.9	\$ 159	2.6	481
2062	1.3	\$ 242	0.6	\$ 123	1.9	366
2063	0.9	\$ 181	0.5	\$ 95	1.4	276
2064	0.7	\$ 134	0.4	\$ 72	1.0	206
2065	0.5	\$ 98	0.3	\$ 54	0.7	152
2066	0.3	\$ 71	0.2	\$ 40	0.5	111
2067	0.2	\$ 50	0.1	\$ 29	0.4	79
2068	0.2	\$ 35	0.1	\$ 20	0.3	55
2069	0.1	\$ 23	0.1	\$ 14	0.2	37
2070	0.1	\$ 15	0.0	\$ 9	0.1	24
2071	0.0	\$ 9	0.0	\$ 6	0.1	15
2072	0.0	\$ 5	0.0	\$ 4	0.0	8
2073	0.0	\$ 2	0.0	\$ 2	0.0	4
2074	0.0	\$ 1	0.0	\$ 1	0.0	2
2075	0.0	\$ 0	0.0	\$ 0	0.0	1
2076	0.0	\$ 0	0.0	\$ 0	0.0	0
2077	0.0	\$ 0	0.0	\$ 0	0.0	0

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**APPENDIX A – MEMBERSHIP INFORMATION**

Active Participants	July 1, 2016			July 1, 2017		
	Police	Fire	Total	Police	Fire	Total
Number	0	0	0	0	0	0
Number Vested	0	0	0	0	0	0
Average Age	0.0	0.0	0.0	0.0	0.0	0.0
Average Service	0.0	0.0	0.0	0.0	0.0	0.0
Average Pay	\$0	\$0	\$0	\$0	\$0	\$0
<b>Service Retirees</b>						
Number	268	129	397	260	120	380
Average Age	73.6	80.0	75.7	74.3	80.2	76.1
Average Annual Benefit	\$68,602	\$73,664	\$70,247	\$72,011	\$73,308	\$72,420
<b>Disabled Retirees</b>						
Number	124	118	242	117	114	231
Average Age	73.3	74.9	74.1	73.8	75.6	74.6
Average Annual Benefit	\$65,477	\$68,757	\$67,076	\$68,956	\$68,799	\$68,879
<b>Beneficiaries</b>						
Number	153	137	290	139	136	275
Average Age	81.3	83.2	82.2	80.6	83.9	82.2
Average Annual Benefit	\$49,101	\$51,798	\$50,375	\$52,291	\$51,846	\$52,071
<b>All Inactives</b>						
Number	545	384	929	516	370	886
Average Age	75.7	79.6	77.3	75.9	80.1	77.6
Average Annual Benefit	\$62,416	\$64,355	\$63,218	\$66,006	\$64,030	\$65,181

Data pertaining to active and inactive Members and their beneficiaries as of the valuation date was supplied by the Plan Administrator on electronic media.



**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**APPENDIX A – MEMBERSHIP INFORMATION**

**Changes in Plan Membership: Police**

	<b>Actives</b>	<b>Service Retirees</b>	<b>Disabled Retirees</b>	<b>Beneficiaries</b>	<b>Total</b>
July 1, 2016	0	268	124	153	545
Retired	0	0	0	0	0
Disabled	0	0	0	0	0
Deceased	0	(8)	(7)	(19)	(34)
New Beneficiary	0	0	0	5	5
July 1, 2017	<b>0</b>	<b>260</b>	<b>117</b>	<b>139</b>	<b>516</b>

**Changes in Plan Membership: Fire**

	<b>Actives</b>	<b>Service Retirees</b>	<b>Disabled Retirees</b>	<b>Beneficiaries</b>	<b>Total</b>
July 1, 2016	0	129	118	137	384
Retired	0	0	0	0	0
Disabled	0	0	0	0	0
Deceased	0	(9)	(4)	(6)	(19)
New Beneficiary	0	0	0	5	5
July 1, 2017	<b>0</b>	<b>120</b>	<b>114</b>	<b>136</b>	<b>370</b>

**Changes in Plan Membership: All**

	<b>Actives</b>	<b>Service Retirees</b>	<b>Disabled Retirees</b>	<b>Beneficiaries</b>	<b>Total</b>
July 1, 2016	0	397	242	290	929
Retired	0	0	0	0	0
Disabled	0	0	0	0	0
Deceased	0	(17)	(11)	(25)	(53)
New Beneficiary	0	0	0	10	10
July 1, 2017	<b>0</b>	<b>380</b>	<b>231</b>	<b>275</b>	<b>886</b>

