



CITY OF OAKLAND

DISTRIBUTION DATE: 1-29-2021

## *MEMORANDUM*

**TO:** HONORABLE MAYOR &  
CITY COUNCIL

**FROM:** Margaret O'Brien  
Interim Director of Finance

**SUBJECT:** Oakland PFRS's Investment  
Portfolio and Actuary Valuation

**DATE:** January 26, 2021

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### **INFORMATION**

As a continued best practice and in accordance with the City of Oakland Charter, the Finance Department will publish a quarterly informational report on the performance of Oakland Police and Fire Retirement System's ("PFRS") investment portfolio to the City Council.

The Oakland Police and Fire Retirement System 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 September 30, 2020, PFRS had 759 retired members and no active members.

For the quarter ended September 30, 2020, the PFRS Investment Portfolio had a balance of \$400.1 million and generated a quarterly return of 5.2 percent, gross of fees, overperforming its policy benchmark by 0.1 percent. However, the portfolio underperformed its benchmark by -2.7 percent over the one-year period, -0.4 percent over the three-year period, and -0.2 percent over the five-year period. This is discussed in more detail in the attached Investment Quarterly report.

As of the most recent PFRS actuarial valuation dated July 1, 2020, the PFRS Funded Ratio (market value of assets divided by present value of future benefits) is 63.5 percent. The City is currently making annual required contributions to PFRS. The required contribution for fiscal year 2020/2021 is \$43.65 million. The City funds these contributions from a voter approved ad valorem tax on all property within the City of Oakland. This tax is specifically dedicated to fund PFRS pension obligations.

The attached Quarterly Investment Performance report (*Attachment A*) provided by the PFRS Investment Consultant, Meketa Investment Group (MIG) summarizes the performance of the PFRS investment portfolio for the quarter ended December 31, 2019. In addition, the Council is being provided the recently updated PFRS' Actuarial Valuation (*Attachment B*) as of July 1, 2020.

For questions regarding this report, please contact Teir Jenkins, Investment Officer, at (510) 238-6481.

Respectfully submitted,

*Margaret L. O'Brien*

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MARGARET O'BRIEN  
Interim Director of Finance

**Attachment A:** Oakland Police and Fire System Quarterly Investment Performance Report as of September 30, 2020

**Attachment B:** Oakland Police and Fire System Actuarial Valuation Report as of July 1, 2020

**ATTACHMENT A:**

**Oakland Police and Fire System Quarterly  
Investment Performance Report**

# Oakland Police and Fire Retirement System

Q3 2020

Quarterly Report

1. Total Portfolio Summary
2. World Markets Third Quarter of 2020
3. Capital Markets Outlook & Risk Metrics
  - Meketa Market Sentiment Indicator
4. Total Portfolio Review
5. Manager Monitoring / Probation List
6. Individual Manager Performance
7. Disclaimer, Glossary, and Notes

## **Total Portfolio Summary**

Total Portfolio Summary

As of September 30, 2020, the City of Oakland Police and Fire Retirement System (OPFRS) portfolio had an aggregate value of \$400.0 million. This represents a \$20.0 million increase in investment value and (\$3.0) million in benefit payments over the quarter. Year-to-date, the OPFRS Total Portfolio value is lower by (\$8.1) million, after withdrawals totaling (\$12.0) million for benefit payments.

Asset Allocation Trends

- The asset allocation targets throughout this report reflect those as of September 30, 2020. Target weightings reflect the interim phase (CRO = 10%) of the Plan’s previously approved asset allocation (effective 5/31/2017).
- Relative to policy targets, the portfolio ended the latest quarter overweight Domestic Equity, Covered Calls and Cash, while underweight Crisis Risk Offset. All asset classes were, however, within acceptable ranges from their policy targets.

Recent Investment Performance

- During the most recent quarter, the OPFRS Total Portfolio generated an absolute return of +5.2%, gross of fees, underperforming its policy benchmark by 10 basis points. The portfolio underperformed its benchmark by (2.7%) and (0.4%) over the 1- and 3-year periods, respectively, and underperformed by (20) basis points over the 5-year period.
- The Total Portfolio outperformed the Median fund’s return over the most recent quarter by 0.1% but underperformed the Median fund over the 1-year period by (2.3%). The Total Portfolio matched the median fund over the 3-year periods while outperforming the median fund by 0.8% over the 5-year period. Performance differences with respect to the Median Fund continue to be attributed largely to differences in asset allocation.

	Quarter	Fiscal Year	1 Year	3 Year	5 Year
Total Portfolio <sup>1</sup>	5.2	5.2	5.7	6.6	9.0
Policy Benchmark <sup>2</sup>	5.1	5.1	8.4	7.0	9.2
<b>Excess Return</b>	<b>0.1</b>	<b>0.1</b>	<b>-2.7</b>	<b>-0.4</b>	<b>-0.2</b>
Reference: Median Fund <sup>3</sup>	5.0	5.0	7.7	6.3	8.2
Reference: Total Net of Fees <sup>4</sup>	5.1	5.1	5.4	6.3	8.7

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

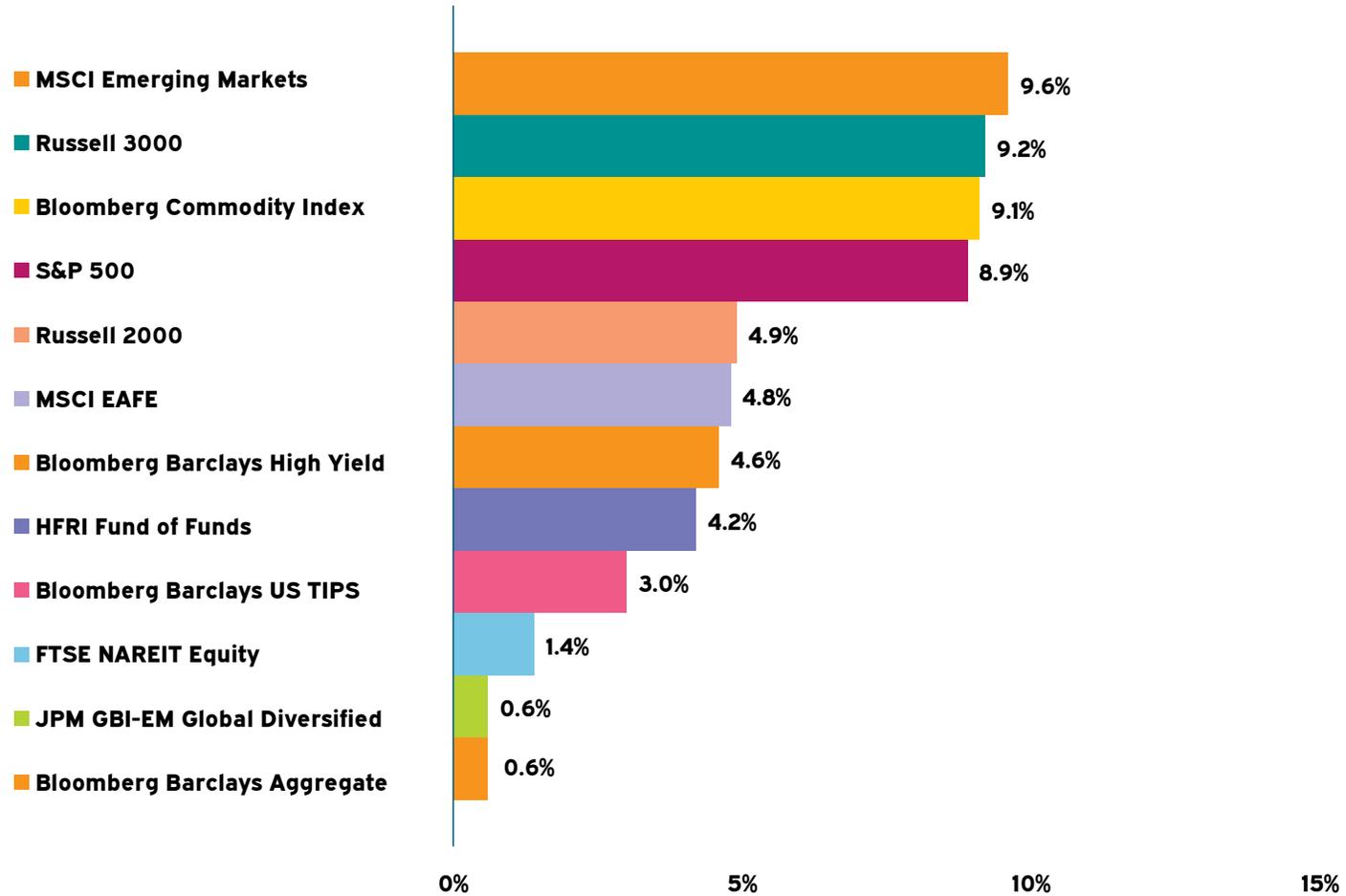
<sup>2</sup> Evolving Policy Benchmark consists of 40% Russell 3000, 12% MSCI ACWI ex U.S., 33% Bbg BC Universal, 5% CBOE BXM , 6.7% SG Multi Asset Risk Premia, 3.3% Bbg BC Long Treasury.

<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).

# **The World Markets Third Quarter of 2020**

### The World Markets<sup>1</sup> Third Quarter of 2020



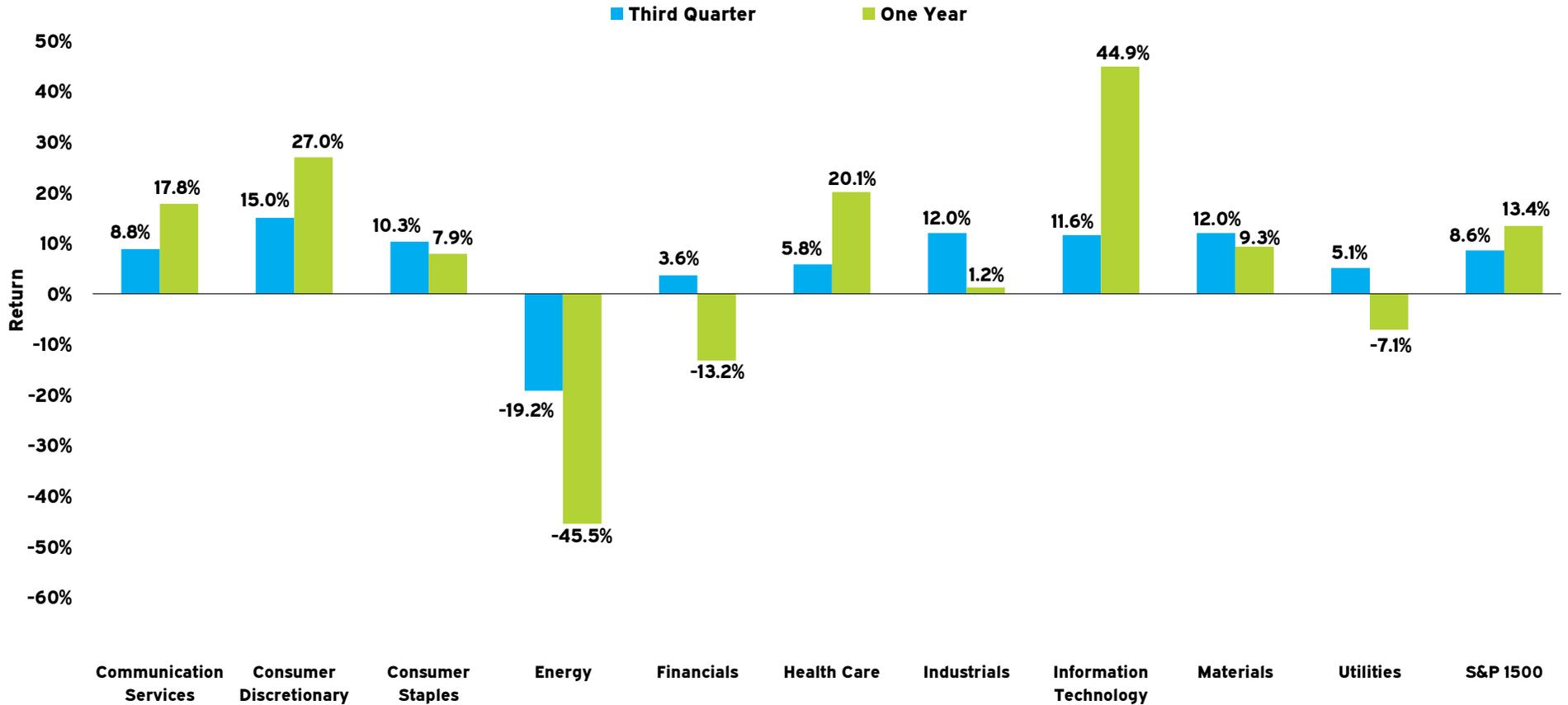
<sup>1</sup> Source: InvestorForce.

Index Returns<sup>1</sup>

	3Q20 (%)	YTD (%)	1 YR (%)	3 YR (%)	5 YR (%)	10 YR (%)
<b>Domestic Equity</b>						
S&P 500	8.9	5.6	15.1	12.3	14.1	13.7
Russell 3000	9.2	5.4	15.0	11.6	13.7	13.5
Russell 1000	9.5	6.4	16.0	12.4	14.1	13.8
Russell 1000 Growth	13.2	24.3	37.5	21.7	20.1	17.3
Russell 1000 Value	5.6	-11.6	-5.0	2.6	7.7	9.9
Russell MidCap	7.5	-2.3	4.6	7.1	10.1	11.8
Russell MidCap Growth	9.4	13.9	23.2	16.2	15.5	14.6
Russell MidCap Value	6.4	-12.8	-7.3	0.8	6.4	9.7
Russell 2000	4.9	-8.7	0.4	1.8	8.0	9.9
Russell 2000 Growth	7.2	3.9	15.7	8.2	11.4	12.3
Russell 2000 Value	2.6	-21.5	-14.9	-5.1	4.1	7.1
<b>Foreign Equity</b>						
MSCI ACWI (ex. US)	6.3	-5.4	3.0	1.2	6.2	4.0
MSCI EAFE	4.8	-7.1	0.5	0.6	5.3	4.6
MSCI EAFE (Local Currency)	1.2	-9.4	-4.7	0.6	4.8	6.3
MSCI EAFE Small Cap	10.3	-4.2	6.8	1.4	7.4	7.3
MSCI Emerging Markets	9.6	-1.2	10.5	2.4	9.0	2.5
MSCI Emerging Markets (Local Currency)	8.6	2.7	12.5	4.8	9.6	5.6
<b>Fixed Income</b>						
Bloomberg Barclays Universal	1.0	6.2	6.7	5.1	4.5	3.9
Bloomberg Barclays Aggregate	0.6	6.8	7.0	5.2	4.2	3.6
Bloomberg Barclays US TIPS	3.0	9.2	10.1	5.8	4.6	3.6
Bloomberg Barclays High Yield	4.6	0.6	3.3	4.2	6.8	6.5
JPM GBI-EM Global Diversified	0.6	-6.3	-1.4	0.2	4.8	0.5
<b>Other</b>						
FTSE NAREIT Equity	1.4	-17.5	-18.2	0.2	3.9	7.9
Bloomberg Commodity Index	9.1	-12.1	-8.2	-4.2	-3.1	-6.0
HFRI Fund of Funds	4.2	2.5	5.6	2.9	3.1	2.9

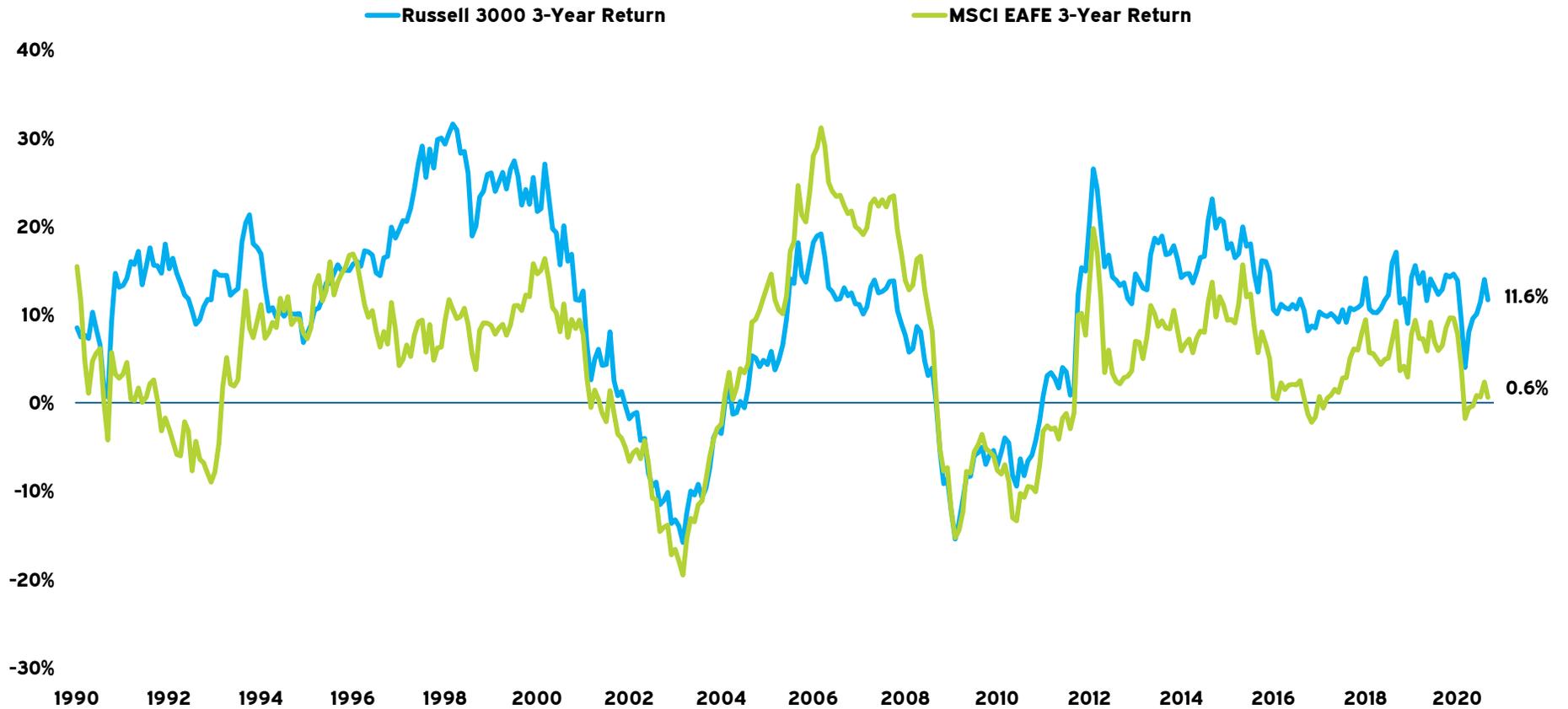
<sup>1</sup> Source: InvestorForce.

### S&P Sector Returns<sup>1</sup>



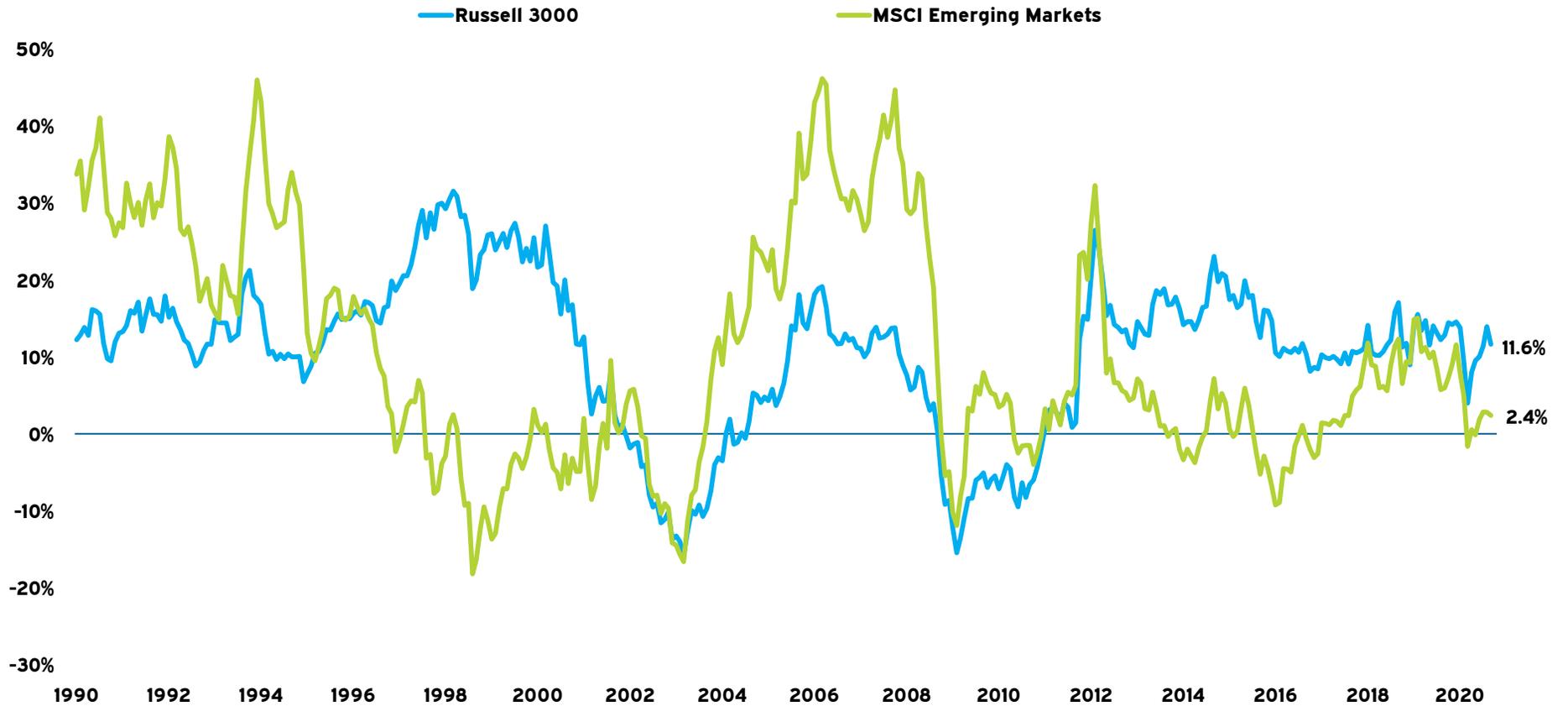
<sup>1</sup> Source: InvestorForce. Represents S&P 1500 (All Cap) data.

US and Developed Market Foreign Equity Rolling Three-Year Returns<sup>1</sup>



<sup>1</sup> Source: InvestorForce.

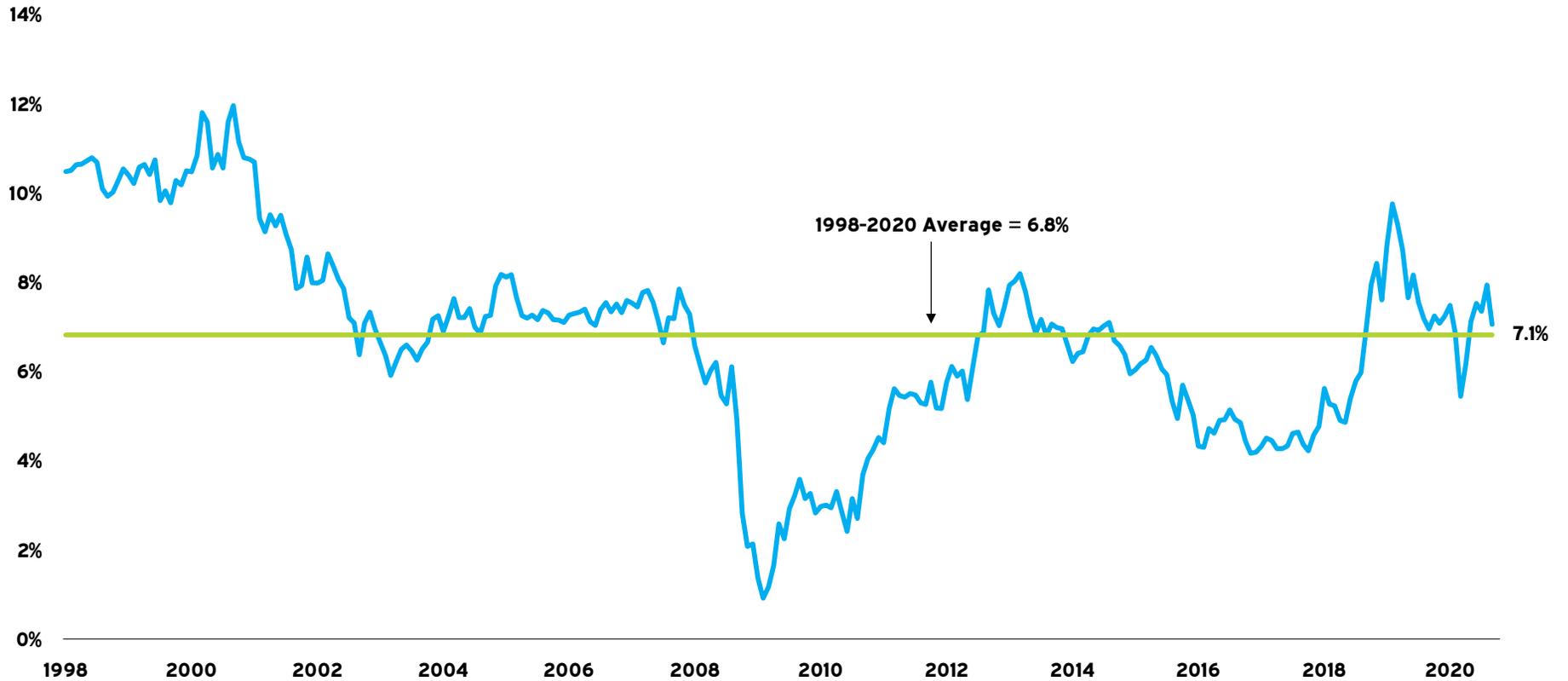
US and Emerging Market Equity Rolling Three-Year Returns<sup>1</sup>



<sup>1</sup> Source: InvestorForce.

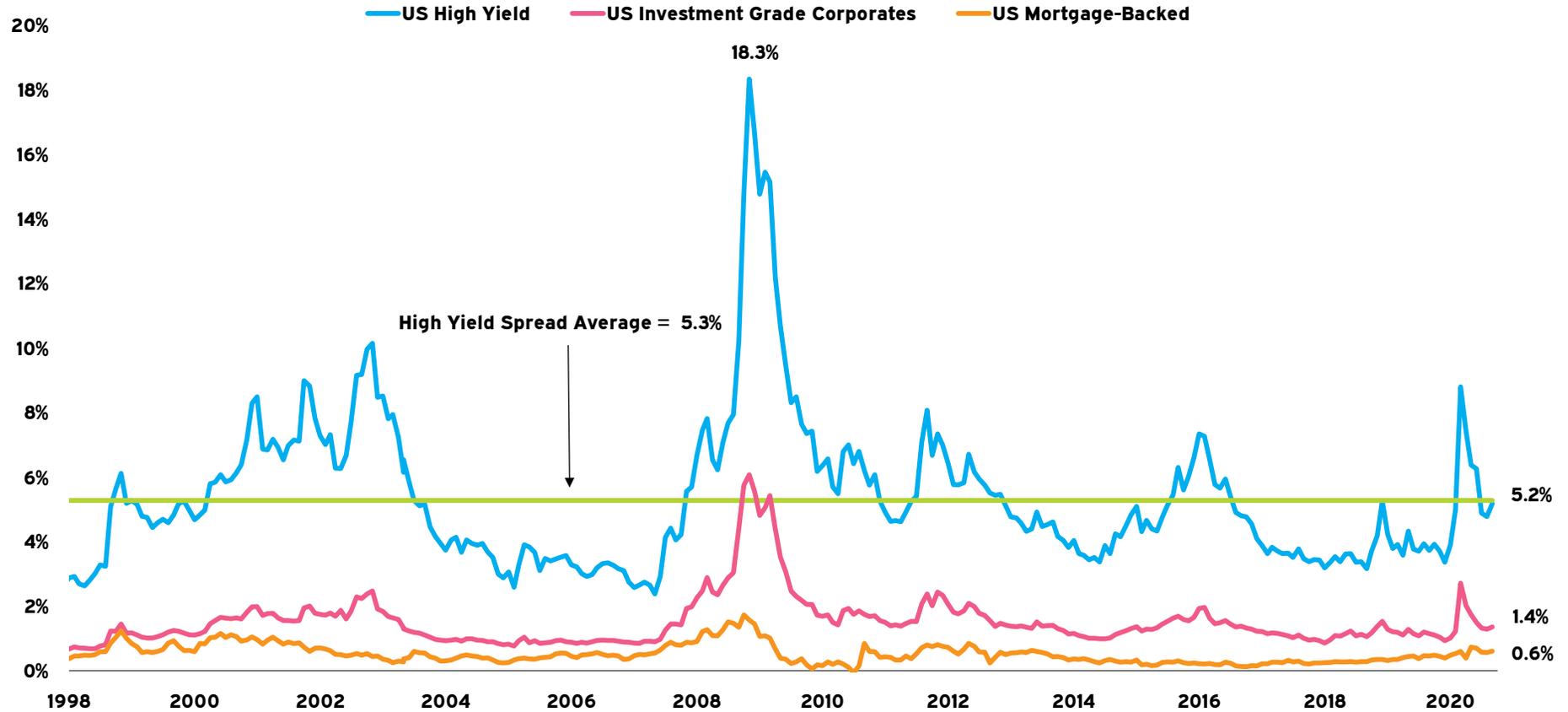
Rolling Ten-Year Returns: 65% Stocks and 35% Bonds<sup>1</sup>

— 65% Stocks (MSCI ACWI) / 35% Bonds (Bloomberg Barclays Aggregate) 10-Year Rolling Return



<sup>1</sup> Source: InvestorForce.

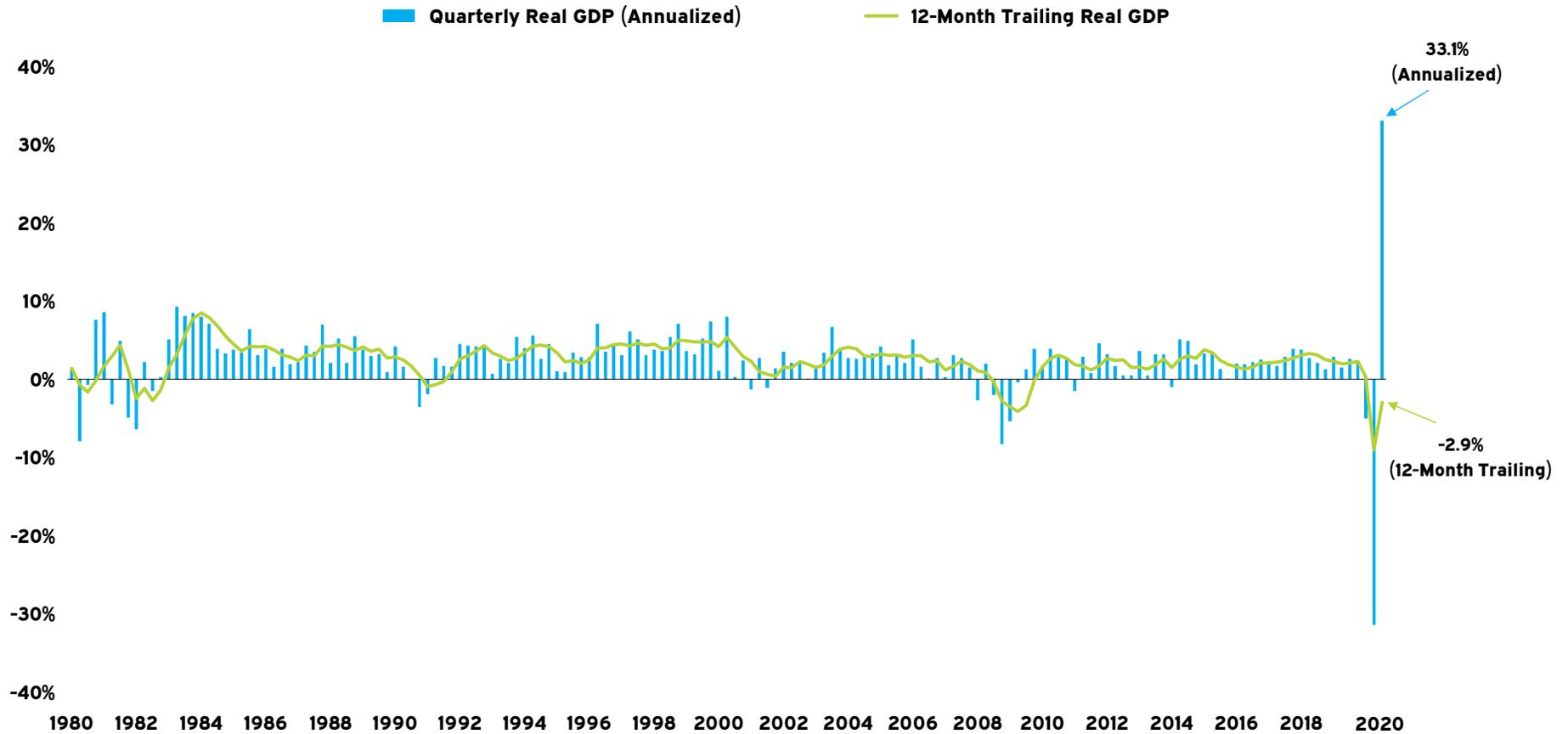
Credit Spreads vs. US Treasury Bonds<sup>1,2</sup>



<sup>1</sup> Source: Barclays Live. Data represents the OAS.

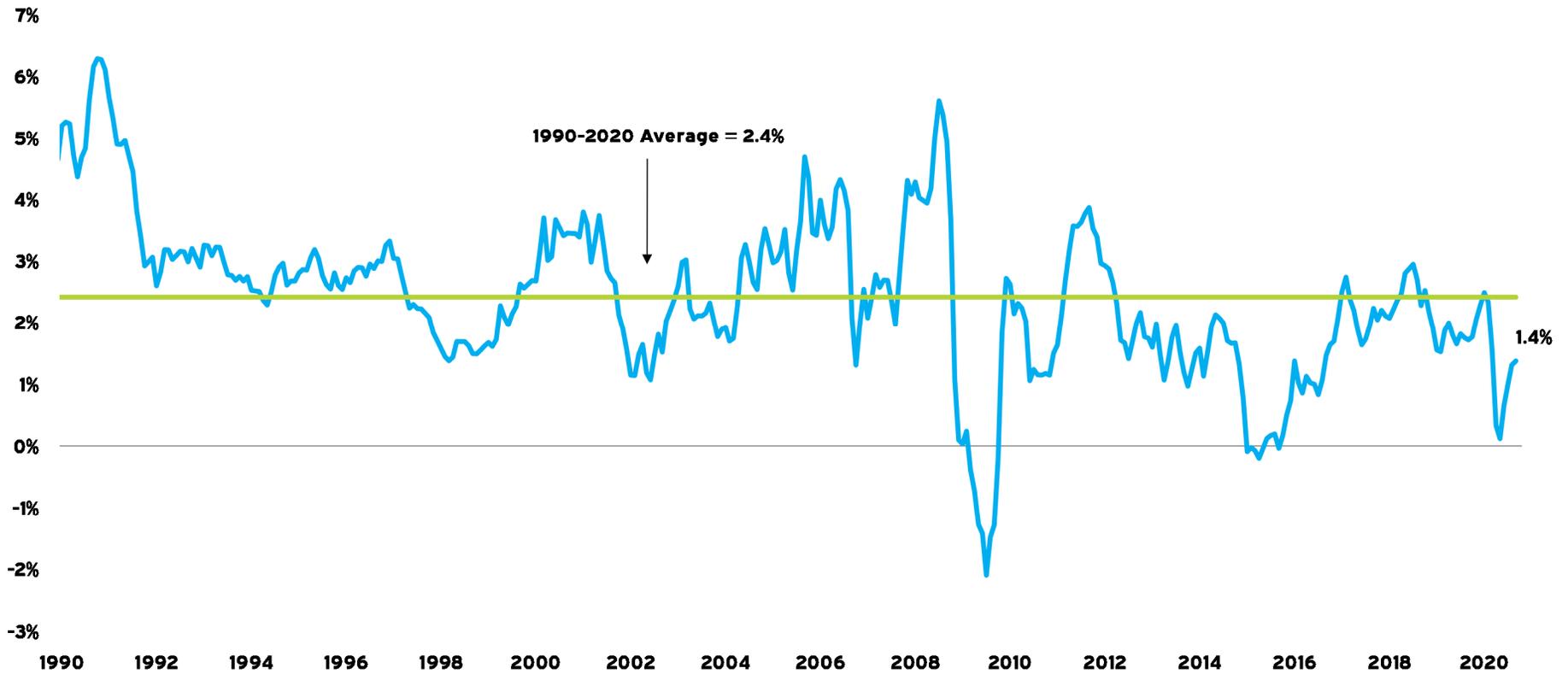
<sup>2</sup> The median high yield spread was 4.8% from 1997-2020.

US Real Gross Domestic Product (GDP) Growth<sup>1</sup>



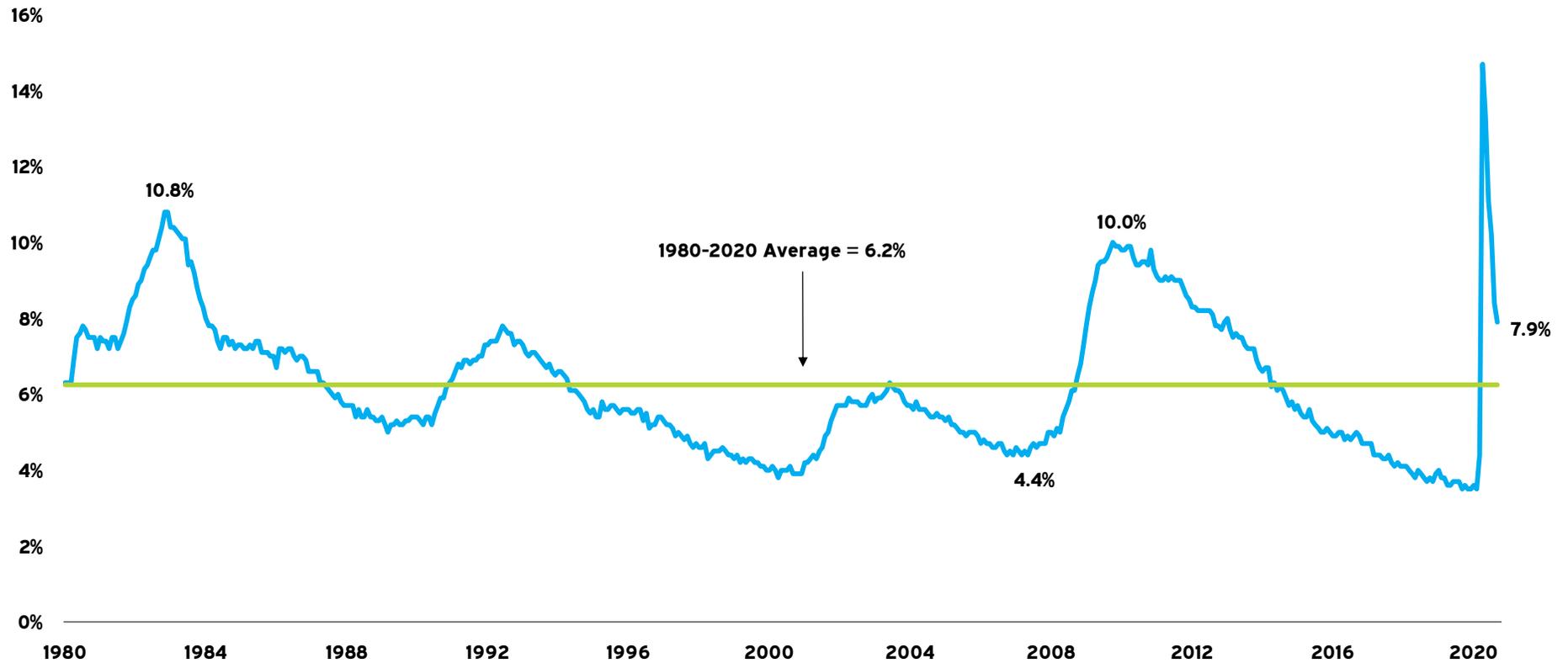
<sup>1</sup> Source: Bureau of Economic Analysis. Data is as of Q3 2020 and represents the first estimate.

US Inflation (CPI)  
Trailing Twelve Months<sup>1</sup>



<sup>1</sup> Source: Bureau of Labor Statistics. Data is non-seasonally adjusted CPI, which may be volatile in the short-term. Data is as of September 30, 2020.

US Unemployment<sup>1</sup>



<sup>1</sup> Source: Bureau of Labor Statistics. Data is as of September 30, 2020.

**Capital Markets Outlook & Risk Metrics**  
As of October 31, 2020

## Capital Markets Outlook

### Takeaways

- October saw a modest reversal from the primary themes of Q2 and Q3. In particular, global equity markets generally produced flat-to-negative returns, although small cap and value stocks regained some ground relative to their counterparts. Additionally, longer-term interest rates in the US ticked up slightly, resulting in negative returns for most safe haven assets (e.g., US Treasury bonds).
- Risk-oriented markets have rebounded significantly since the March lows, although October represented a pause to the recovery. Despite some catch-up in October, there continues to be a high degree of divergence among equity regions/styles/capitalizations, and this is exemplified at the extremes with US large cap growth stocks outperforming US small cap value stocks by nearly 40% thus far in 2020.
- While the shorter portions of the US Treasury curve were stable during October, yields rose by 10-20 basis points for US Treasuries greater than 5 years in maturity. Although this movement is not significant in an absolute sense, at current interest rate levels such a move does modestly impact bond prices.
- Real yields in the US ticked up during October, with the most significant movements occurring at the longer end of the curve. The entire real yield curve does, however, remain in negative territory.
- Q3 GDP and other economic data indicate that an economic recovery was well underway. However, recent increases in COVID-related cases/deaths, as well as newly announced shutdowns in Europe and other regions, represent a new headwind to the recovery.

### Capital Markets Outlook

#### Takeaways

- Market activity appears to be focused on two items: 1) 2020 election results and 2) vaccine development and COVID-related shutdowns. Returning to pre-COVID levels of economic activity is not expected to occur until 2021 at the earliest.
- Implied equity market volatility<sup>1</sup> increased throughout October before ending the month at around 38. Conversely, our Systemic Risk measure decreased during the month, while implied fixed income volatility<sup>2</sup> increased.
- While valuations for several risk-based asset classes appear neutral-to-attractive at first glance, it is important to note that the full impact on corporate earnings and solvencies remains unknown. The path that the global economy will take moving forward is uncertain.
- The Market Sentiment Indicator<sup>3</sup> returned to grey (i.e., neutral) at month-end.

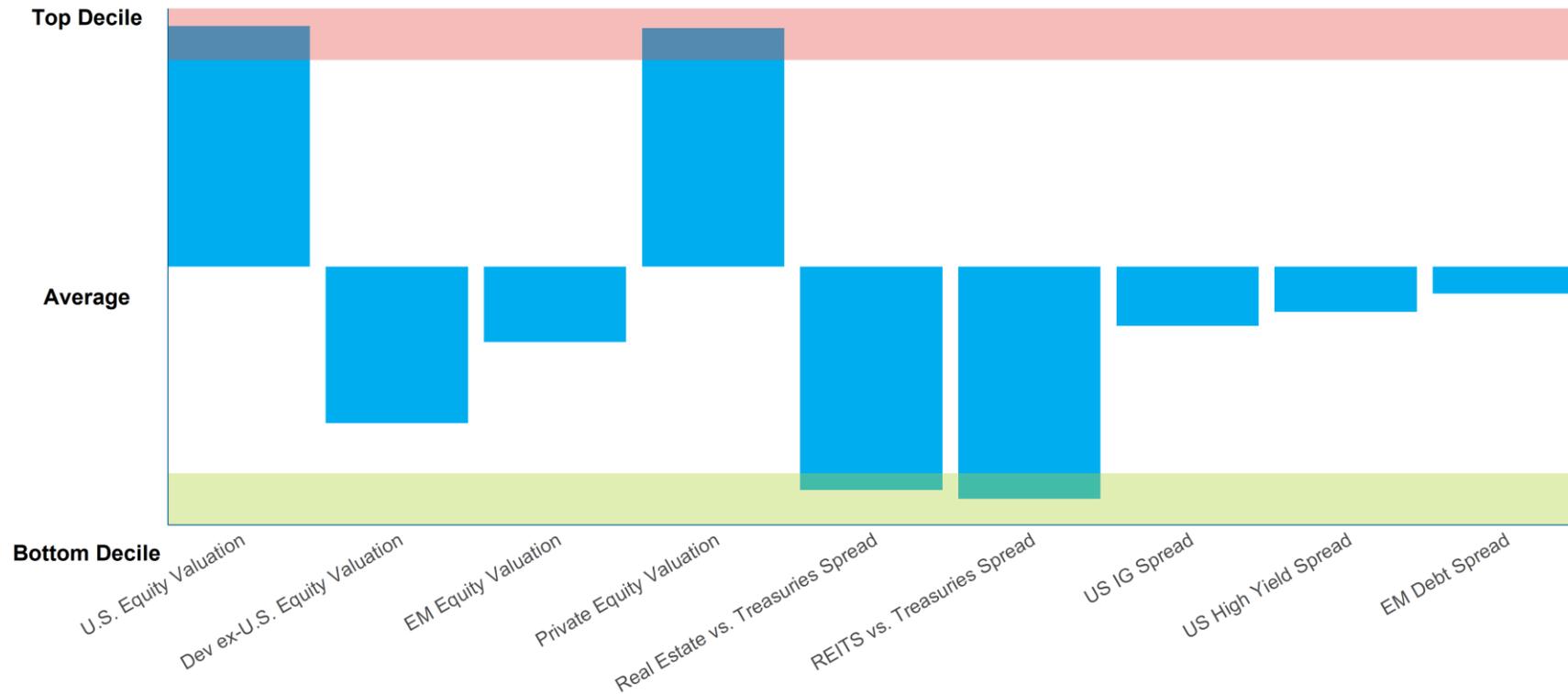
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<sup>1</sup> As measured by VIX Index.

<sup>2</sup> As measured by MOVE Index.

<sup>3</sup> See Appendix for the rationale for selection and calculation methodology used for the risk metrics.

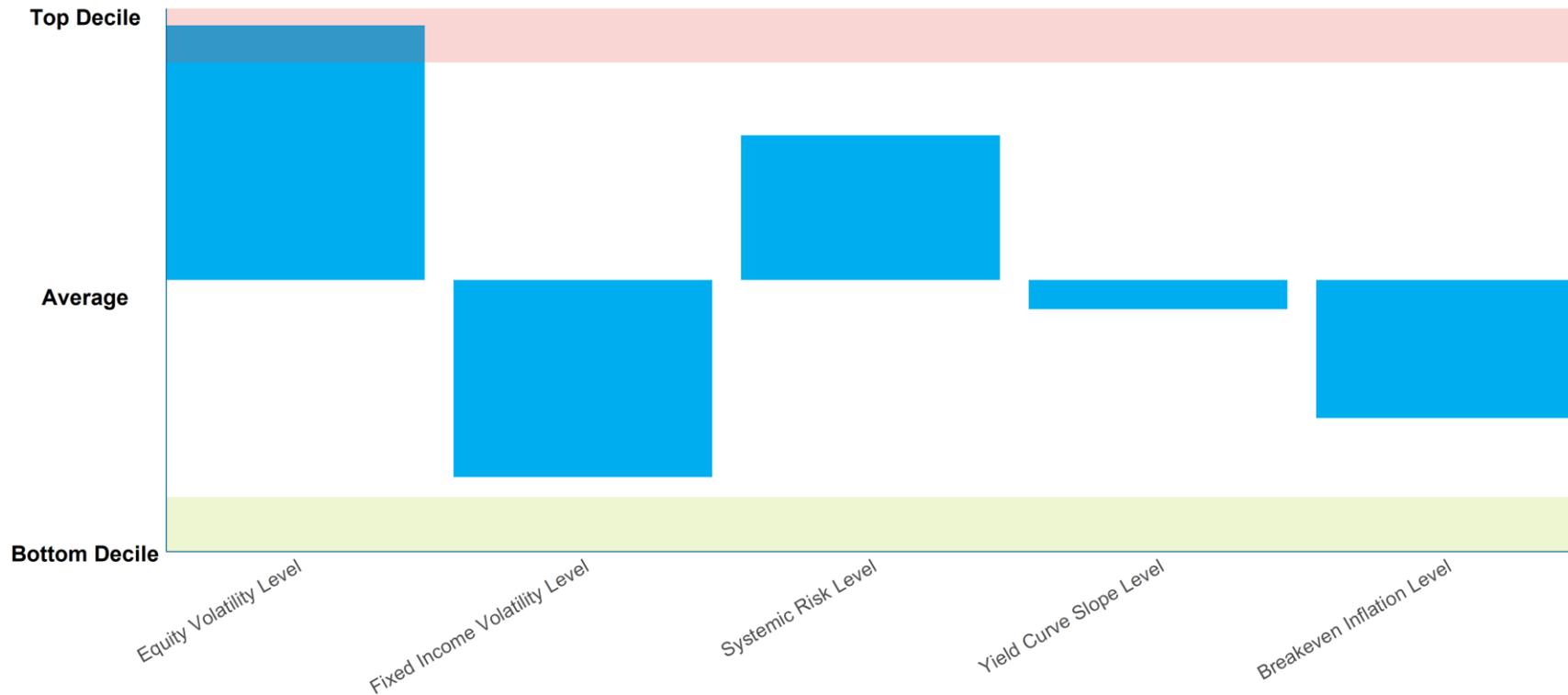
### Risk Overview/Dashboard (1) (As of October 31, 2020)<sup>1</sup>



- Dashboard (1) summarizes the current state of the different valuation metrics per asset class relative to their own history.