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**APPENDIX A – MEMBERSHIP INFORMATION**

**Service Retired Participants**

Age	Police		Fire		Total	
	Number	Total Annual Benefit	Number	Total Annual Benefit	Number	Total Annual Benefit
< 50	0	\$0	0	\$0	0	\$0
50-54	0	\$0	0	\$0	0	\$0
55-59	0	\$0	0	\$0	0	\$0
60-64	10	\$712,727	0	\$0	10	\$712,727
65-69	52	\$3,884,284	8	\$499,766	60	\$4,384,050
70-74	109	\$7,392,274	38	\$2,758,923	147	\$10,151,197
75-79	52	\$3,720,501	17	\$1,212,351	69	\$4,932,851
80-84	15	\$1,300,441	20	\$1,522,483	35	\$2,822,923
85-89	12	\$860,962	17	\$1,226,312	29	\$2,087,275
90-94	9	\$763,479	15	\$1,188,967	24	\$1,952,446
95-99	1	\$88,182	5	\$388,106	6	\$476,288
100+	0	\$0	0	\$0	0	\$0
<b>Total</b>	<b>260</b>	<b>\$18,722,850</b>	<b>120</b>	<b>\$8,796,908</b>	<b>380</b>	<b>\$27,519,758</b>

**Disability Retired Participants**

Age	Police		Fire		Total	
	Number	Total Annual Benefit	Number	Total Annual Benefit	Number	Total Annual Benefit
< 50	0	\$0	0	\$0	0	\$0
50-54	0	\$0	0	\$0	0	\$0
55-59	0	\$0	0	\$0	0	\$0
60-64	1	\$66,015	0	\$0	1	\$66,015
65-69	29	\$2,071,511	28	\$1,758,879	57	\$3,830,390
70-74	51	\$3,361,636	32	\$2,133,620	83	\$5,495,256
75-79	20	\$1,383,802	29	\$2,106,765	49	\$3,490,567
80-84	9	\$628,068	13	\$956,646	22	\$1,584,714
85-89	3	\$238,952	7	\$576,699	10	\$815,651
90-94	4	\$317,910	3	\$181,003	7	\$498,913
95-99	0	\$0	2	\$129,521	2	\$129,521
100+	0	\$0	0	\$0	0	\$0
<b>Total</b>	<b>117</b>	<b>\$8,067,894</b>	<b>114</b>	<b>\$7,843,134</b>	<b>231</b>	<b>\$15,911,028</b>

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**APPENDIX A – MEMBERSHIP INFORMATION**

**Beneficiaries**

Age	Police		Fire		Total	
	Number	Total Annual Benefit	Number	Total Annual Benefit	Number	Total Annual Benefit
< 50	0	\$0	0	\$0	0	\$0
50-54	0	\$0	0	\$0	0	\$0
55-59	1	\$65,614	2	\$128,511	3	\$194,125
60-64	7	\$396,707	4	\$243,765	11	\$640,472
65-69	16	\$798,228	10	\$559,192	26	\$1,357,421
70-74	23	\$1,080,114	11	\$555,837	34	\$1,635,951
75-79	17	\$838,645	13	\$677,232	30	\$1,515,877
80-84	17	\$993,606	28	\$1,331,647	45	\$2,325,253
85-89	26	\$1,382,746	25	\$1,198,959	51	\$2,581,706
90-94	27	\$1,426,148	32	\$1,668,623	59	\$3,094,771
95-99	4	\$215,222	7	\$407,001	11	\$622,223
100+	1	\$71,395	4	\$280,232	5	\$351,627
<b>Total</b>	<b>139</b>	<b>\$7,268,426</b>	<b>136</b>	<b>\$7,050,999</b>	<b>275</b>	<b>\$14,319,425</b>

OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017

**APPENDIX B – STATEMENT OF ACTUARIAL ASSUMPTIONS AND METHODS**

The assumptions and methods used in the actuarial valuation as of July 1, 2017 are:

**Actuarial Method**

The Entry Age Normal Actuarial Cost Method is used. Under this method, the Plan's Actuarial Liability (AL) is determined as the Present Value of Future Benefits (PVFB) less the Present Value of Future Normal Costs (PVFNC). Since all of the Plan's members are retired, the AL and the PVFB are the same.