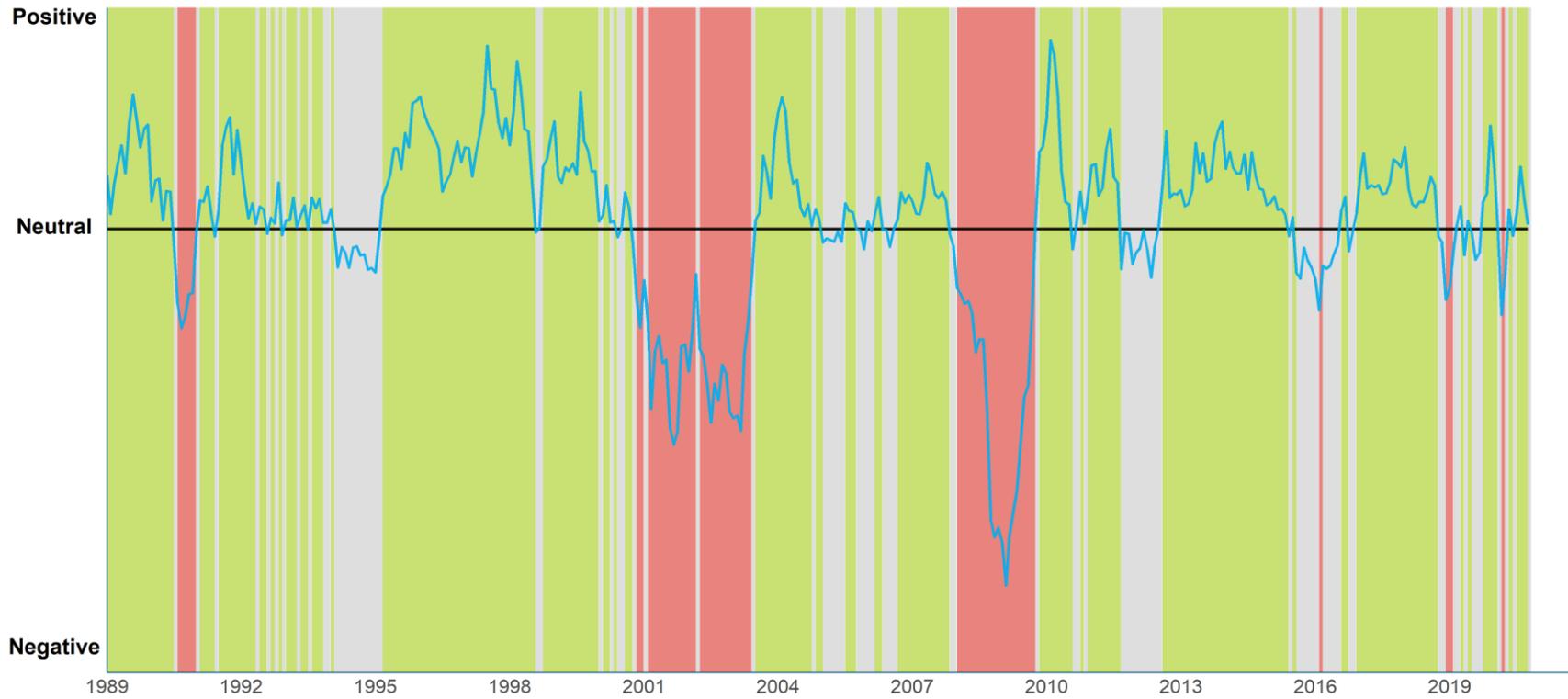
<sup>1</sup> With the exception of Private Equity Valuation, that is YTD as of December 31, 2019.

### Risk Overview/Dashboard (2) (As of October 31, 2020)

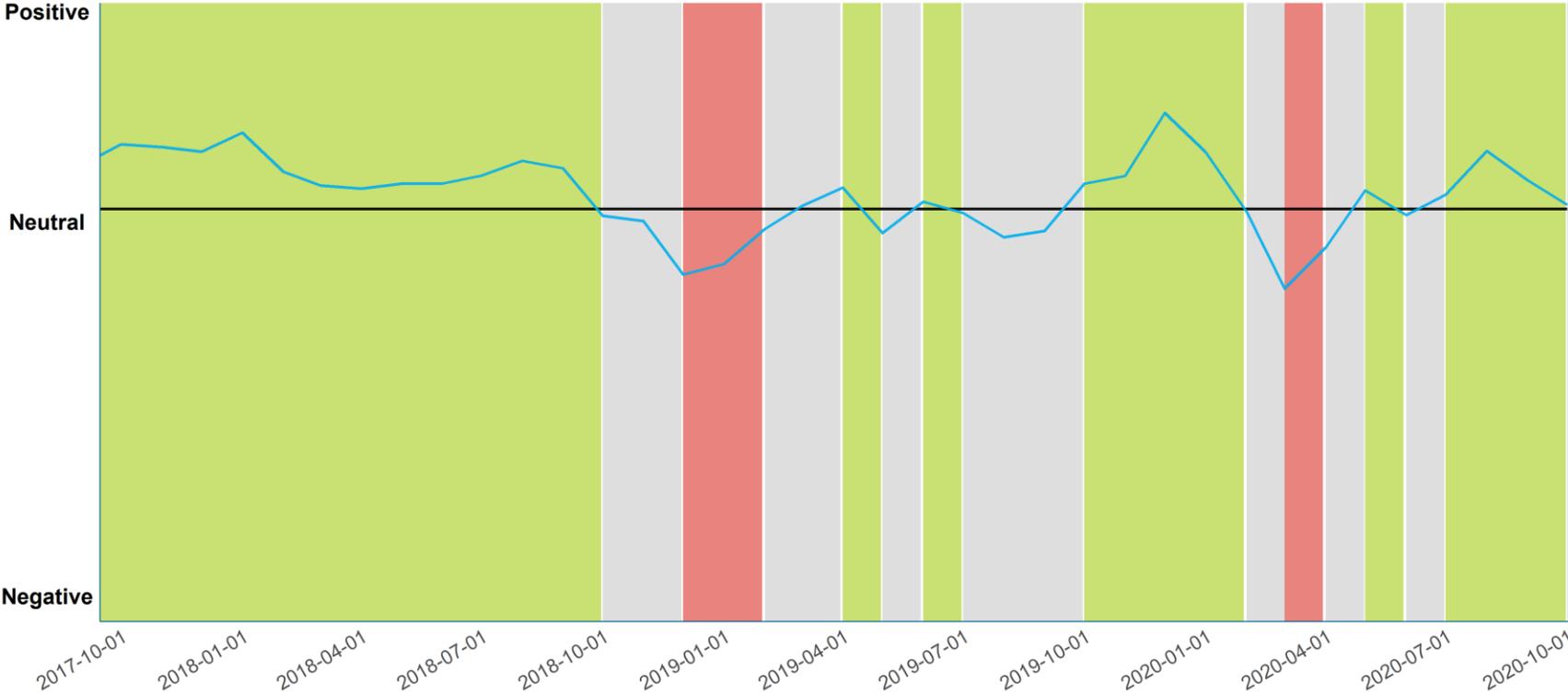


- Dashboard (2) shows how the current level of each indicator compares to its respective history.

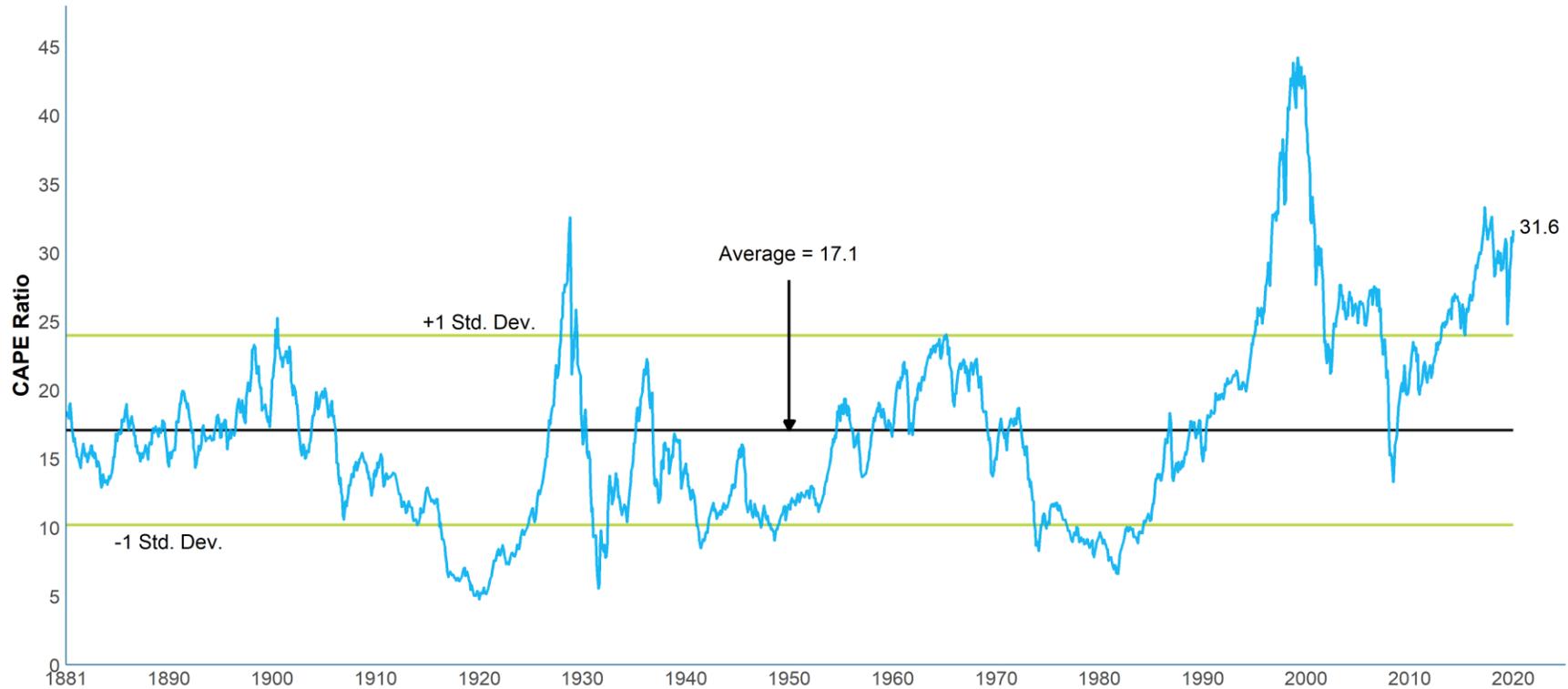
### Market Sentiment Indicator (All History) (As of October 31, 2020)



**Market Sentiment Indicator (Last Three Years)**  
(As of October 31, 2020)



### US Equity Cyclically Adjusted P/E<sup>1</sup> (As of October 31, 2020)



- This chart details one valuation metric for US equities. A higher (lower) figure indicates more expensive (cheaper) valuation relative to history.

<sup>1</sup> US Equity Cyclically Adjusted P/E on S&P 500 Index. Source: Robert Shiller, Yale University, and Meketa Investment Group.

### Small Cap P/E vs. Large Cap P/E<sup>1</sup> (As of October 31, 2020)



- This chart compares the relative attractiveness of small cap US equities vs. large cap US equities on a valuation basis. A higher (lower) figure indicates that large cap (small cap) is more attractive.

<sup>1</sup> Small Cap P/E (Russell 2000 Index) vs. Large Cap P/E (Russell 1000 Index) - Source: Russell Investments. Earnings figures represent 12-month "as reported" earnings.

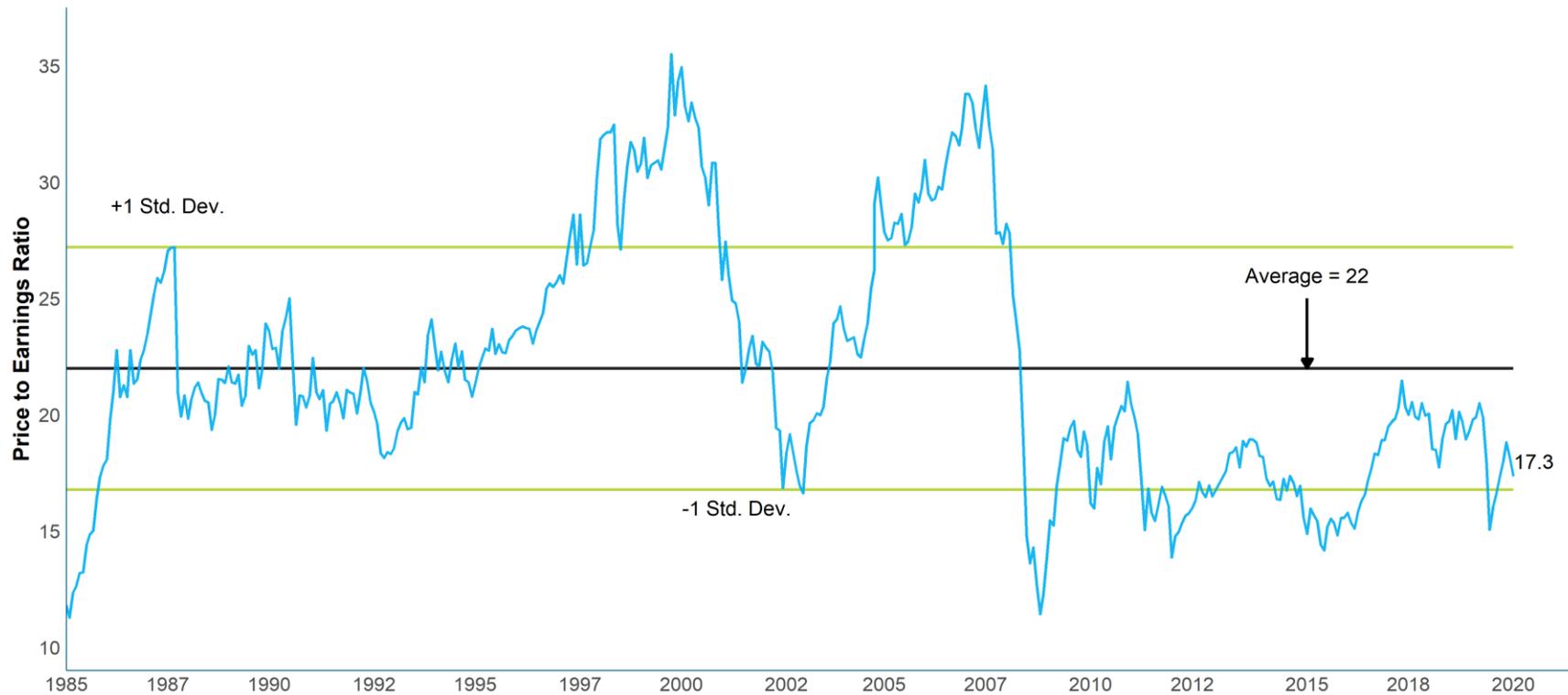
Growth P/E vs. Value P/E<sup>1</sup>  
(As of October 31, 2020)



- This chart compares the relative attractiveness of US growth equities vs. US value equities on a valuation basis. A higher (lower) figure indicates that value (growth) is more attractive.

<sup>1</sup> Growth P/E (Russell 3000 Growth Index) vs. Value (Russell 3000 Value Index) P/E - Source: Bloomberg, MSCI, and Meketa Investment Group. Earnings figures represent 12-month "as reported" earnings.

### Developed International Equity Cyclically Adjusted P/E<sup>1</sup> (As of October 31, 2020)



- This chart details one valuation metric for developed international equities. A higher (lower) figure indicates more expensive (cheaper) valuation relative to history.

<sup>1</sup> Developed International Equity (MSCI EAFE ex Japan Index) Cyclically Adjusted P/E – Source: MSCI and Bloomberg. Earnings figures represent the average of monthly “as reported” earnings over the previous ten years.

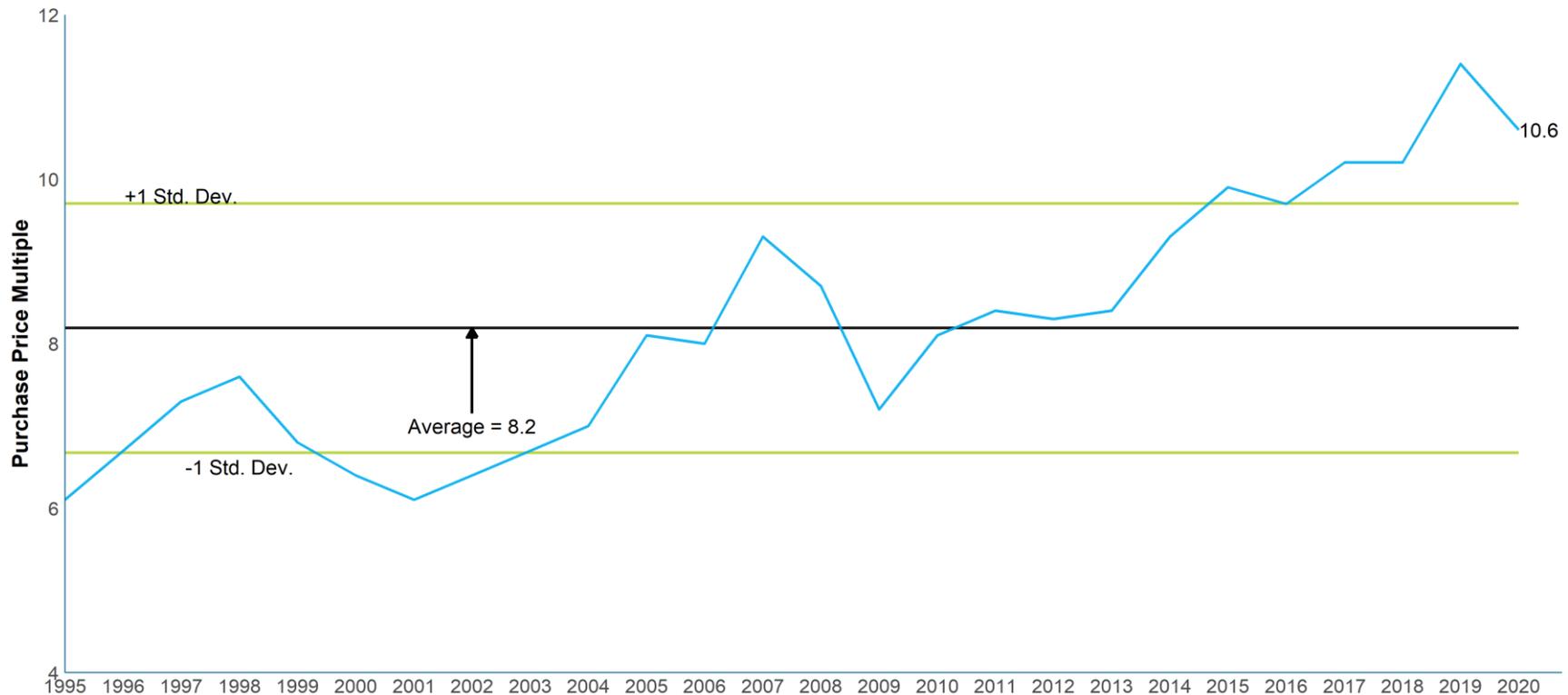
**Emerging Market Equity Cyclically Adjusted P/E<sup>1</sup>**  
 (As of October 31, 2020)



- This chart details one valuation metric for emerging markets equities. A higher (lower) figure indicates more expensive (cheaper) valuation relative to history.

<sup>1</sup> Emerging Market Equity (MSCI Emerging Markets Index) Cyclically Adjusted P/E – Source: MSCI and Bloomberg. Earnings figures represent the average of monthly “as reported” earnings over the previous ten years.

### Private Equity Multiples<sup>1</sup> (As of February 29, 2020)<sup>2</sup>

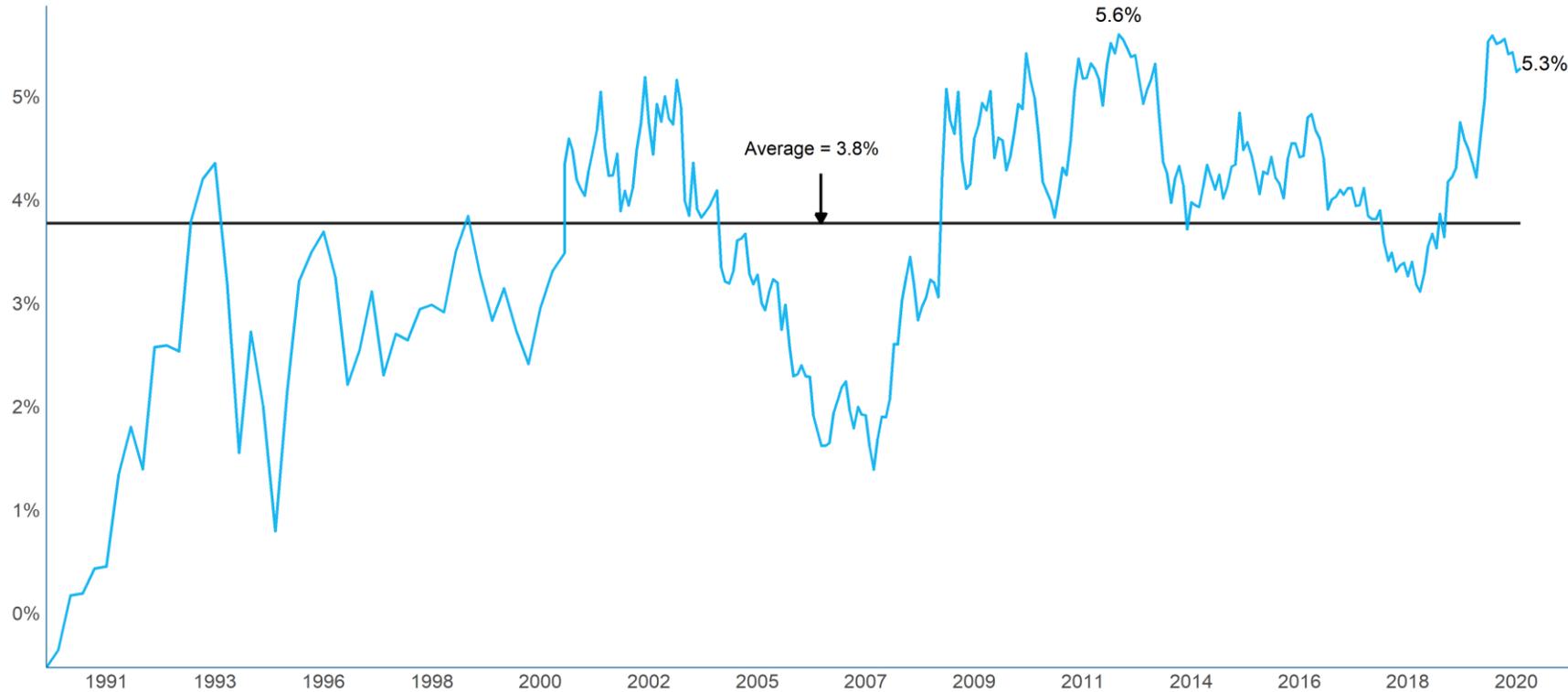


- This chart details one valuation metric for the private equity market. A higher (lower) figure indicates more expensive (cheaper) valuation relative to history.

<sup>1</sup> Private Equity Multiples – Source: S&P LCD Average EBITDA Multiples Paid in All LBOs.

<sup>2</sup> Annual figures, except for 2020 (YTD).

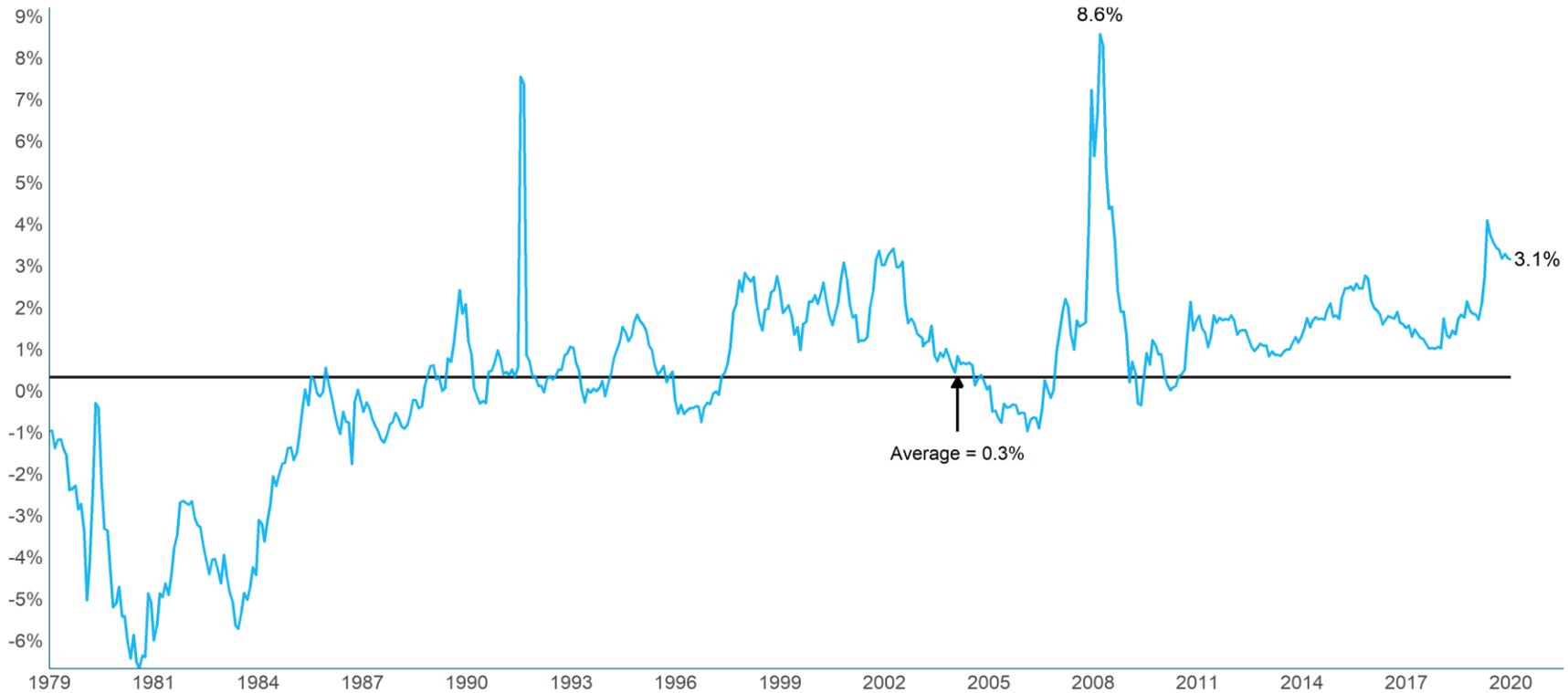
**Core Real Estate Spread vs. Ten-Year Treasury<sup>1</sup>**  
(As of October 31, 2020)



- This chart details one valuation metric for the private core real estate market. A higher (lower) figure indicates cheaper (more expensive) valuation.

<sup>1</sup> Core Real Estate Spread vs. Ten-Year Treasury – Source: Real Capital Analytics, US Treasury, Bloomberg, and Meketa Investment Group. Core Real Estate is proxied by weighted sector transaction based indices from Real Capital Analytics and Meketa Investment Group.

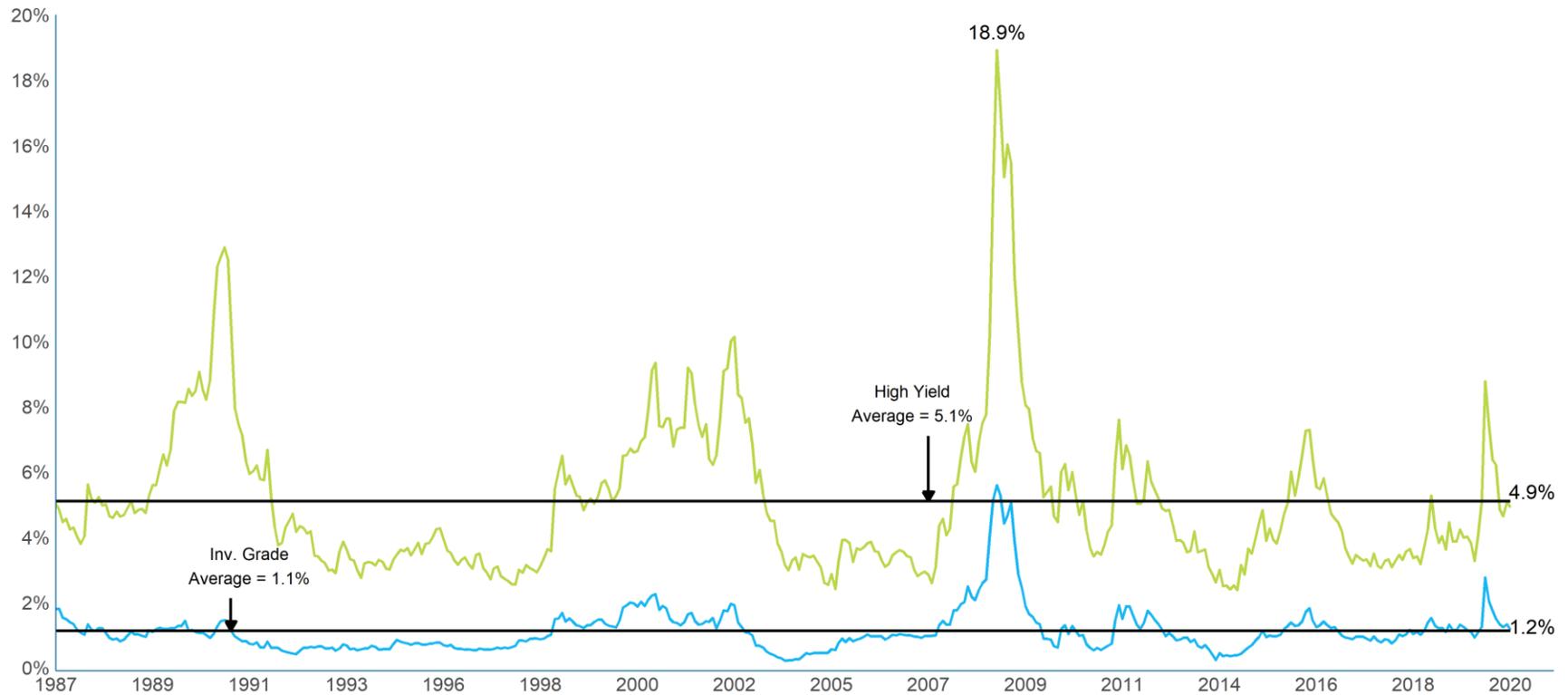
**REITs Dividend Yield Spread vs. Ten-Year Treasury<sup>1</sup>**  
 (As of October 31, 2020)



- This chart details one valuation metric for the public REITs market. A higher (lower) figure indicates cheaper (more expensive) valuation.

<sup>1</sup> REITs Dividend Yield Spread vs. Ten-Year Treasury – Source: NAREIT, US Treasury. REITs are proxied by the yield for the NAREIT Equity index.

**Credit Spreads<sup>1</sup>**  
(As of October 31, 2020)



- This chart details one valuation metric for the US credit markets. A higher (lower) figure indicates cheaper (more expensive) valuation relative to history.

<sup>1</sup> Credit Spreads – Source: Barclays Capital. High Yield is proxied by the Barclays High Yield index and Investment Grade Corporates are proxied by the Barclays US Corporate Investment Grade index. Spread is calculated as the difference between the Yield to Worst of the respective index and the 10-Year US Treasury yield.

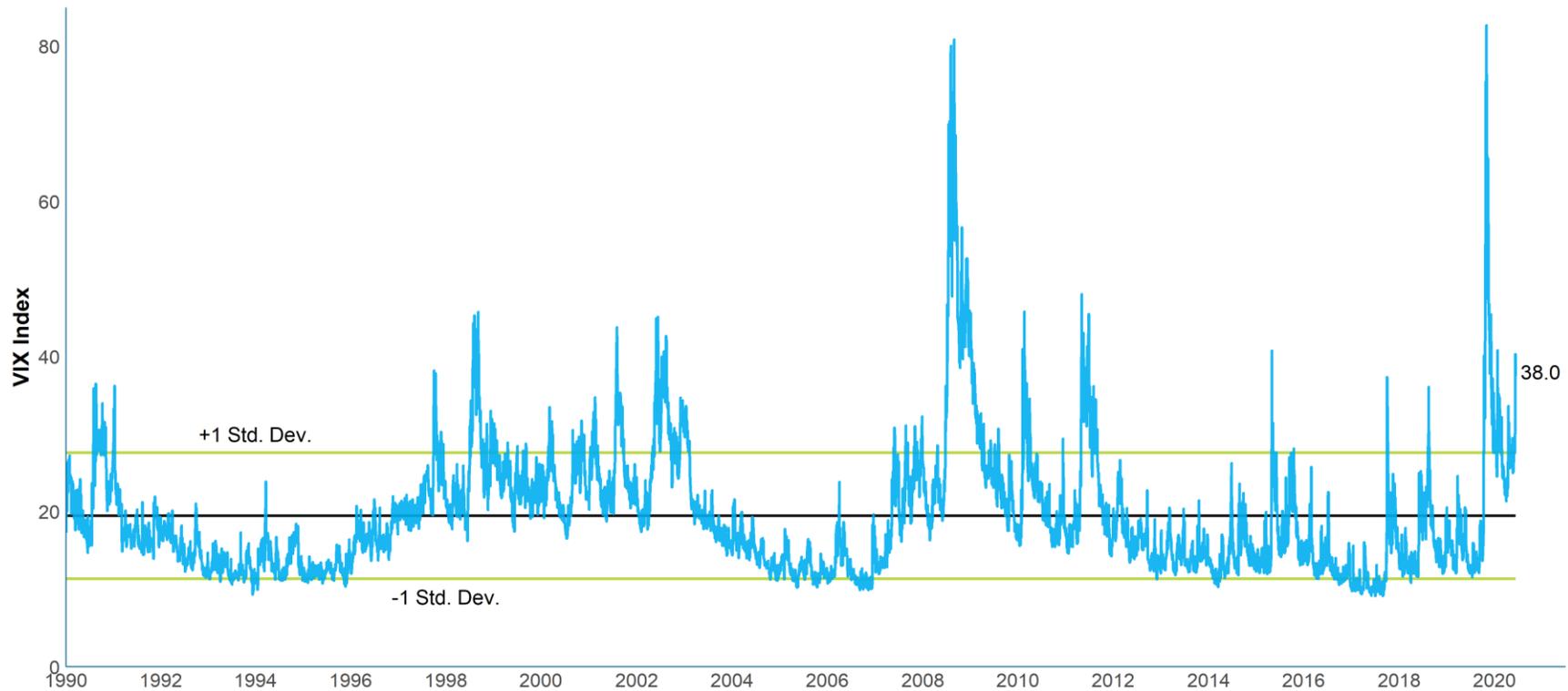
**Emerging Market Debt Spreads<sup>1</sup>**  
(As of October 31, 2020)



- This chart details one valuation metric for the EM debt markets. A higher (lower) figure indicates cheaper (more expensive) valuation relative to history.

<sup>1</sup> EM Spreads – Source: Bloomberg. Option Adjusted Spread (OAS) for the Bloomberg Barclays EM USD Aggregate Index.

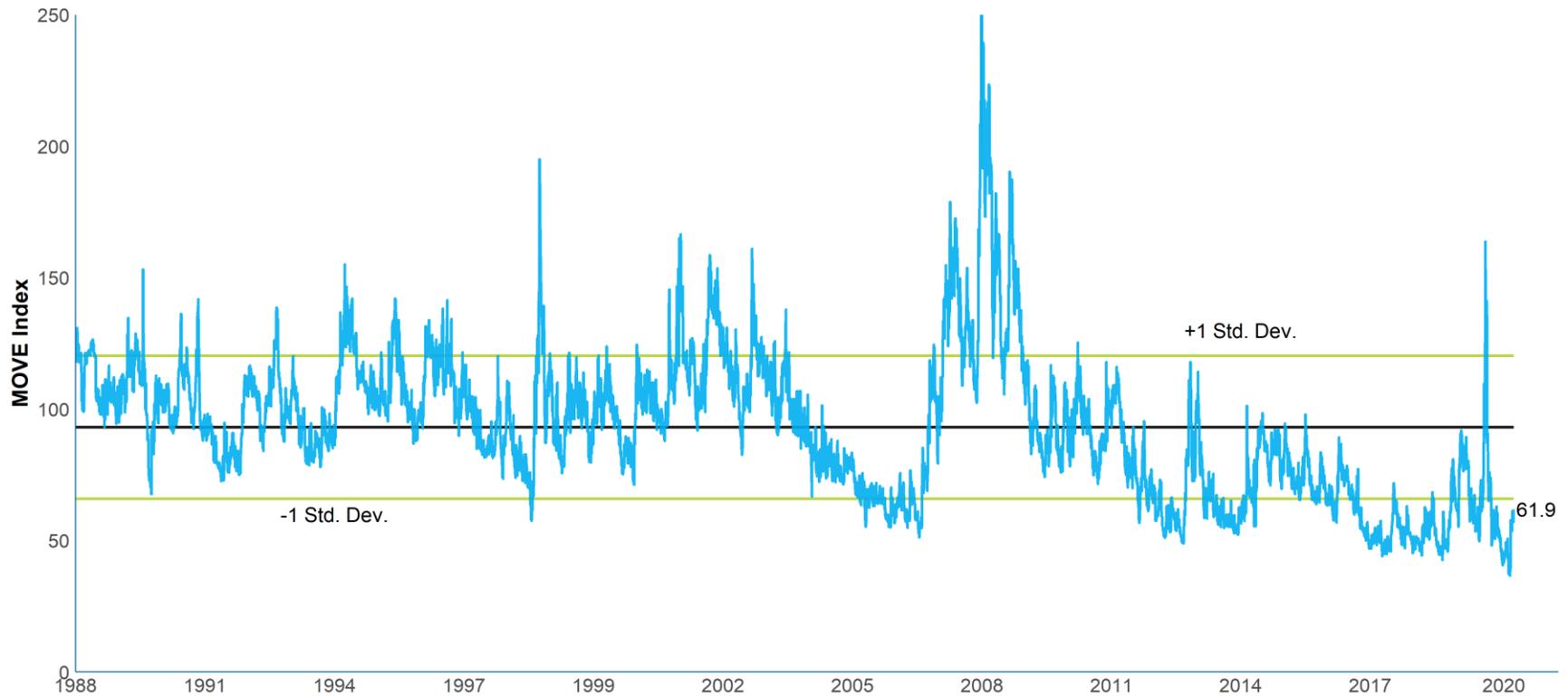
**Equity Volatility<sup>1</sup>**  
(As of October 31, 2020)



- This chart details historical implied equity market volatility. This metric tends to increase during times of stress/fear and while declining during more benign periods.

<sup>1</sup> Equity Volatility – Source: Bloomberg, and Meketa Investment Group. Equity Volatility proxied by VIX Index, a Measure of implied option volatility for US equity markets.

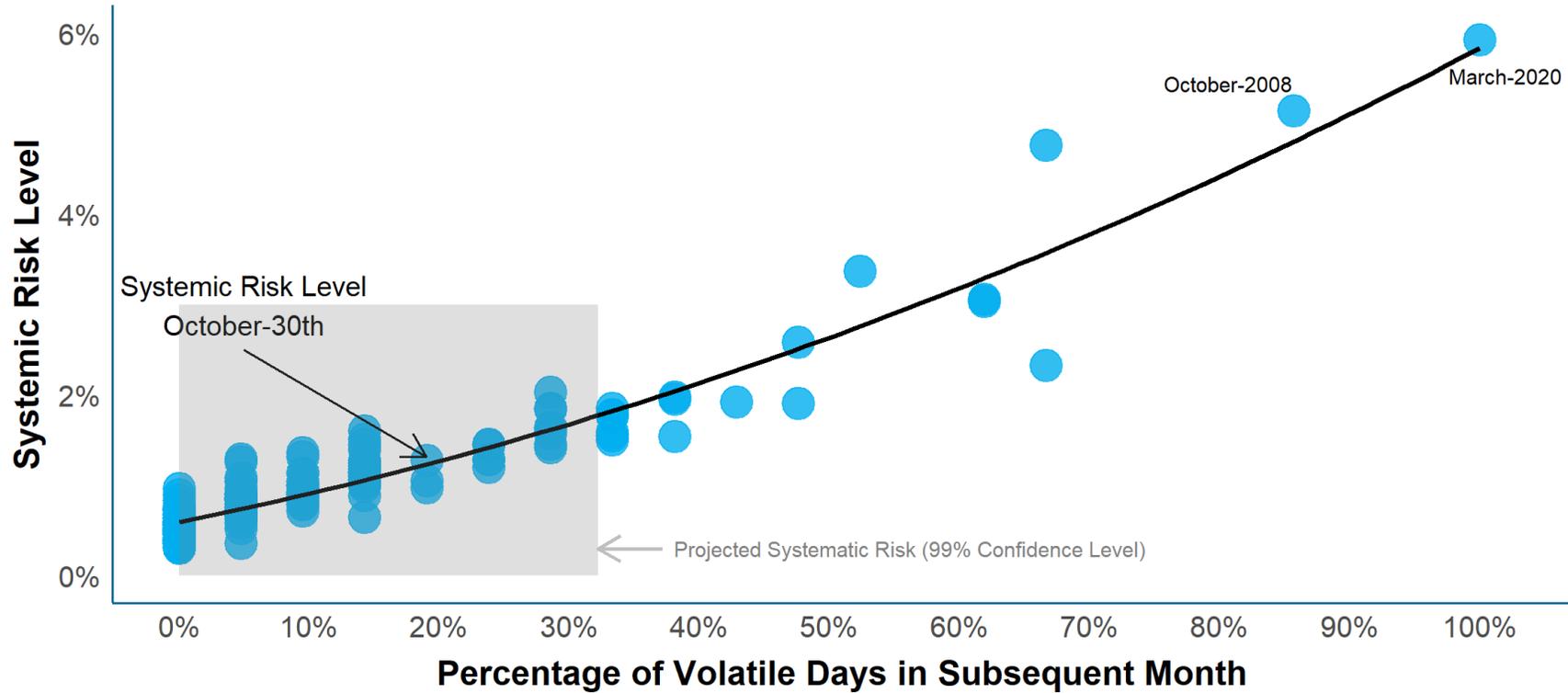
### Fixed Income Volatility<sup>1</sup> (As of October 31, 2020)



- This chart details historical implied fixed income market volatility. This metric tends to increase during times of stress/fear and while declining during more benign periods.

<sup>1</sup> Fixed Income Volatility – Source: Bloomberg, and Meketa Investment Group. Fixed Income Volatility proxied by MOVE Index, a Measure of implied option volatility for US Treasury markets.

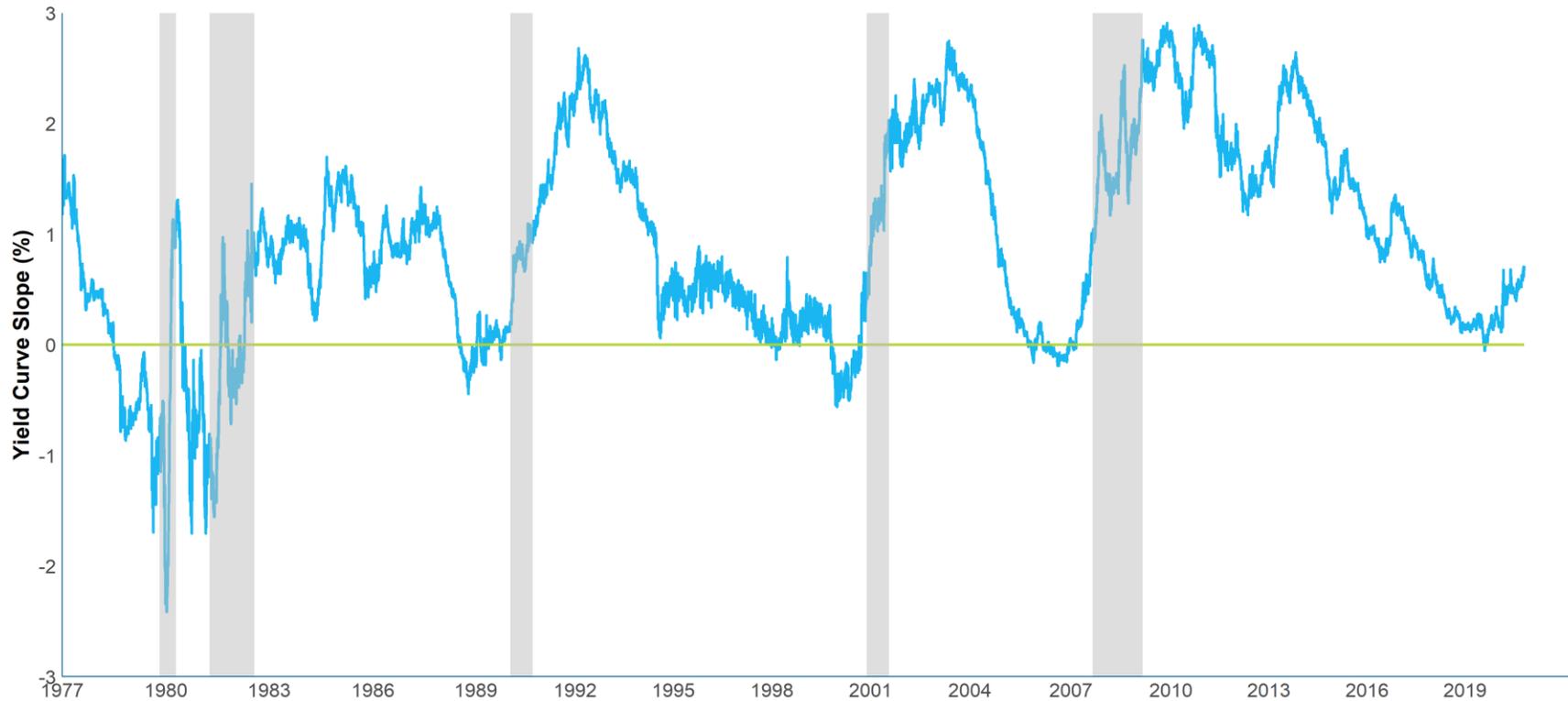
**Systemic Risk and Volatile Market Days<sup>1</sup>**  
(As of October 31, 2020)



- Systemic Risk is a measure of 'System-wide' risk, which indicates herding type behavior.

<sup>1</sup> Source: Meketa Investment Group. Volatile days are defined as the top 10 percent of realized turbulence, which is a multivariate distance between asset returns.