The excess of the AL over the Actuarial Value of Assets (AVA) is the Unfunded Actuarial Liability (UAL). In accordance with the Plan's funding agreement with the City of Oakland, the UAL must be amortized by July 1, 2026, with contributions resuming in the 2017-2018 fiscal year. The projected fiscal year 2018-2019 contribution has been calculated using level percent of pay amortization, based on total projected City payroll for all Safety employees.

**Actuarial Value of Plan Assets**

In determining the recommended employer contribution to the PFRS, we use a smoothed actuarial value of assets. The asset smoothing method dampens the volatility in asset values that could occur because of the fluctuations in market conditions. Use of an asset smoothing method is consistent with the long-term nature of the actuarial valuation process. Assets are assumed to be used exclusively for the provision of retirement benefits and expenses.

The actuarial value of assets is equal to 100% of the *expected actuarial value of assets* plus 20% of the difference between the current market value of assets and the expected actuarial value of assets. In no event will the actuarial value of assets ever be less than 90% of the market value of assets or greater than 110% of the market value of assets.

The expected actuarial value of assets is equal to the prior year's actuarial value of assets increased with actual contributions made, decreased with actual disbursements made, all items (prior assets, contributions, and disbursements) further adjusted with expected investment returns for the year.

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**APPENDIX B – STATEMENT OF ACTUARIAL ASSUMPTIONS AND METHODS**

**Actuarial Assumptions**

The assumptions used in this report reflect the results of an Experience Study performed by Cheiron covering the period from July 1, 2014 through June 30, 2017 and adopted by the Board. More details on the rationale for the demographic and economic assumptions can be found in the Experience Analysis presented to the Board on February 28, 2018.

**1. Rate of Return**

The expected annual rates of return, net of investment expenses, on all Plan assets are shown in the table below. The equivalent single discount rate for these returns using the Plan's expected projected benefit payments is 5.53%.

<b>Benefit Payment Year</b>	<b>Expected Return</b>
2017-2026	6.000%
2027	5.725%
2028	5.450%
2029	5.175%
2030	4.900%
2031	4.625%
2032	4.350%
2033	4.075%
2034	3.800%
2035	3.525%
2036+	3.250%

**2. Inflation**

The assumed rate of general inflation is 2.75% (entire US) and local inflation is 2.85% (Bay Area). The general inflation rate is used in the determination of the investment return assumptions. The local inflation rate is used in the determination of the growth in expenses and salaries (which determine the COLA increases).

**3. Administrative Expenses**

Annual administrative expenses are assumed to be \$979,164, growing at 2.85% per year.

**4. Cost-of-Living Adjustments and Long-Term Salary Increases**

Cost-of-living adjustments are based on salary increases for a retiree's rank at retirement.

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**APPENDIX B – STATEMENT OF ACTUARIAL ASSUMPTIONS AND METHODS**

The long-term rate of salary increase is assumed to be 3.25% (2.85% inflation plus 0.4% productivity). The following schedule shows salary increases based on the current Police and Fire contracts, which expire on June 30, 2019 and October 31, 2017, respectively. All increases shown after those dates are assumptions.

<b>Post-Retirement Benefit Increases (Based on Salary Increases for Rank at Retirement)</b>		
<b>Date of Increase</b>	<b>Police</b>	<b>Fire</b>
January 1, 2018	2.50% & 1.00%	n/a
July 1, 2018	2.00%	3.25%
January 1, 2019	2.50%	n/a
Annual Increases		
Starting	3.25%	3.25%
July 1, 2019		

**5. Rates of Termination**

None

**6. Rates of Disability**

None

**7. Rates of Retirement**

None

**8. Rates of Mortality for Healthy Lives**

CalPERS Healthy Annuitant Table from the 2012-2015 Experience Study, excluding the 15-year projection using 90% of Scale MP-2016.

**9. Rates of Mortality for Disabled Retirees**

CalPERS Industrial Disability Mortality Table from the 2012-2015 Experience Study, excluding the 15-year projection using 90% of Scale MP-2016.

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**APPENDIX B – STATEMENT OF ACTUARIAL ASSUMPTIONS AND METHODS**

**10. Mortality Improvement**

The mortality tables are projected to improve with MP-2017 generational mortality improvement tables, with improvements projected from a base year of 2014 (the mid-point of the CalPERS base tables).

**11. Survivor Continuance**

30% of disabled retirees' deaths are assumed to be related to injuries arising out of the performance of duty, entitling the surviving spouse to a 100% continuance.