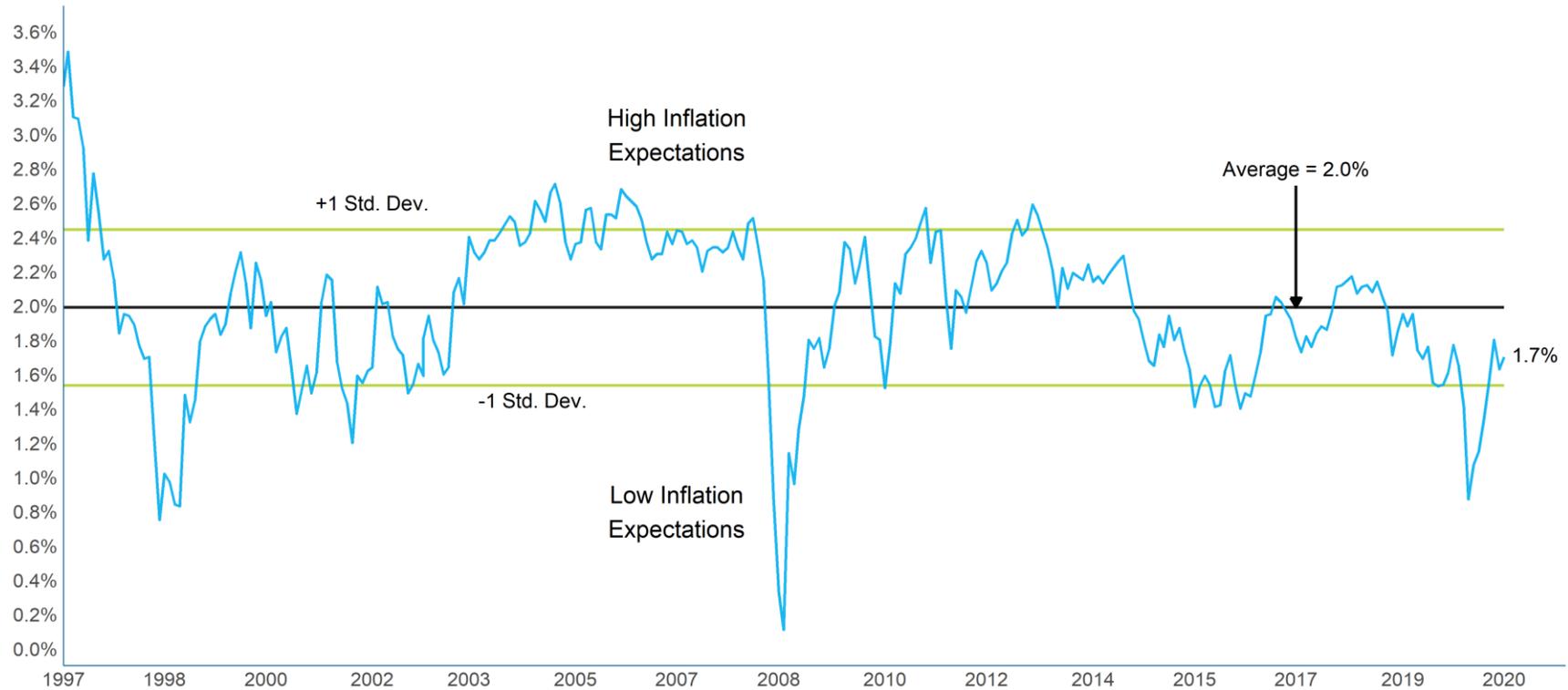
Yield Curve Slope (Ten Minus Two)<sup>1</sup>  
(As of October 31, 2020)



- This chart details the historical difference in yields between ten-year and two-year US Treasury bonds/notes. A higher (lower) figure indicates a steeper (flatter) yield curve slope.

<sup>1</sup> Yield Curve Slope (Ten Minus Two) – Source: Bloomberg, and Meketa Investment Group. Yield curve slope is calculated as the difference between the 10-Year US Treasury Yield and 2-Year US Treasury Yield.

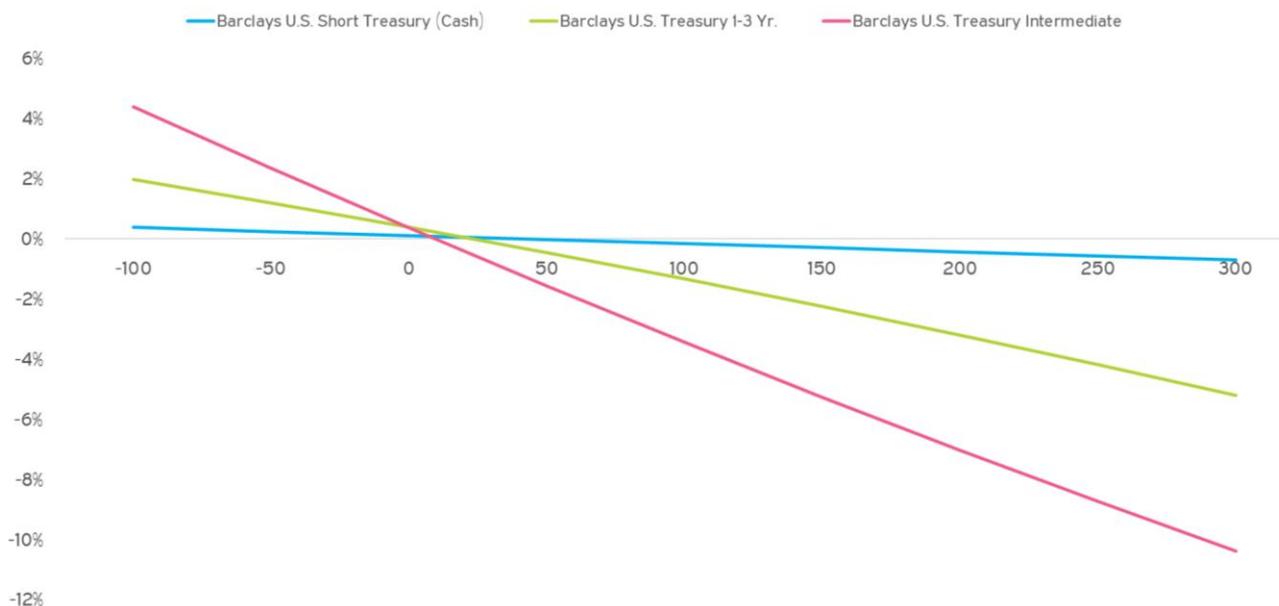
**Ten-Year Breakeven Inflation<sup>1</sup>**  
(As of October 31, 2020)



- This chart details the difference between nominal and inflation-adjusted US Treasury bonds. A higher (lower) figure indicates higher (lower) inflation expectations.

<sup>1</sup> Ten-Year Breakeven Inflation – Source: US Treasury and Federal Reserve. Inflation is measured by the Consumer Price Index (CPI-U NSA).

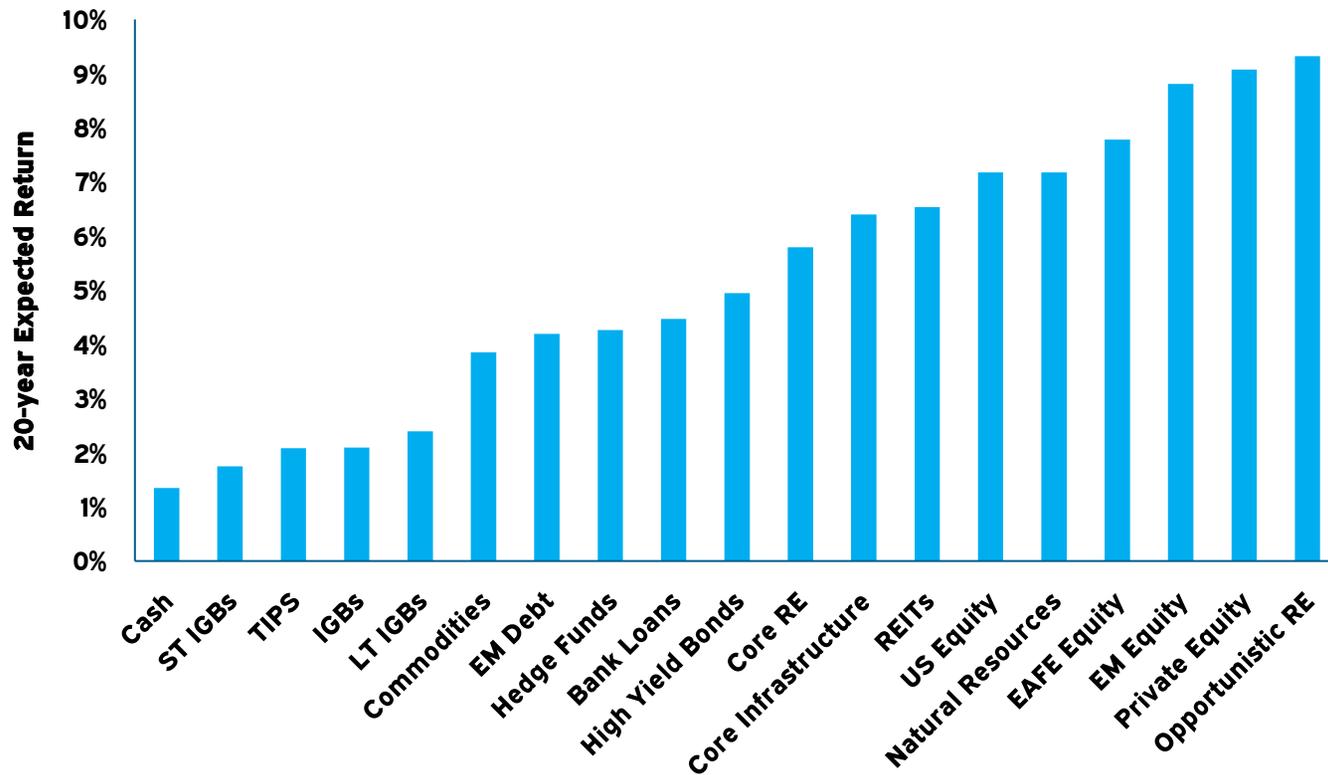
### Total Return Given Changes in Interest Rates (bps)<sup>1</sup> (As of October 31, 2020)



	Total Return for Given Changes in Interest Rates (bps)									Statistics	
	-100	-50	0	50	100	150	200	250	300	Duration	YTW
Barclays US Short Treasury (Cash)	0.4%	0.2%	0.1%	0.0%	-0.2%	-0.3%	-0.4%	-0.6%	-0.7%	0.27	0.09%
Barclays US Treasury 1-3 Yr.	1.9%	1.2%	0.4%	-0.5%	-1.4%	-2.3%	-3.2%	-4.2%	-5.2%	1.65	0.37%
Barclays US Treasury Intermediate	4.4%	2.3%	0.3%	-1.6%	-3.5%	-5.3%	-7.0%	-8.8%	-10.4%	3.92	0.34%
Barclays US Treasury Long	23.0%	11.7%	1.5%	-7.6%	-15.5%	-22.3%	-27.9%	-32.4%	-35.8%	19.24	1.50%

<sup>1</sup> Data represents the expected total return from a given change in interest rates (shown in basis points) over a 12-month period assuming a parallel shift in rates. Source: Bloomberg, and Meketa Investment Group.

Long-Term Outlook – 20-Year Annualized Expected Returns<sup>1</sup>



- This chart details Meketa’s long-term forward-looking expectations for total returns across asset classes.

<sup>1</sup> Source: Meketa Investment Group’s 2020 Annual Asset Study.

## Appendix

### Data Sources and Explanations<sup>1</sup>

- US Equity Cyclically Adjusted P/E on S&P 500 Index – Source: Robert Shiller and Yale University.
- Small Cap P/E (Russell 2000 Index) vs. Large Cap P/E (Russell 1000 Index) - Source: Russell Investments. Earnings figures represent 12-month “as reported” earnings.
- Growth P/E (Russell 3000 Growth Index) vs. Value (Russell 3000 Value Index) P/E - Source: Bloomberg, MSCI, and Meketa Investment Group. Earnings figures represent 12-month “as reported” earnings.
- Developed International Equity (MSCI EAFE ex Japan Index) Cyclically Adjusted P/E – Source: MSCI and Bloomberg. Earnings figures represent the average of monthly “as reported” earnings over the previous ten years.
- Emerging Market Equity (MSCI Emerging Markets Index) Cyclically Adjusted P/E – Source: MSCI and Bloomberg. Earnings figures represent the average of monthly “as reported” earnings over the previous ten years.
- Private Equity Multiples – Source: S&P LCD Average EBITDA Multiples Paid in All LBOs.
- Core Real Estate Spread vs. Ten-Year Treasury – Source: Real Capital Analytics, US Treasury, Bloomberg, and Meketa Investment Group. Core Real Estate is proxied by weighted sector transaction based indices from Real Capital Analytics and Meketa Investment Group.

<sup>1</sup> All Data as of October 31, 2020 unless otherwise noted.

## Appendix

### Data Sources and Explanations<sup>1</sup>

- REITs Dividend Yield Spread vs. Ten-Year Treasury – Source: NAREIT, US Treasury. REITs are proxied by the yield for the NAREIT Equity index.
- Credit Spreads – Source: Barclays Capital. High Yield is proxied by the Barclays High Yield index and Investment Grade Corporates are proxied by the Barclays US Corporate Investment Grade index.
  - Spread is calculated as the difference between the Yield to Worst of the respective index and the 10-Year Treasury Yield.
- EM Debt Spreads – Source: Bloomberg, and Meketa Investment Group. Option Adjusted Spread (OAS) for the Bloomberg Barclays EM USD Aggregate Index.
- Equity Volatility – Source: Bloomberg, and Meketa Investment Group. Equity Volatility proxied by VIX Index, a Measure of implied option volatility for US equity markets.
- Fixed Income Volatility – Source: Bloomberg, and Meketa Investment Group. Equity Volatility proxied by MOVE Index, a Measure of implied option volatility for US Treasury markets.
- Systemic Risk and Volatile Market Days – Source: Meketa Investment Group. Volatile days are defined as the top 10 percent of realized turbulence, which is a multivariate distance between asset returns.
- Systemic Risk, which measures risk across markets, is important because the more contagion of risk that exists between assets, the more likely it is that markets will experience volatile periods.

<sup>1</sup> All Data as of October 31, 2020 unless otherwise noted.

## Appendix

### Data Sources and Explanations<sup>1</sup>

- Yield Curve Slope (Ten Minus Two) – Source: Bloomberg, and Meketa Investment Group. Yield curve slope is calculated as the difference between the 10-Year US Treasury Yield and 2-Year US Treasury Yield.
- Ten-Year Breakeven Inflation – Source: US Treasury and Federal Reserve. Inflation is measured by the Consumer Price Index (CPI-U NSA).

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<sup>1</sup> All Data as of October 31, 2020 unless otherwise noted.

## **Meketa Market Sentiment Indicator** Explanation, Construction and Q&A

Meketa has created the MIG Market Sentiment Indicator (MIG-MSI) to complement our valuation-focused Risk Metrics. This measure of sentiment is meant to capture significant and persistent shifts in long-lived market trends of economic growth risk, either towards a risk-seeking trend or a risk-aversion trend.

### This appendix explores:

- What is the Meketa Market Sentiment Indicator?
- How do I read the indicator graph?
- How is the Meketa Market Sentiment Indicator constructed?
- What do changes in the indicator mean?

Meketa has created a market sentiment indicator for monthly publication (the MIG-MSI – see below) to complement Meketa’s Risk Metrics.

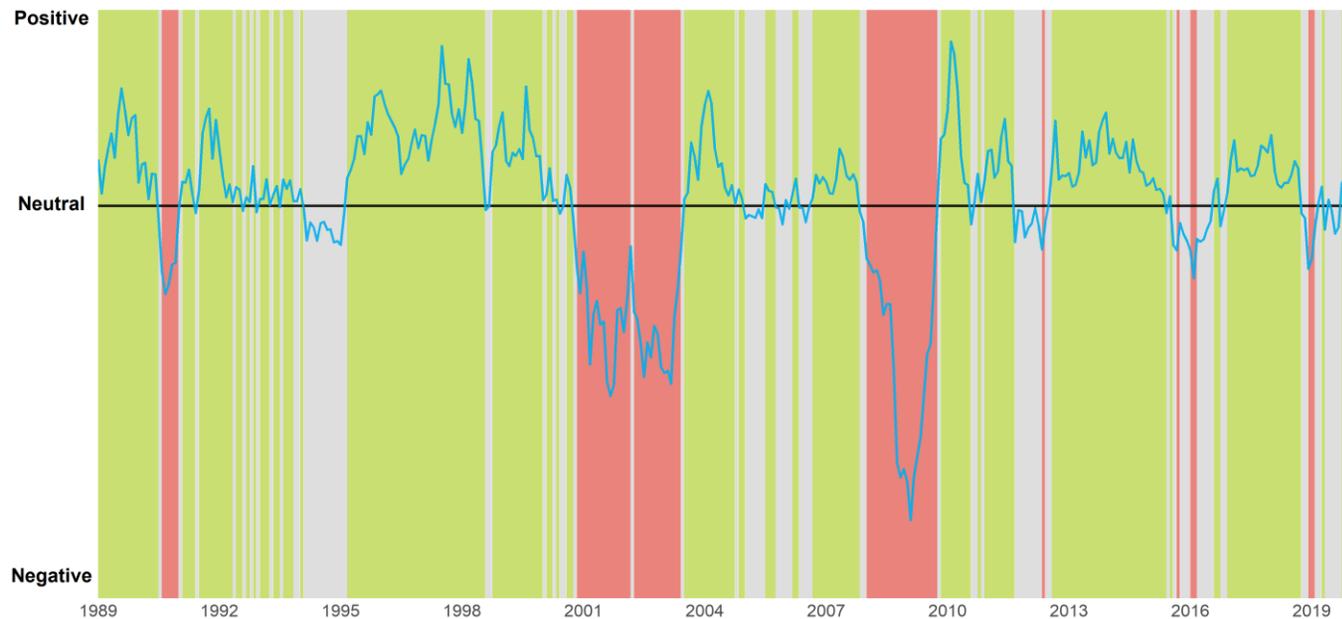
- Meketa’s Risk Metrics, which rely significantly on standard market measures of relative valuation, often provide valid early signals of increasing long-term risk levels in the global investment markets. However, as is the case with numerous valuation measures, the Risk Metrics may convey such risk concerns long before a market corrections take place. The MIG-MSI helps to address this early-warning bias by measuring whether the markets are beginning to acknowledge key Risk Metrics trends, and / or indicating non-valuation based concerns. Once the MIG-MSI indicates that the market sentiment has shifted, it is our belief that investors should consider significant action, particularly if confirmed by the Risk Metrics. Importantly, Meketa believes the Risk Metrics and MIG-MSI should always be used in conjunction with one another and never in isolation. The questions and answers below highlight and discuss the basic underpinnings of the Meketa MIG-MSI:

### What is the Meketa Market Sentiment Indicator (MIG-MSI)?

- The MIG-MSI 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 MIG-MSI 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 Meketa Market Sentiment Indicator graph?

- Simply put, the MIG-MSI 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 MIG-MSI 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 MIG-MSI. The degree of the signal above or below the neutral reading is an indication the signal's current strength.
- Momentum as we are defining it is the use of the past behavior of a series as a predictor of its future behavior.



### How is the Meketa Market Sentiment Indicator (MIG-MSI) Constructed?

- The MIG-MSI is constructed from two sub-elements representing investor sentiment in stocks and bonds:
  - Stock return momentum: Return momentum for the S&P 500 Equity Index (trailing 12-months)
  - Bond yield spread momentum: Momentum of bond yield spreads (excess of the measured bond yield over the identical duration US Treasury bond yield) for corporate bonds (trailing 12-months) for both investment grade bonds (75% weight) and high yield bonds (25% weight).
  - Both measures are converted to Z-scores and then combined to get an “apples to apples” comparison without the need of re-scaling.
- The black line reading on the graph is calculated as the average of the stock return momentum measure and the bonds spread momentum measure.<sup>1</sup> The color reading on the graph is determined as follows:
  - If both stock return momentum and bond spread momentum are positive = GREEN (positive)
  - If one of the momentum indicators is positive, and the other negative = GRAY (inconclusive)
  - If both stock return momentum and bond spread momentum are negative = RED (negative)

<sup>1</sup> Momentum as we are defining it is the use of the past behavior of a series as a predictor of its future behavior.

“Time Series Momentum” Moskowitz, Ooi, Pedersen, August 2010. <http://pages.stern.nyu.edu/~lpederse/papers/TimeSeriesMomentum.pdf>

### What does the Meketa Market Sentiment Indicator (MIG-MSI) 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 MIG-MSI 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.

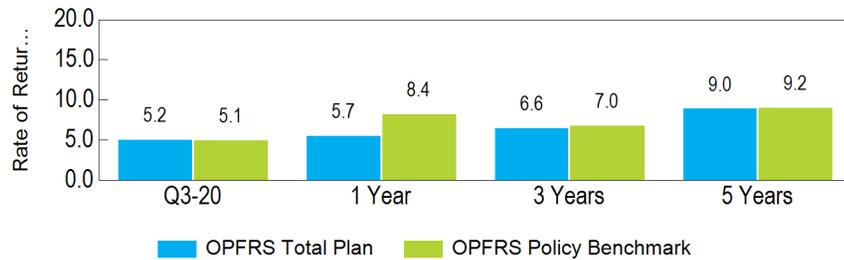
## Total Portfolio Review

### OPFRS Total Plan | As of September 30, 2020

Year to Date		
	Anlzd Return	Standard Deviation
OPFRS Total Plan	1.80%	5.29%
OPFRS Policy Benchmark	4.99%	4.50%
InvMetrics Public DB \$250mm-\$1B Gross Median	4.53%	4.40%

1 Year Ending September 30, 2020		
	Anlzd Return	Standard Deviation
OPFRS Total Plan	5.44%	4.82%
OPFRS Policy Benchmark	8.39%	4.09%
InvMetrics Public DB \$250mm-\$1B Gross Median	7.74%	4.03%

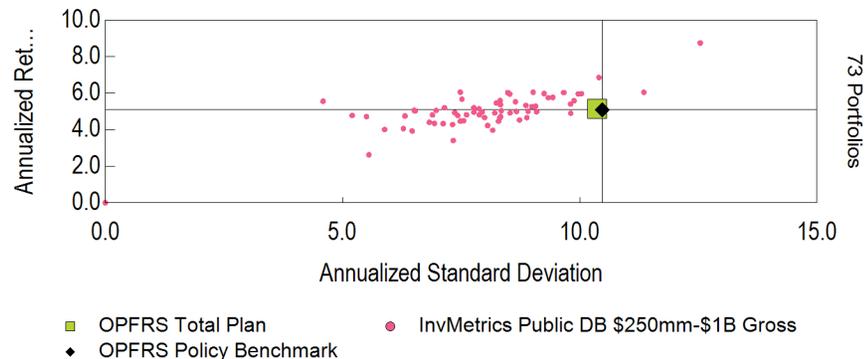
### Return Summary Ending September 30, 2020



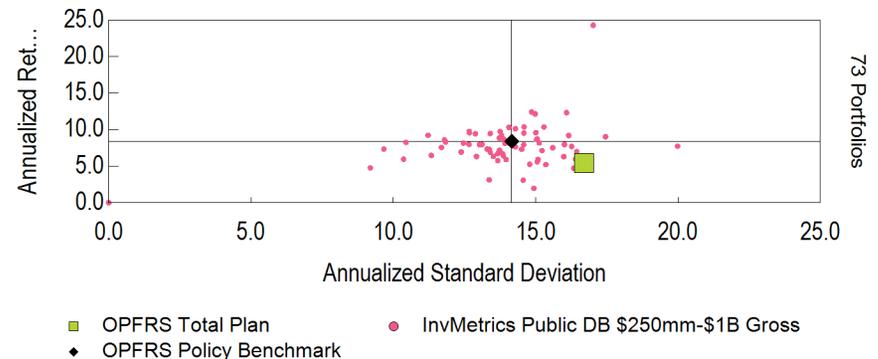
### Summary of Cash Flows

	Quarter-To-Date	One Year
Beginning Market Value	\$383,325,294	\$391,243,866
Net Cash Flow	-\$3,291,600	-\$13,036,146
Capital Appreciation	\$20,033,548	\$21,859,522
Ending Market Value	\$400,067,242	\$400,067,242

### Annualized Return vs. Annualized Standard Deviation 3 Months Ending September 30, 2020



### Annualized Return vs. Annualized Standard Deviation 1 Year Ending September 30, 2020



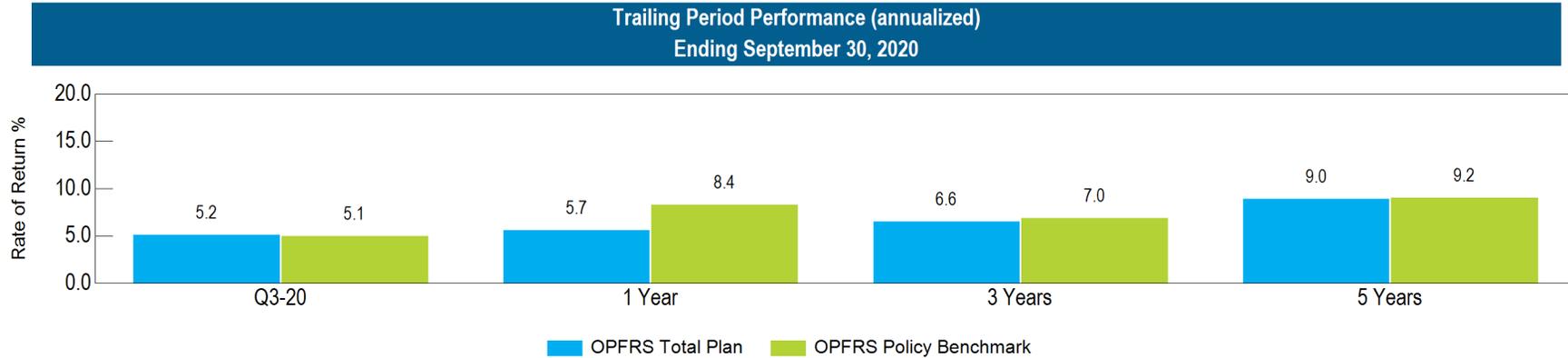
Evolving Policy Benchmark consists of 40% russell 3000, 12% MSCI ACWI ex U.S., 33% Bbg BC Universal, 5% CBOE BXM, 6.7% SG Multi Asset Risk Premia, 3.3% Bbg BC Long Treasury.

### Asset Class Performance (gross of fees) | As of September 30, 2020

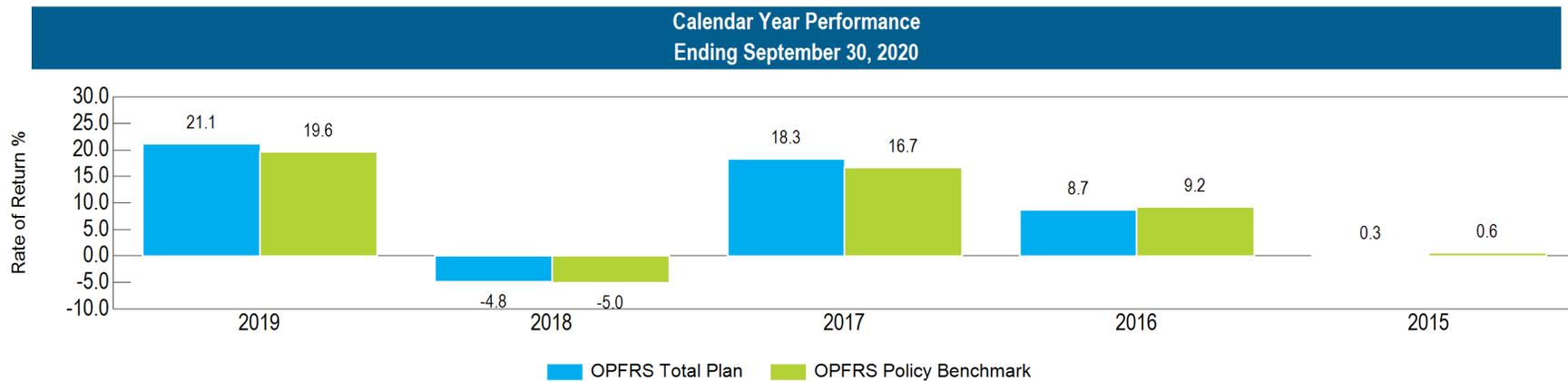
	QTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	7 Yrs (%)	10 Yrs (%)
<b>OPFRS Total Plan</b>	<b>5.2</b>	<b>5.7</b>	<b>6.6</b>	<b>9.0</b>	<b>7.7</b>	<b>8.3</b>
<i>OPFRS Policy Benchmark</i>	<u>5.1</u>	<u>8.4</u>	<u>7.0</u>	<u>9.2</u>	<u>7.8</u>	<u>8.0</u>
Excess Return	0.1	-2.7	-0.4	-0.2	-0.1	0.3
<b>Domestic Equity</b>	<b>8.3</b>	<b>11.6</b>	<b>10.3</b>	<b>12.9</b>	<b>11.4</b>	<b>13.2</b>
<i>Russell 3000 (Blend)</i>	<u>9.2</u>	<u>15.0</u>	<u>11.6</u>	<u>13.7</u>	<u>12.1</u>	<u>13.5</u>
Excess Return	-0.9	-3.4	-1.3	-0.8	-0.7	-0.3
<b>International Equity</b>	<b>5.5</b>	<b>2.4</b>	<b>1.8</b>	<b>7.2</b>	<b>4.5</b>	<b>5.3</b>
<i>MSCI ACWI ex US (Blend)</i>	<u>6.4</u>	<u>3.4</u>	<u>1.6</u>	<u>6.7</u>	<u>3.7</u>	<u>4.5</u>
Excess Return	-0.9	-1.0	0.2	0.5	0.8	0.8
<b>Fixed Income</b>	<b>1.9</b>	<b>6.8</b>	<b>5.6</b>	<b>4.9</b>	<b>4.5</b>	<b>4.2</b>
<i>Bloomberg BC Universal (Blend)</i>	<u>1.0</u>	<u>6.7</u>	<u>5.1</u>	<u>4.5</u>	<u>4.2</u>	<u>3.9</u>
Excess Return	0.9	0.1	0.5	0.4	0.3	0.3
<b>Credit</b>	<b>7.7</b>	<b>3.3</b>	<b>2.7</b>	<b>5.8</b>	--	--
<i>Bloomberg US High Yield TR</i>	<u>4.6</u>	<u>3.3</u>	<u>4.2</u>	<u>6.8</u>	--	--
Excess Return	3.1	0.0	-1.5	-1.0		
<b>Covered Calls</b>	<b>7.1</b>	<b>7.2</b>	<b>6.9</b>	<b>9.7</b>	--	--
<i>CBOE S&amp;P 500 BuyWrite USD</i>	<u>6.5</u>	<u>-4.9</u>	<u>1.1</u>	<u>4.8</u>	--	--
Excess Return	0.6	12.1	5.8	4.9		
<b>Crisis Risk Offset</b>	<b>-1.2</b>	<b>-20.4</b>	--	--	--	--
<i>SG Multi Alternative Risk Premia Index</i>	<u>-0.6</u>	<u>-13.9</u>	--	--	--	--
Excess Return	-0.6	-6.5				
<b>Cash</b>	<b>0.0</b>	<b>1.5</b>	<b>1.9</b>	<b>1.4</b>	<b>1.0</b>	--
<i>FTSE T-Bill 3 Months TR</i>	<u>0.0</u>	<u>1.0</u>	<u>1.6</u>	<u>1.2</u>	<u>0.8</u>	--
Excess Return	0.0	0.5	0.3	0.2	0.2	

1. Evolving Policy Benchmark consists of 40% Russell 3000, 12% MSCI Acwi ex U.S., 33% Bbg BC Universal, 5% CBOE BXM, 6.7% SG Multi Asset Risk Premia, 3.3% Bbg BC Long Treasury,
2. Domestic Equity Benchmark consists of S&P 500 thru 3/31/98 10% Russell 1000, 20% Russell 1000 Value, 5% RMC from 4/1/98 - 12/31/04 and Russell 3000 from 1/1/05 to present.
3. International Equity Benchmark consists of MSCI EAFE thru 12/31/04 and MSCI ACWI x US thereafter.
4. Fixed Income Benchmark consists of Bbg BC Aggregate prior to 4/1/06, and Bbg BC Universal thereafter.

### Portfolio Relative Performance Results | As of September 30, 2020



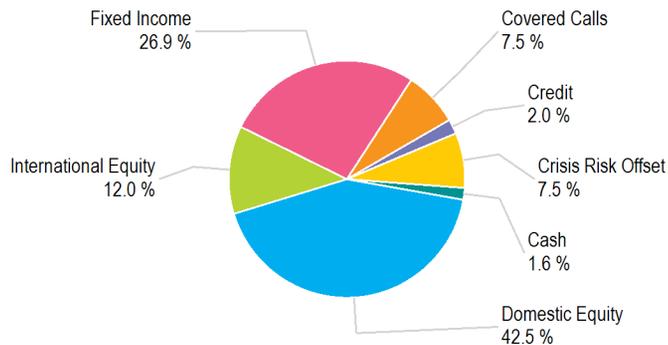
	QTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	2015 (%)	2016 (%)	2017 (%)	2018 (%)	2019 (%)
<b>OPFRS Total Plan</b>	<b>5.2</b>	<b>5.7</b>	<b>6.6</b>	<b>9.0</b>	<b>0.3</b>	<b>8.7</b>	<b>18.3</b>	<b>-4.8</b>	<b>21.1</b>
<i>OPFRS Policy Benchmark</i>	<i>5.1</i>	<i>8.4</i>	<i>7.0</i>	<i>9.2</i>	<i>0.6</i>	<i>9.2</i>	<i>16.7</i>	<i>-5.0</i>	<i>19.6</i>
<i>InvMetrics Public DB \$250mm-\$1B Gross Median</i>	<i>5.0</i>	<i>7.7</i>	<i>6.3</i>	<i>8.2</i>	<i>0.0</i>	<i>7.8</i>	<i>15.8</i>	<i>-4.1</i>	<i>18.6</i>



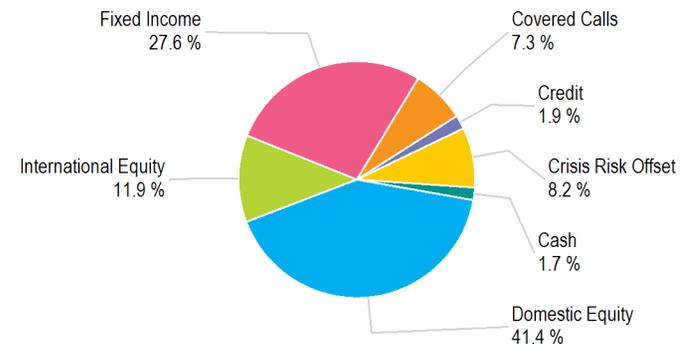
#### Asset Allocation vs. Target As Of September 30, 2020

	Current	%	Policy	Difference*
Domestic Equity	\$169,962,378	42.5%	40.0%	2.5%
International Equity	\$47,942,430	12.0%	12.0%	0.0%
Fixed Income	\$107,701,274	26.9%	31.0%	-4.1%
Covered Calls	\$29,895,963	7.5%	5.0%	2.5%
Credit	\$8,028,648	2.0%	2.0%	0.0%
Crisis Risk Offset	\$30,031,879	7.5%	10.0%	-2.5%
Cash	\$6,504,670	1.6%	0.0%	1.6%
<b>Total</b>	<b>\$400,067,242</b>	<b>100.0%</b>	<b>100.0%</b>	

September 30, 2020: \$400,067,242



June 30, 2020: \$383,325,294



Target weightings reflect the Plan's evolving asset allocation (effective 5/31/2017.)

### Manager Performance - Gross of Fees | As of September 30, 2020

	Market Value	% of Portfolio	QTD	YTD	1 Yr	3 Yrs	5 Yrs	S.I.	S.I. Date
<b>Domestic Equity</b>	<b>169,962,378</b>	<b>100.0</b>	<b>8.3</b>	<b>2.7</b>	<b>11.6</b>	<b>10.3</b>	<b>12.9</b>	<b>8.6</b>	<b>Jun-97</b>
<i>Russell 3000 (Blend)</i>			<i>9.2</i>	<i>5.4</i>	<i>15.0</i>	<i>11.6</i>	<i>13.7</i>	<i>8.8</i>	<i>Jun-97</i>
Excess Return			-0.9	-2.7	-3.4	-1.3	-0.8	-0.2	
Northern Trust Russell 1000	97,755,168	57.5	9.4	6.3	15.9	12.4	14.0	13.8	Jun-10
<i>Russell 1000</i>			<i>9.5</i>	<i>6.4</i>	<i>16.0</i>	<i>12.4</i>	<i>14.1</i>	<i>13.9</i>	<i>Jun-10</i>
Excess Return			-0.1	-0.1	-0.1	0.0	-0.1	-0.1	
<i>eV US Large Cap Core Equity Gross Rank</i>			<i>30</i>	<i>34</i>	<i>31</i>	<i>34</i>	<i>29</i>	<i>37</i>	<i>Jun-10</i>
EARNEST Partners	34,661,855	20.4	8.5	2.5	10.4	11.4	14.6	9.8	Apr-06
<i>Russell MidCap</i>			<i>7.5</i>	<i>-2.3</i>	<i>4.6</i>	<i>7.1</i>	<i>10.1</i>	<i>8.2</i>	<i>Apr-06</i>
Excess Return			1.0	4.8	5.8	4.3	4.5	1.6	
<i>eV US Mid Cap Core Equity Gross Rank</i>			<i>26</i>	<i>24</i>	<i>19</i>	<i>22</i>	<i>10</i>	<i>31</i>	<i>Apr-06</i>
iShares Edge MSCI Min Vol	18,419,148	10.8	5.6	--	--	--	--	19.2	Apr-20
<i>MSCI USA Minimum Volatility GR USD</i>			<i>5.8</i>	--	--	--	--	<i>19.4</i>	<i>Apr-20</i>
Excess Return			-0.2					-0.2	
<i>eV US Low Volatility Equity Gross Rank</i>			<i>53</i>	--	--	--	--	<i>63</i>	<i>Apr-20</i>
Rice Hall James	12,400,423	7.3	5.7	3.0	13.1	7.6	--	8.2	Jul-17
<i>Russell 2000 Growth</i>			<i>7.2</i>	<i>3.9</i>	<i>15.7</i>	<i>8.2</i>	--	<i>9.5</i>	<i>Jul-17</i>
Excess Return			-1.5	-0.9	-2.6	-0.6		-1.3	
<i>eV US Small Cap Growth Equity Gross Rank</i>			<i>84</i>	<i>74</i>	<i>72</i>	<i>81</i>	--	<i>87</i>	<i>Jul-17</i>
Vanguard Russell 2000 Value	6,725,783	4.0	2.7	-21.3	-14.7	--	--	-13.0	Aug-19
<i>Russell 2000 Value</i>			<i>2.6</i>	<i>-21.5</i>	<i>-14.9</i>	--	--	<i>-13.4</i>	<i>Aug-19</i>
Excess Return			0.1	0.2	0.2			0.4	
<i>eV US Small Cap Value Equity Gross Rank</i>			<i>49</i>	<i>65</i>	<i>60</i>	--	--	<i>59</i>	<i>Aug-19</i>

Manager Performance - Gross of Fees | As of September 30, 2020

	Market Value	% of Portfolio	QTD	YTD	1 Yr	3 Yrs	5 Yrs	S.I.	S.I. Date
<b>International Equity</b>	<b>47,942,430</b>	<b>100.0</b>	<b>5.5</b>	<b>-6.7</b>	<b>2.4</b>	<b>1.8</b>	<b>7.2</b>	<b>5.1</b>	<b>Jan-98</b>
<i>MSCI ACWI ex US (Blend)</i>			<i>6.4</i>	<i>-5.1</i>	<i>3.4</i>	<i>1.6</i>	<i>6.7</i>	<i>5.3</i>	<i>Jan-98</i>
Excess Return			-0.9	-1.6	-1.0	0.2	0.5	-0.2	
SGA ACWI ex-U.S. Equity	33,541,668	70.0	5.9	-5.7	--	--	--	-5.1	Dec-19
<i>MSCI ACWI ex USA Gross</i>			<i>6.4</i>	<i>-5.1</i>	--	--	--	<i>-0.9</i>	<i>Dec-19</i>
Excess Return			-0.5	-0.6				-4.2	
<i>eV ACWI ex-US All Cap Core Eq Gross Rank</i>			<i>79</i>	<i>69</i>	--	--	--	<i>85</i>	<i>Dec-19</i>
Vanguard Developed Markets ETF	14,122,361	29.5	6.0	-5.6	2.2	--	--	5.0	Sep-19
<i>FTSE Developed All Cap Ex US TR USD</i>			<i>6.0</i>	<i>-5.8</i>	<i>2.3</i>	--	--	<i>5.0</i>	<i>Sep-19</i>
Excess Return			0.0	0.2	-0.1			0.0	
<i>eV ACWI ex-US All Cap Core Eq Gross Rank</i>			<i>77</i>	<i>68</i>	<i>72</i>	--	--	<i>71</i>	<i>Sep-19</i>

Total International Equity market value includes cash held in closed accounts Fisher and Hansberger.

### Manager Performance - Gross of Fees | As of September 30, 2020

	Market Value	% of Portfolio	QTD	YTD	1 Yr	3 Yrs	5 Yrs	S.I.	S.I. Date
<b>Fixed Income</b>	<b>107,701,274</b>	<b>100.0</b>	<b>1.9</b>	<b>6.5</b>	<b>6.8</b>	<b>5.6</b>	<b>4.9</b>	<b>5.6</b>	<b>Dec-93</b>
<i>Blmbg BC Universal (Blend)</i>			<i>1.0</i>	<i>6.2</i>	<i>6.7</i>	<i>5.1</i>	<i>4.5</i>	<i>5.4</i>	<i>Dec-93</i>
Excess Return			0.9	0.3	0.1	0.5	0.4	0.2	
Ramirez	78,306,337	72.7	1.9	5.5	5.6	5.4	--	5.4	Jan-17
<i>BBgBarc US Aggregate TR</i>			<i>0.6</i>	<i>6.8</i>	<i>7.0</i>	<i>5.2</i>	--	<i>5.0</i>	<i>Jan-17</i>
Excess Return			1.3	-1.3	-1.4	0.2		0.4	
<i>eV US Core Fixed Inc Net Rank</i>			<i>6</i>	<i>93</i>	<i>93</i>	<i>49</i>	--	<i>34</i>	<i>Jan-17</i>
Reams	29,394,894	27.3	2.0	18.0	17.9	9.1	6.6	6.2	Feb-98
<i>Blmbg BC Universal (Blend)</i>			<i>1.0</i>	<i>6.2</i>	<i>6.7</i>	<i>5.1</i>	<i>4.5</i>	<i>5.1</i>	<i>Feb-98</i>
Excess Return			1.0	11.8	11.2	4.0	2.1	1.1	
<i>eV US Core Plus Fixed Inc Gross Rank</i>			<i>32</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>4</i>	<i>37</i>	<i>Feb-98</i>

**Manager Performance - Gross of Fees | As of September 30, 2020**

	Market Value	% of Portfolio	QTD	YTD	1 Yr	3 Yrs	5 Yrs	S.I.	S.I. Date
<b>Covered Calls</b>	<b>29,895,963</b>	<b>100.0</b>	<b>7.1</b>	<b>1.0</b>	<b>7.2</b>	<b>6.9</b>	<b>9.7</b>	<b>8.0</b>	<b>Apr-14</b>
<i>CBOE S&amp;P 500 BuyWrite USD</i>			<i>6.5</i>	<i>-9.6</i>	<i>-4.9</i>	<i>1.1</i>	<i>4.8</i>	<i>4.3</i>	<i>Apr-14</i>
Excess Return			0.6	10.6	12.1	5.8	4.9	3.7	
Parametric DeltaShift	16,203,027	54.2	7.9	3.8	11.5	9.4	12.0	10.2	Apr-14
<i>CBOE S&amp;P 500 BuyWrite USD</i>			<i>6.5</i>	<i>-9.6</i>	<i>-4.9</i>	<i>1.1</i>	<i>4.8</i>	<i>4.3</i>	<i>Apr-14</i>
Excess Return			1.4	13.4	16.4	8.3	7.2	5.9	
<i>eV US Large Cap Core Equity Gross Rank</i>			<i>56</i>	<i>49</i>	<i>54</i>	<i>68</i>	<i>69</i>	<i>64</i>	<i>Apr-14</i>
Parametric BXM	13,692,936	45.8	6.3	-1.9	2.7	4.2	7.3	6.2	Apr-14
<i>CBOE S&amp;P 500 BuyWrite USD</i>			<i>6.5</i>	<i>-9.6</i>	<i>-4.9</i>	<i>1.1</i>	<i>4.8</i>	<i>4.3</i>	<i>Apr-14</i>
Excess Return			-0.2	7.7	7.6	3.1	2.5	1.9	
<i>eV US Large Cap Core Equity Gross Rank</i>			<i>83</i>	<i>82</i>	<i>91</i>	<i>96</i>	<i>97</i>	<i>97</i>	<i>Apr-14</i>

### Manager Performance - Gross of Fees | As of September 30, 2020

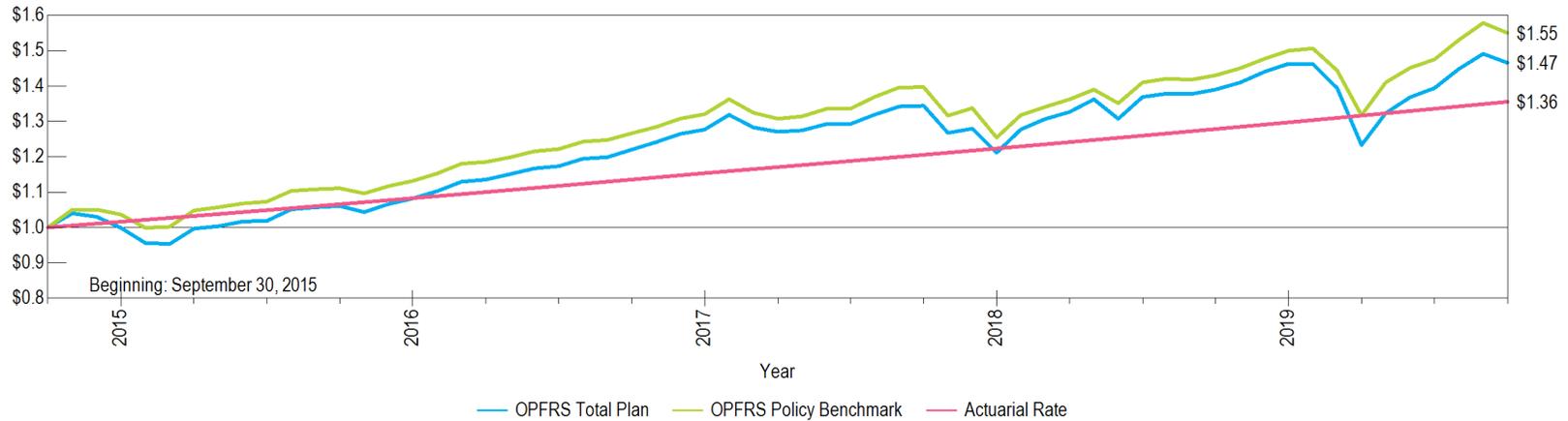
	Market Value	% of Portfolio	QTD	YTD	1 Yr	3 Yrs	5 Yrs	S.I.	S.I. Date
<b>Credit</b>	<b>8,028,648</b>	<b>100.0</b>	<b>7.7</b>	<b>0.5</b>	<b>3.3</b>	<b>2.7</b>	<b>5.8</b>	<b>5.0</b>	<b>Feb-15</b>
<i>BBgBarc US High Yield TR</i>			<u>4.6</u>	<u>0.6</u>	<u>3.3</u>	<u>4.2</u>	<u>6.8</u>	<u>5.4</u>	<u>Feb-15</u>
Excess Return			3.1	-0.1	0.0	-1.5	-1.0	-0.4	
DDJ Capital	8,028,648	100.0	7.7	0.5	3.3	2.7	5.8	5.0	Feb-15
<i>ICE BofA High Yield Master TR</i>			<u>4.7</u>	<u>-0.3</u>	<u>2.3</u>	<u>3.9</u>	<u>6.6</u>	<u>5.2</u>	<u>Feb-15</u>
Excess Return			3.0	0.8	1.0	-1.2	-0.8	-0.2	
<i>eV US High Yield Fixed Inc Gross Rank</i>			1	56	49	97	78	68	<i>Feb-15</i>