**12. Changes in Assumptions Since the Last Valuation**

The mortality rates, mortality improvement projection scales and expected annual rate of return on investments have changed based on the June 30, 2017 experience study.

OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017

APPENDIX C – SUMMARY OF PLAN PROVISIONS

**1. Plan Year**

July 1 to June 30.

**2. Membership**

The Plan has been closed to new members since June 30, 1976.

**3. Salary**

Retirement allowances are based on the pensionable compensation attached to the average rank held during the three years immediately preceding retirement.

**4. Employee Contributions**

There are no active employees in the Plan, and thus no employee contributions.

**5. Service Retirement**

Eligibility

25 years of service, or 20 years of service and age 55, or age 65. A reduced early retirement is available with 20 years of service.

Benefit Amount

50% of Salary plus 1.67% for each additional year of service beyond that required for service retirement eligibility, to a maximum of 10 years. For retirements with less than 20 years of service, benefits are pro-rated.

**6. Duty-Related Disability Retirement**

Equivalent to service retirement benefit if 25 or more years of service.

**7. Non-Duty Related Disability Retirement**

Equivalent to service retirement benefit if age 55 is attained.

**8. Post-Retirement Death Benefit**

For retirees without a spouse at death, a \$1,000 lump sum is paid to designated beneficiary.

**9. Cost-of-Living Adjustments**

Benefit increases are based on increases in salary for rank at retirement (see above definition of Salary).



**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**APPENDIX C – SUMMARY OF PLAN PROVISIONS**

**10. Benefit Forms**

Benefit is paid for the lifetime of the member. For non-duty related deaths after retirement, a 66-2/3% continuance is paid for the lifetime of the spouse. If the death is duty-related, a continuance of 100% is paid.

**11. Changes in Plan Provisions Since the Last Valuation**

None

OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017

APPENDIX D – GLOSSARY

**1. Actuarial Assumptions**

Assumptions as to the occurrence of future events affecting pension costs such as mortality, withdrawal, disability, retirement, changes in compensation, and rates of investment return.

**2. Actuarial Cost Method**

A procedure for determining the Actuarial Present Value of pension plan benefits and expenses and for developing an allocation of such value to each year of service, usually in the form of a Normal Cost and an Actuarial Liability.

**3. Actuarial Gain (Loss)**

The difference between actual experience and that expected based upon a set of Actuarial Assumptions during the period between two Actuarial Valuation dates, as determined in accordance with a particular Actuarial Cost Method.

**4. Actuarial Liability**

The portion of the Actuarial Present Value of Projected Benefits which will not be paid by future Normal Costs. It represents the value of the past Normal Costs with interest to the valuation date.

**5. Actuarial Present Value (Present Value)**

The value as of a given date of a future amount or series of payments. The Actuarial Present Value discounts the payments to the given date at the assumed investment return and includes the probability of the payment being made.

**6. Actuarial Valuation**

The determination, as of a specified date, of the Normal Cost, Actuarial Liability, Actuarial Value of Assets, and related Actuarial Present Values for a pension plan.

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2017**

**APPENDIX D – GLOSSARY**

**7. Actuarial Value of Assets**

The value of cash, investments, and other property belonging to a pension plan as used by the actuary for the purpose of an Actuarial Valuation. The purpose of an Actuarial Value of Assets is to smooth out fluctuations in market values.

**8. Actuarially Equivalent**

Of equal Actuarial Present Value, determined as of a given date, with each value based on the same set of actuarial assumptions.

**9. Amortization Payment**

The portion of the pension plan contribution which is designed to pay interest and principal on the Unfunded Actuarial Liability in order to pay for that liability in a given number of years.

**10. Entry Age Normal Actuarial Cost Method**

A method under which the Actuarial Present Value of the Projected Benefits of each individual included in an Actuarial Valuation is allocated on a level basis over the earnings of the individual between entry age and assumed exit ages.

**11. Funded Ratio**

The ratio of the Actuarial Value of Assets to the Actuarial Liabilities.

**12. Normal Cost**

That portion of the Actuarial Present Value of pension plan benefits and expenses which is allocated to a valuation year by the Actuarial Cost Method.

**13. Projected Benefits**

Those pension plan benefit amounts which are expected to be paid in the future under a particular set of Actuarial Assumptions, taking into account such items as increases in future compensation and service credits.

**14. Unfunded Actuarial Liability**

The excess of the Actuarial Liability over the Actuarial Value of Assets.



*Classic Values, Innovative Advice*