**Manager Performance - Gross of Fees | As of September 30, 2020**

	Market Value	% of Portfolio	QTD	YTD	1 Yr	3 Yrs	5 Yrs	S.I.	S.I. Date
<b>Crisis Risk Offset</b>	<b>30,031,879</b>	<b>100.0</b>	<b>-1.2</b>	<b>-21.2</b>	<b>-20.4</b>	--	--	<b>-8.5</b>	<b>Aug-18</b>
<i>SG Multi Alternative Risk Premia Index</i>			<i>-0.6</i>	<i>-13.1</i>	<i>-13.9</i>	--	--	<i>-5.5</i>	<i>Aug-18</i>
Excess Return			-0.6	-8.1	-6.5			-3.0	
Parametric Systematic Alternative Risk Premia	15,284,520	50.9	-2.4	-42.5	-40.3	--	--	-19.8	Aug-18
<i>SG Multi Alternative Risk Premia Index</i>			<i>-0.6</i>	<i>-13.1</i>	<i>-13.9</i>	--	--	<i>-5.5</i>	<i>Aug-18</i>
Excess Return			-1.8	-29.4	-26.4			-14.3	
Vanguard Long-Term Treasury ETF	14,747,360	49.1	0.0	21.0	15.8	--	--	19.6	Jul-19
<i>BBgBarc US Govt Long TR</i>			<i>0.1</i>	<i>2.1</i>	<i>16.2</i>	--	--	<i>19.8</i>	<i>Jul-19</i>
Excess Return			-0.1	-0.1	-0.4			-0.2	
<i>eV US Long Duration - Gov/Cred Fixed Inc Net Rank</i>			<i>99</i>	<i>5</i>	<i>14</i>	--	--	<i>7</i>	<i>Jul-19</i>

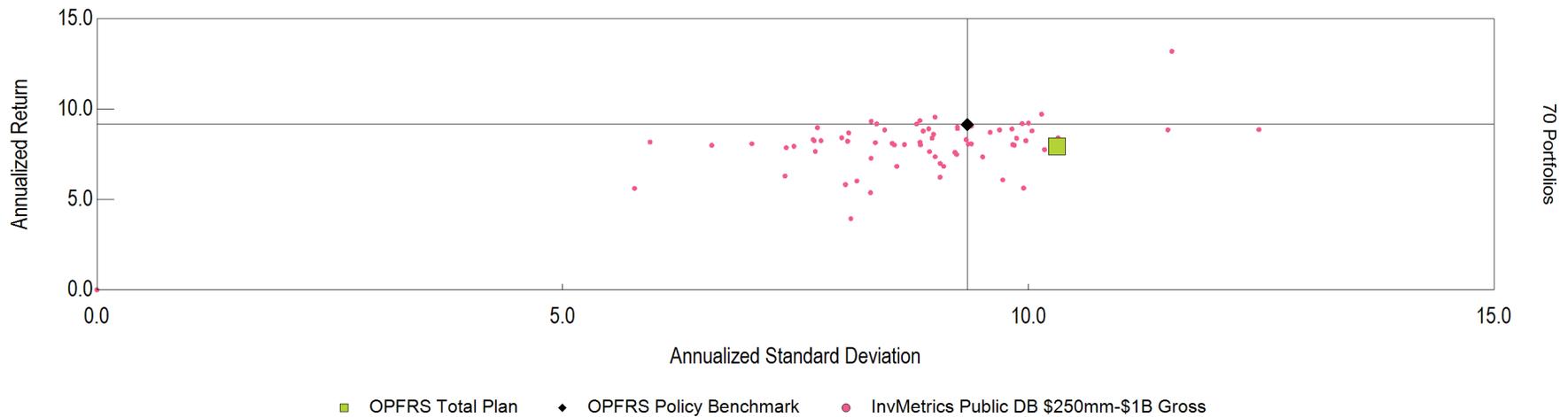
### Total Portfolio 5-Year Performance | As of September 30, 2020

#### Growth of a Dollar



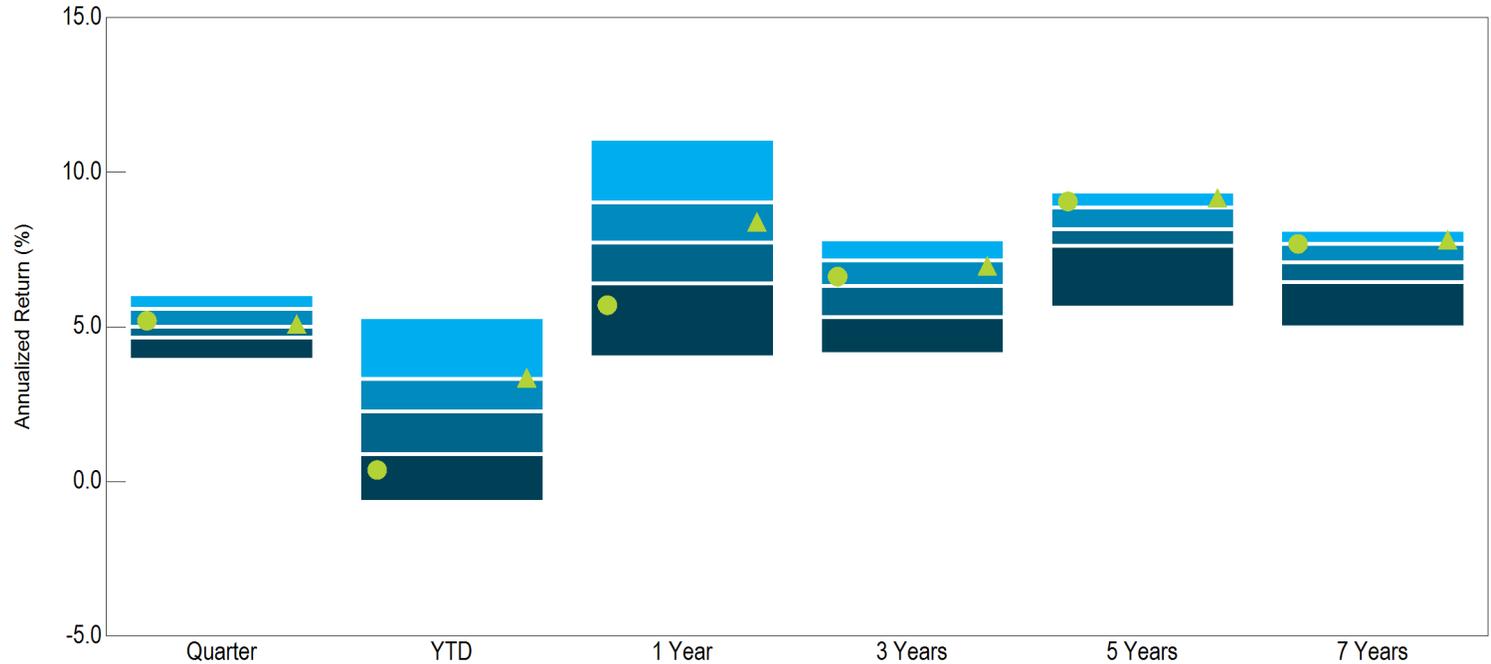
The actuarial expected rate of return was 8% through 6/30/2009, 7.5% through 6/30/2010, 7% through 6/30/2011, 6.75% through 6/30/2014, 6.5% through 2/31/2017 and 6.0% currently

#### Annualized Return vs. Annualized Standard Deviation 5 Years Ending September 30, 2020



### Plan Sponsor Peer Group Analysis | As of September 30, 2020

InvMetrics Public DB \$250mm-\$1B Gross Return Comparison



**Return (Rank)**

5th Percentile	6.0		5.3		11.1		7.8		9.4		8.1	
25th Percentile	5.6		3.3		9.0		7.2		8.9		7.7	
Median	5.0		2.3		7.7		6.3		8.2		7.1	
75th Percentile	4.7		0.9		6.4		5.3		7.6		6.5	
95th Percentile	4.0		-0.7		4.0		4.1		5.6		5.0	
# of Portfolios	73		73		73		72		70		69	
● OPFRS Total Plan	5.2	(41)	0.4	(84)	5.7	(87)	6.6	(41)	9.0	(14)	7.7	(26)
▲ OPFRS Policy Benchmark	5.1	(43)	3.4	(24)	8.4	(35)	7.0	(33)	9.2	(12)	7.8	(21)

## **Manager Monitoring / Probation List**

### Monitoring/Probation Status

#### Return vs. Benchmark since Corrective Action As of September 30, 2020

Portfolio	Status	Concern	Months Since Corrective Action	Performance <sup>^</sup> Since Corrective Action (Gross)	Peer Group Percentile Ranking	Date of Corrective Action*
DDJ Capital	On Watch	Performance	15	1.1	1	5/29/2019
Ice BofAML US High Yield			---	4.6		
Rice Hall James	On Watch	Performance	15	11.2	84	5/29/2019
Russell 2000 Growth	---	---	---	14.2		

<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

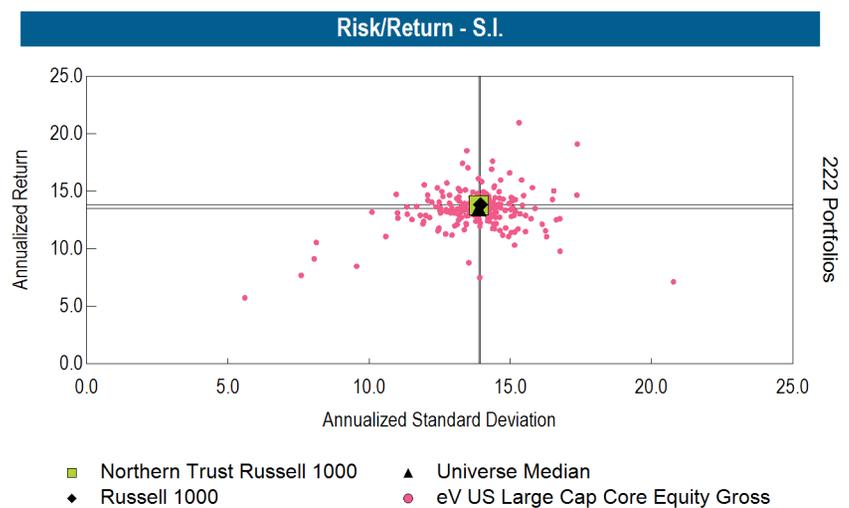
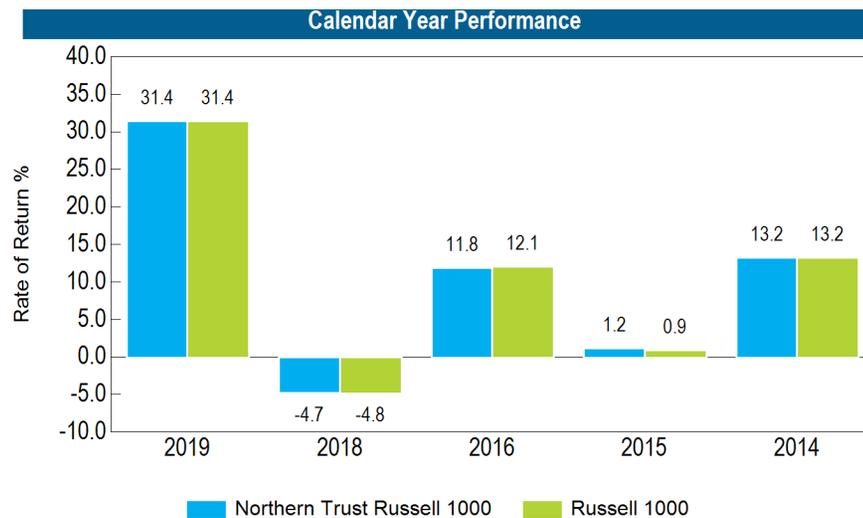
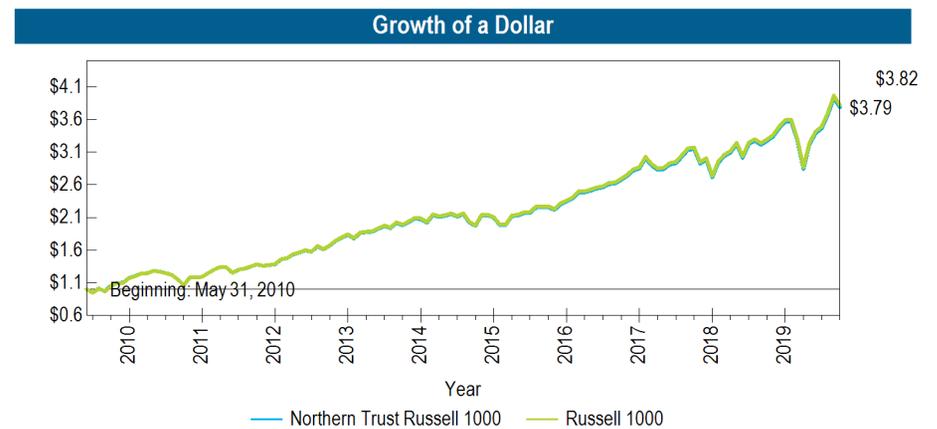
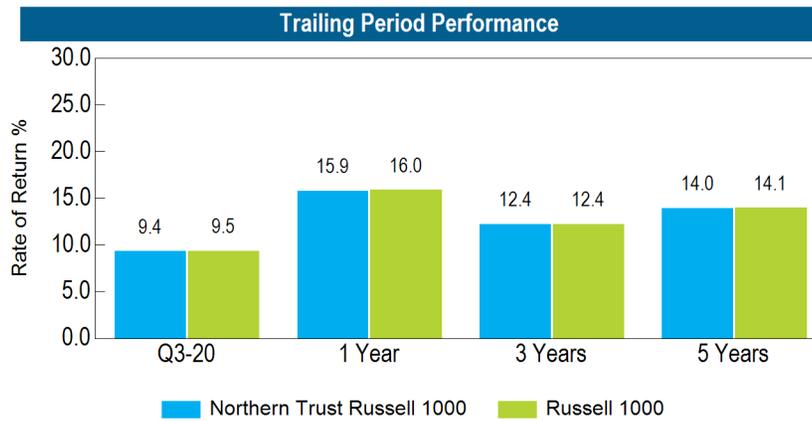
Asset Class	Short-term (Rolling 12 months)	Medium-term (Rolling 36 months)	Long-term (60 + months)
<b>Active Domestic Equity</b>	Fund return < benchmark return - 3.5%	Annualized Fund return < benchmark return - 1.75% for 6 consecutive months	VRR** < 0.97 for 6 consecutive months
<b>Active International Equity</b>	Fund return < benchmark return - 4.5%	Annualized Fund return < benchmark 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	Annualized Fund return < benchmark return - 0.40% for 6 consecutive months
<b>Fixed Income</b>	Fund return < benchmark return - 1.5%	Annualized Fund return < benchmark 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.

## Individual Manager Performance

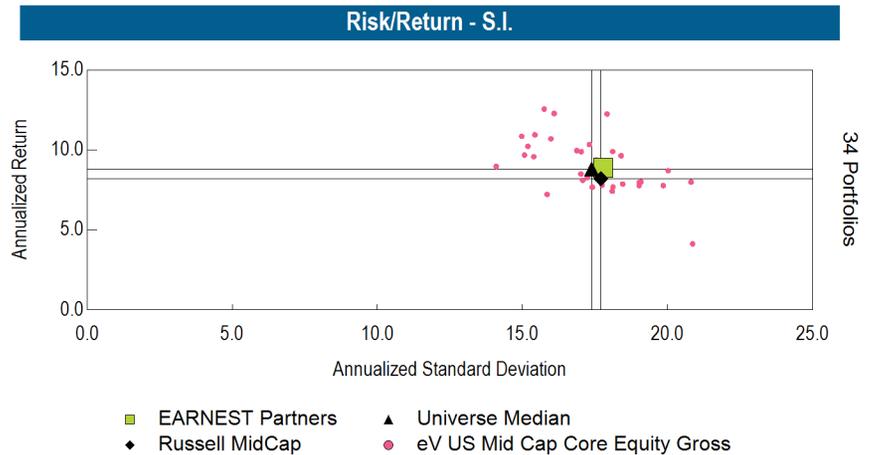
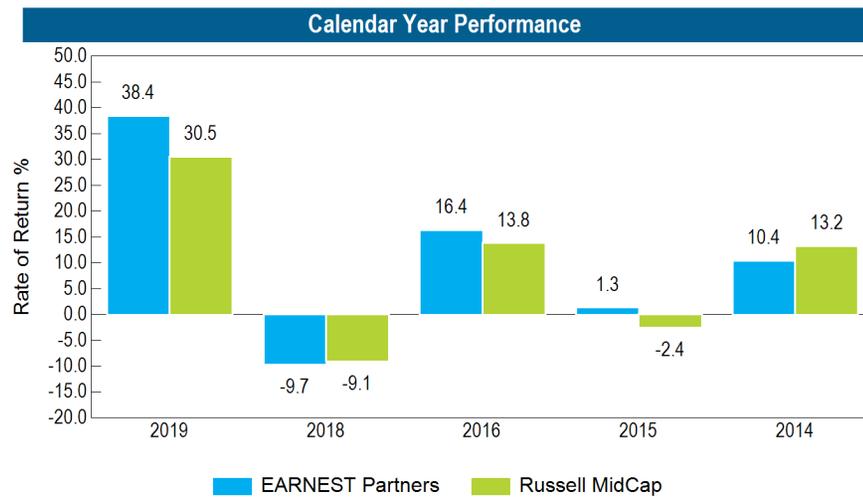
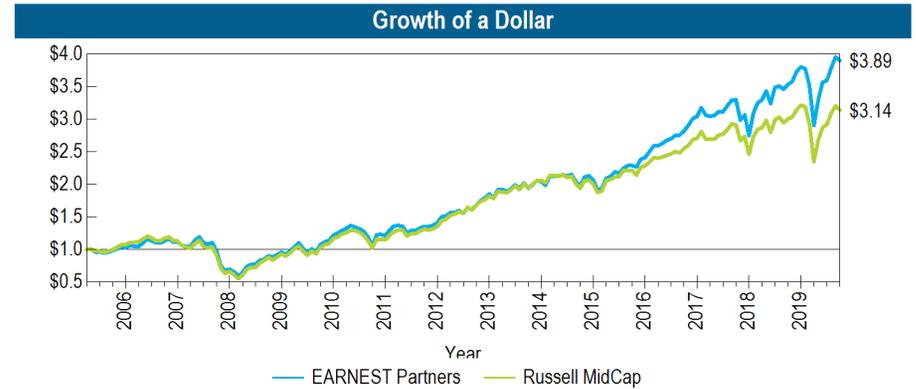
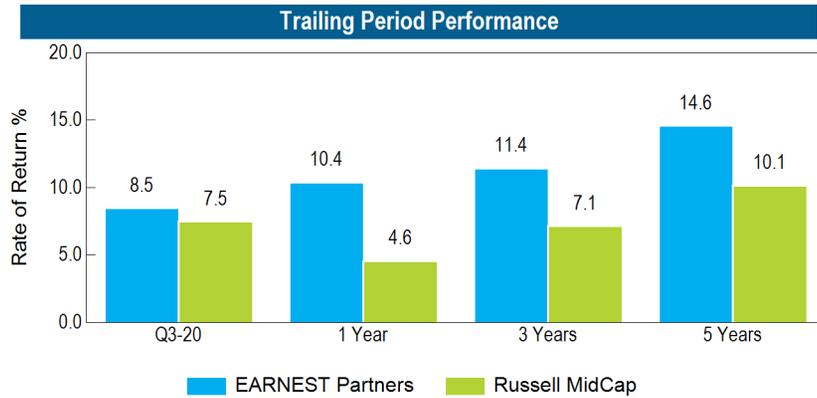
### Northern Trust Russell 1000 | As of September 30, 2020

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Mkt Capture Ratio	Down Mkt Capture Ratio
Northern Trust Russell 1000	0.00%	1.00	-0.70	0.95	0.13%	1.00	98.37%	99.75%
Russell 1000	0.00%	1.00	--	0.95	0.00%	1.00	100.00%	100.00%



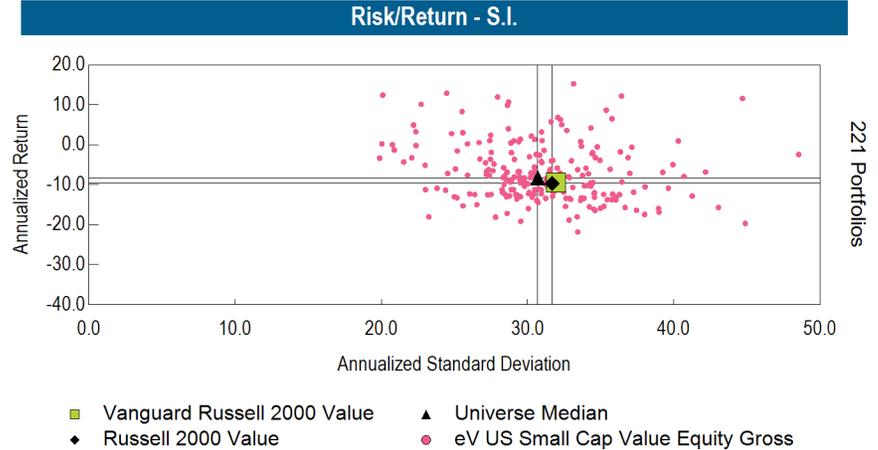
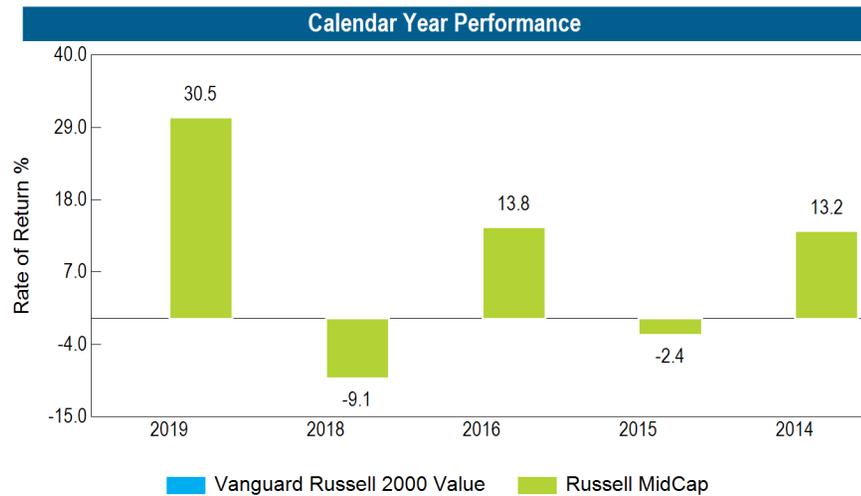
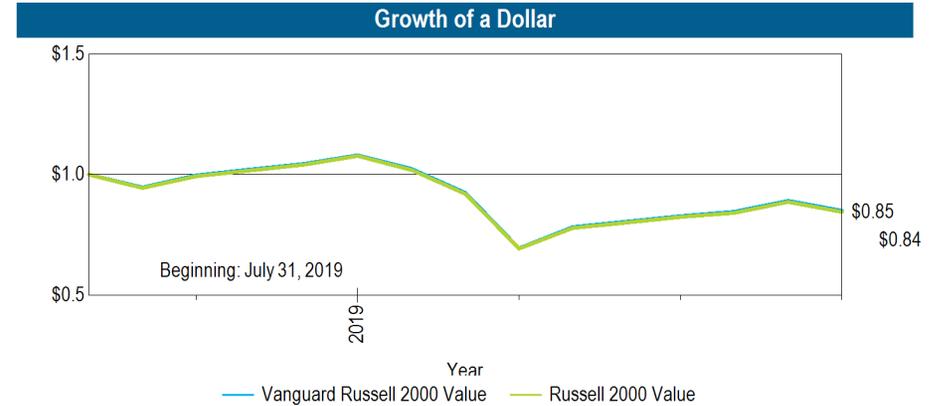
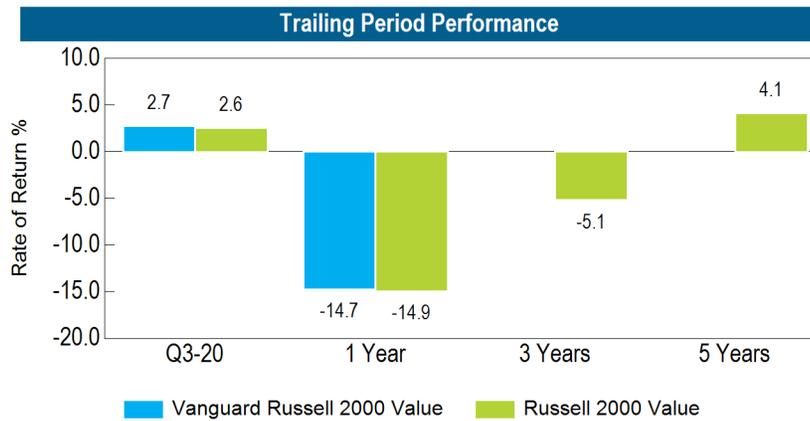
### EARNEST Partners | As of September 30, 2020

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Mkt Capture Ratio	Down Mkt Capture Ratio
EARNEST Partners	0.14%	0.99	0.49	0.49	3.32%	0.97	104.84%	98.69%
Russell MidCap	0.00%	1.00	--	0.40	0.00%	1.00	100.00%	100.00%



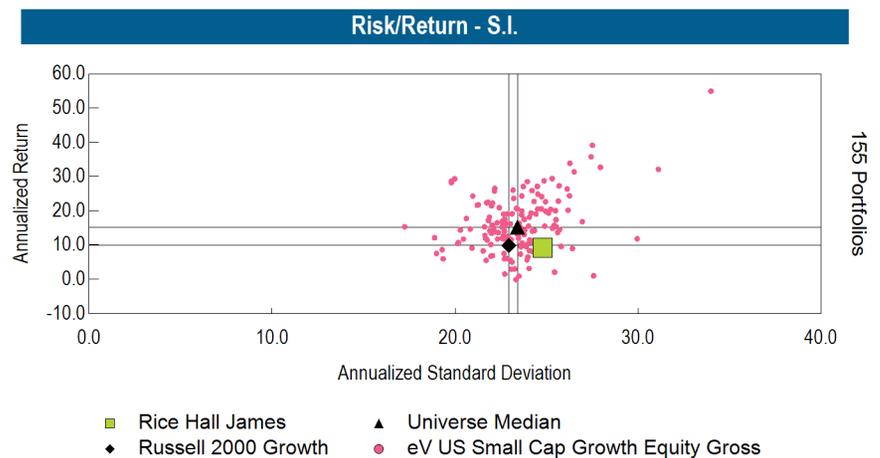
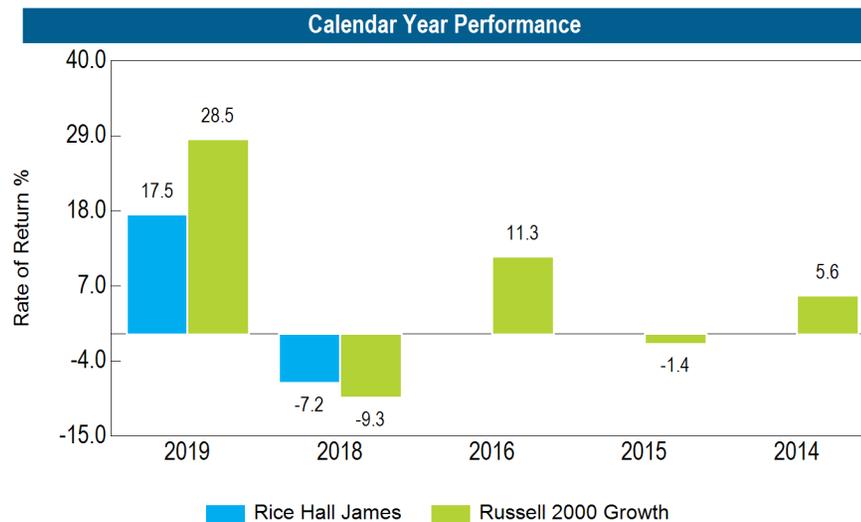
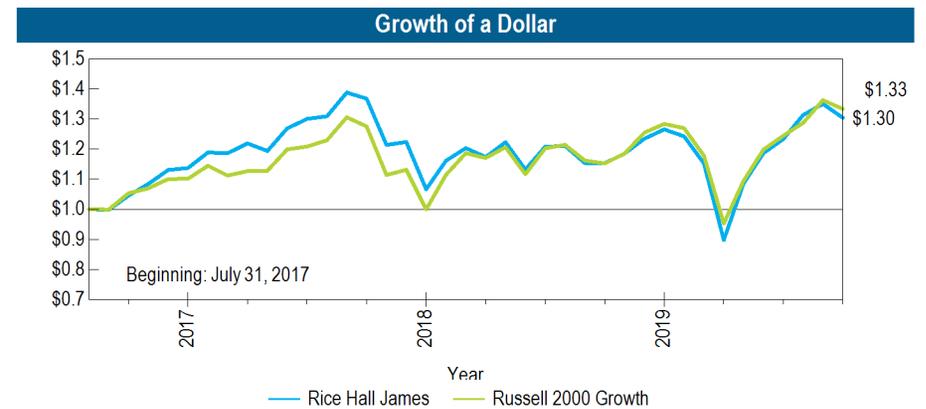
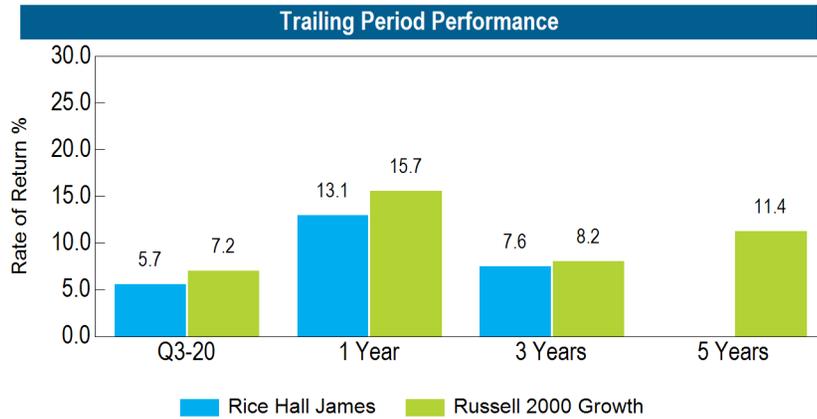
### Vanguard Russell 2000 Value | As of September 30, 2020

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Mkt Capture Ratio	Down Mkt Capture Ratio
Vanguard Russell 2000 Value	0.05%	1.01	0.92	-0.45	0.49%	1.00	101.17%	99.67%
Russell 2000 Value	0.00%	1.00	--	-0.47	0.00%	1.00	100.00%	100.00%



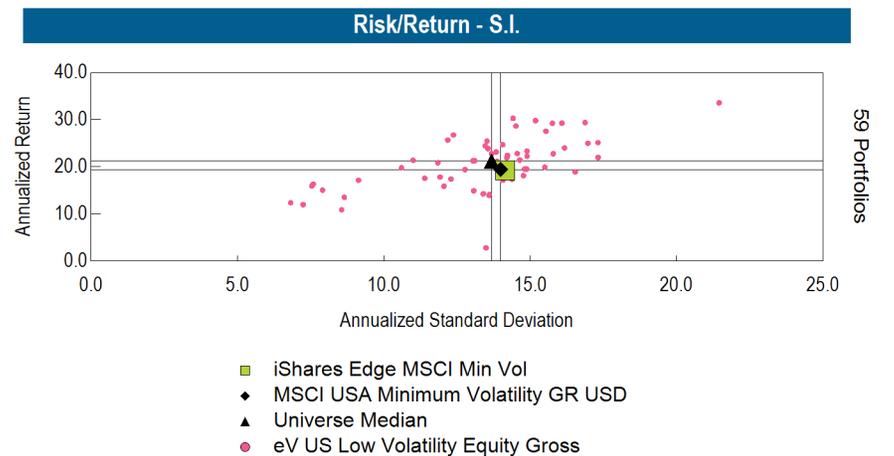
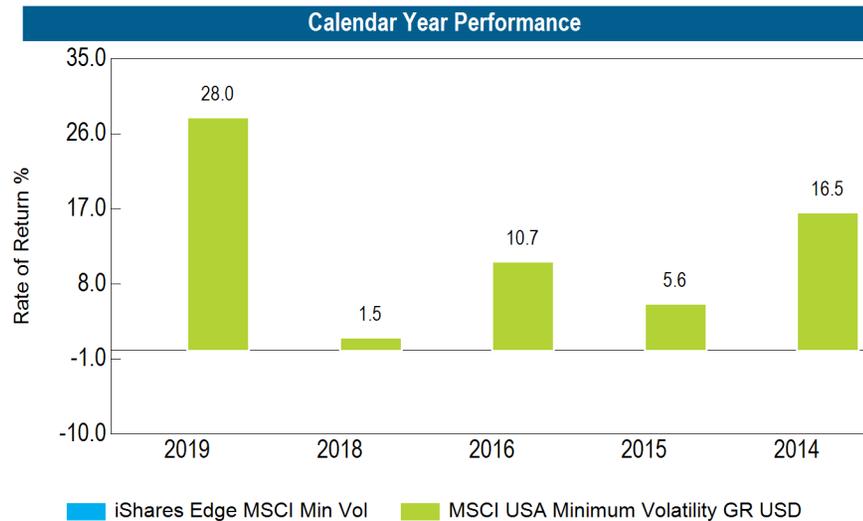
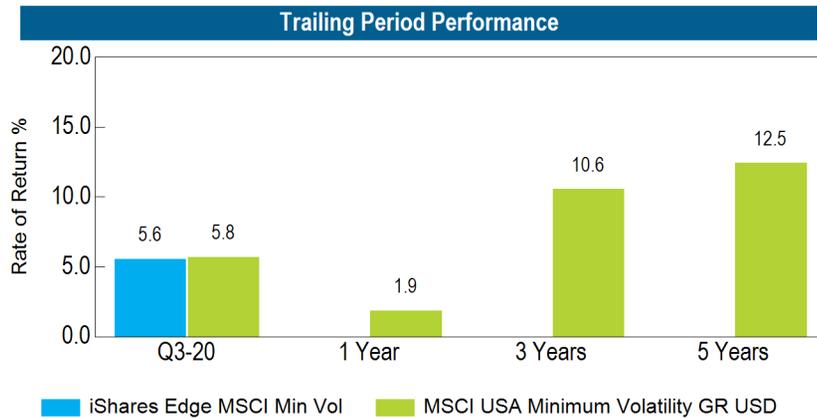
### Rice Hall James | As of September 30, 2020

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Mkt Capture Ratio	Down Mkt Capture Ratio
Rice Hall James	-0.07%	1.05	-0.12	0.29	6.24%	0.94	100.90%	102.37%
Russell 2000 Growth	0.00%	1.00	--	0.35	0.00%	1.00	100.00%	100.00%



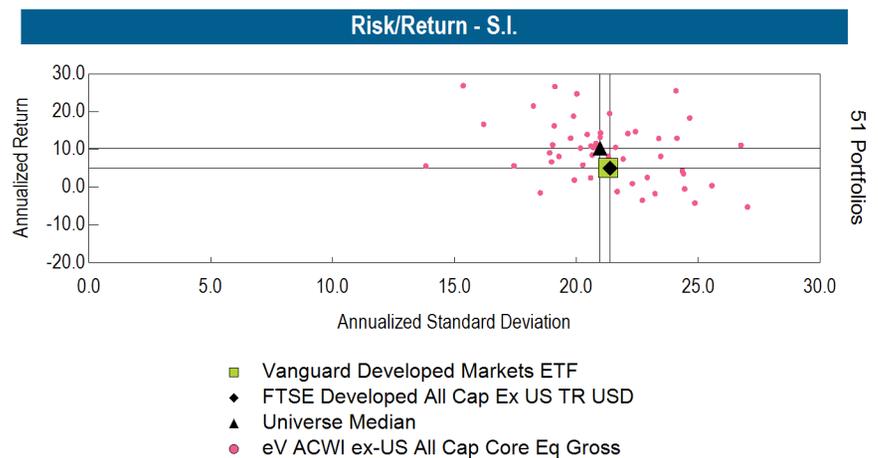
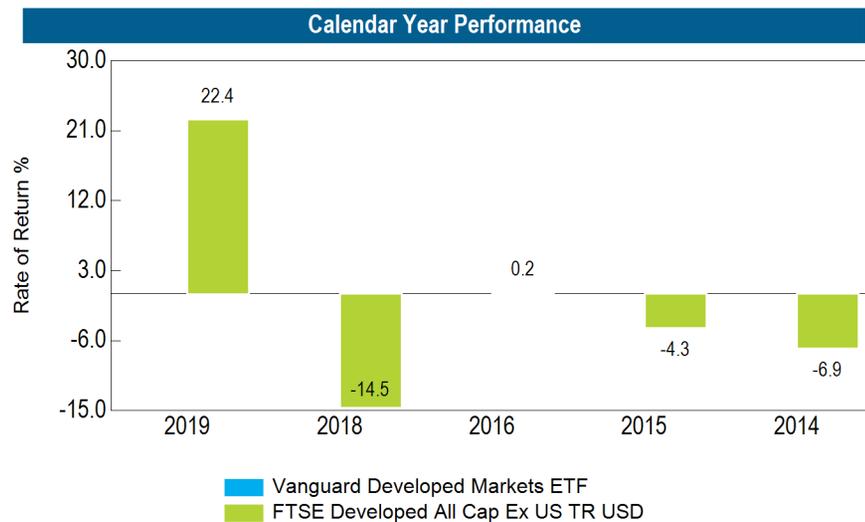
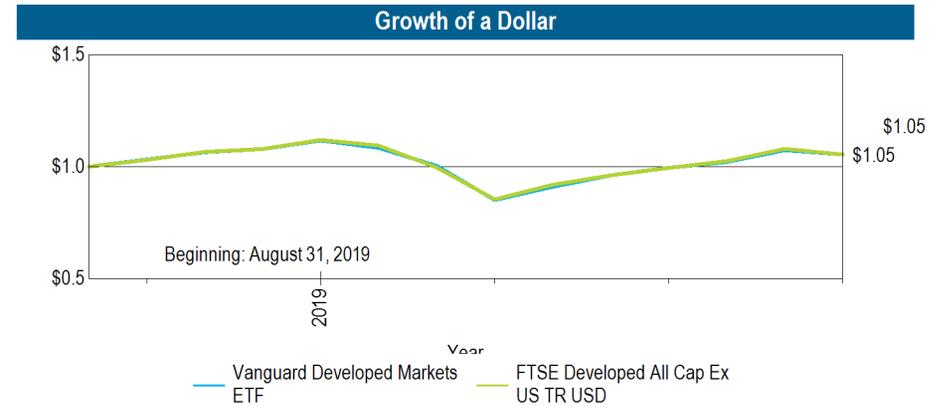
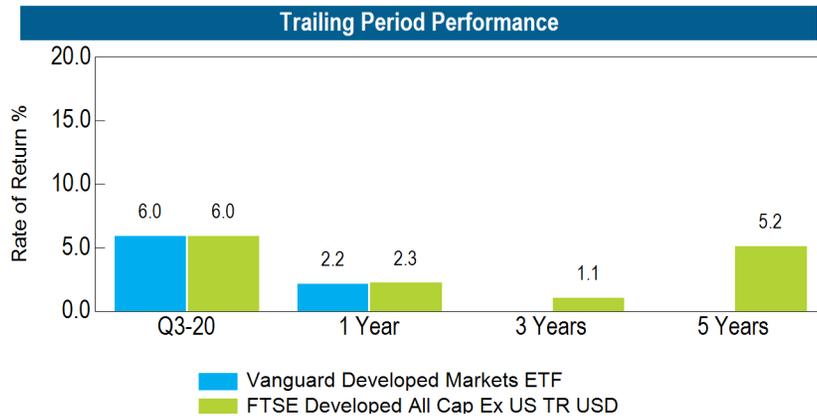
### iShares Edge MSCI Min Vol | As of September 30, 2020

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Mkt Capture Ratio	Down Mkt Capture Ratio
iShares Edge MSCI Min Vol	-0.06%	1.01	-0.66	1.35	0.28%	1.00	99.69%	103.64%
MSCI USA Minimum Volatility GR USD	0.00%	1.00	--	1.38	0.00%	1.00	100.00%	100.00%



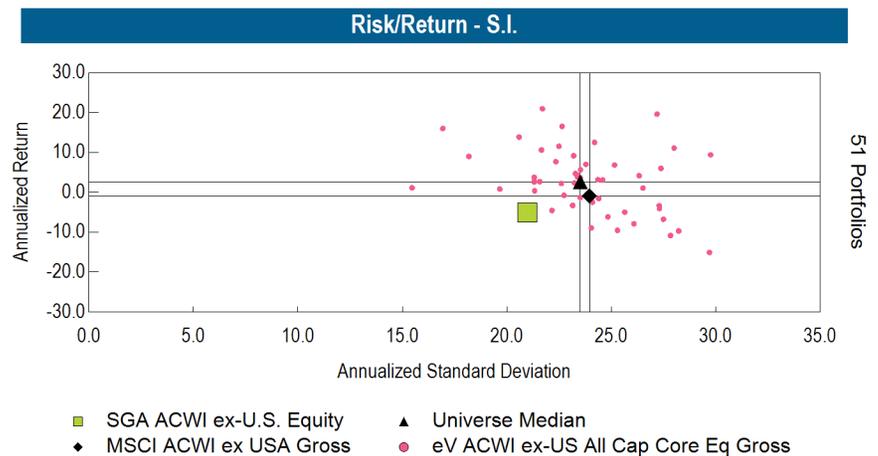
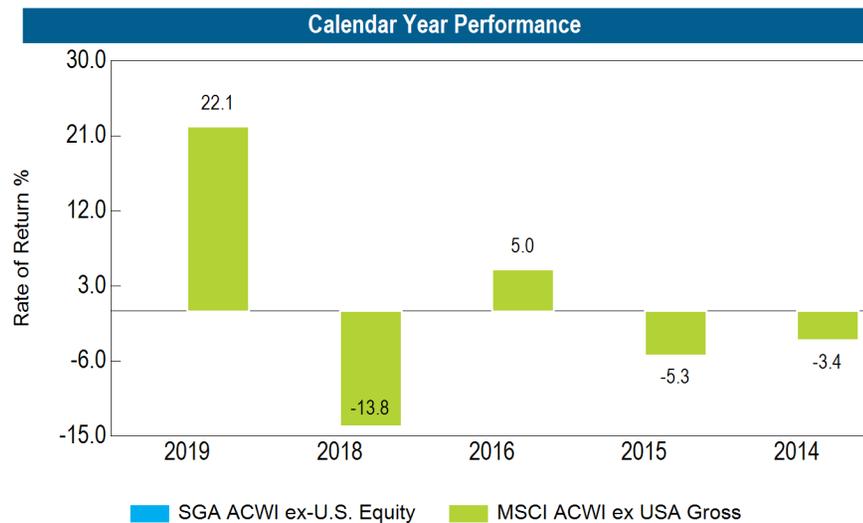
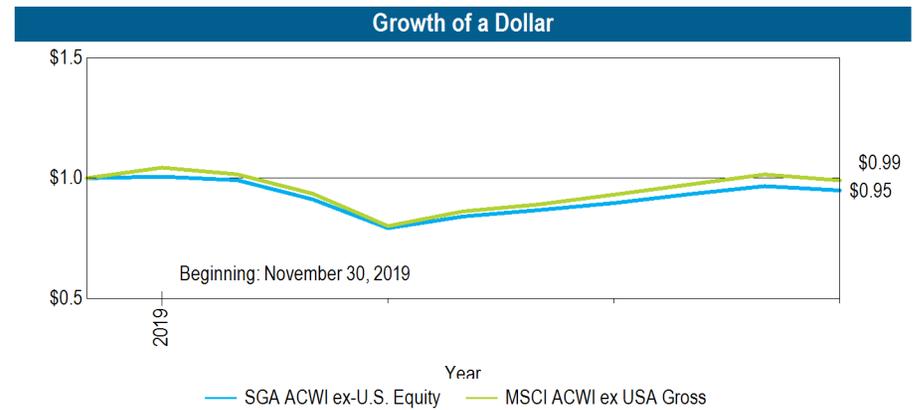
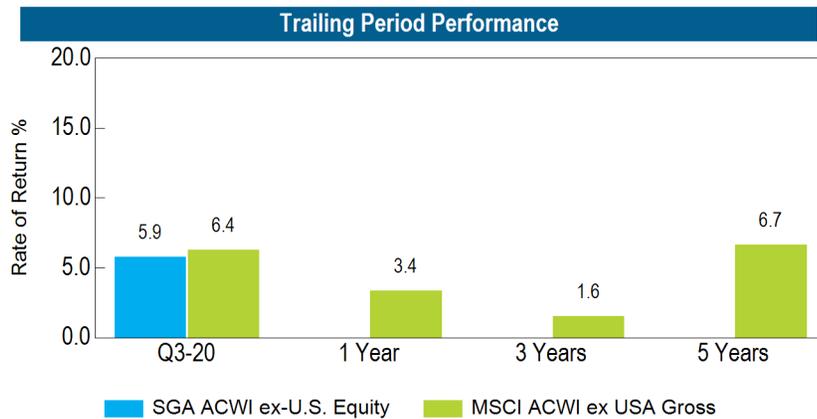
### Vanguard Developed Markets ETF | As of September 30, 2020

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Mkt Capture Ratio	Down Mkt Capture Ratio
Vanguard Developed Markets ETF	0.01%	0.99	0.02	0.19	2.27%	0.99	98.64%	98.68%
FTSE Developed All Cap Ex US TR USD	0.00%	1.00	--	0.19	0.00%	1.00	100.00%	100.00%



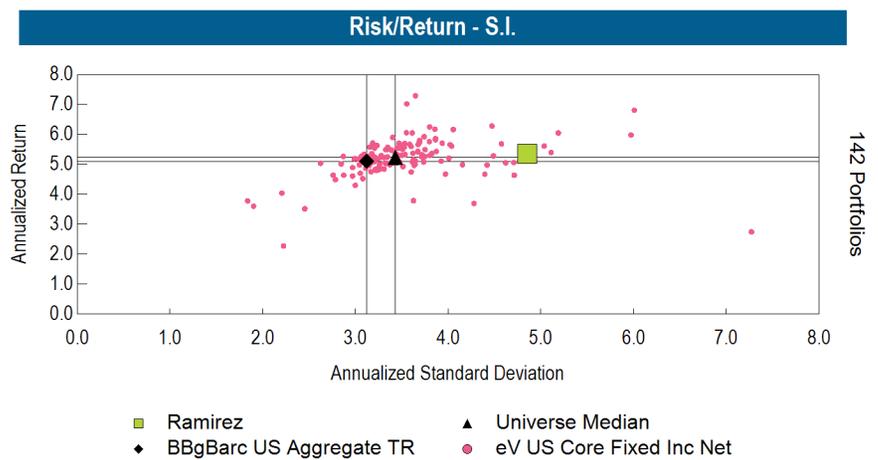
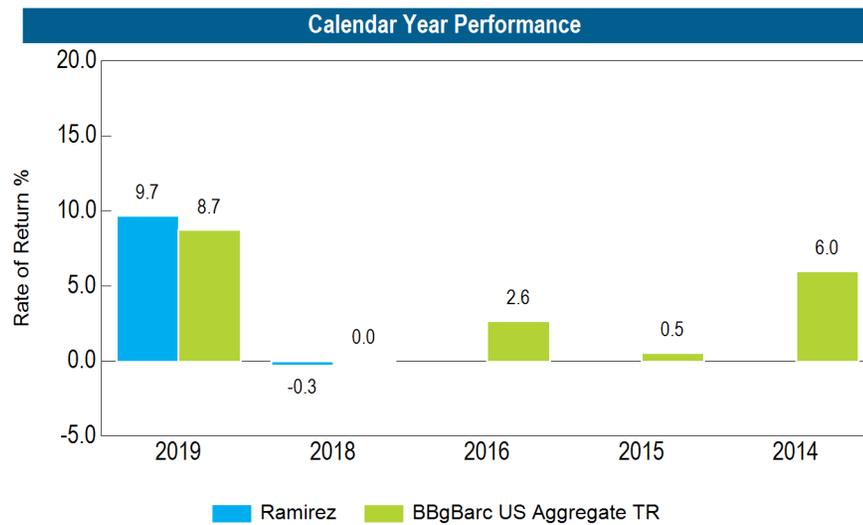
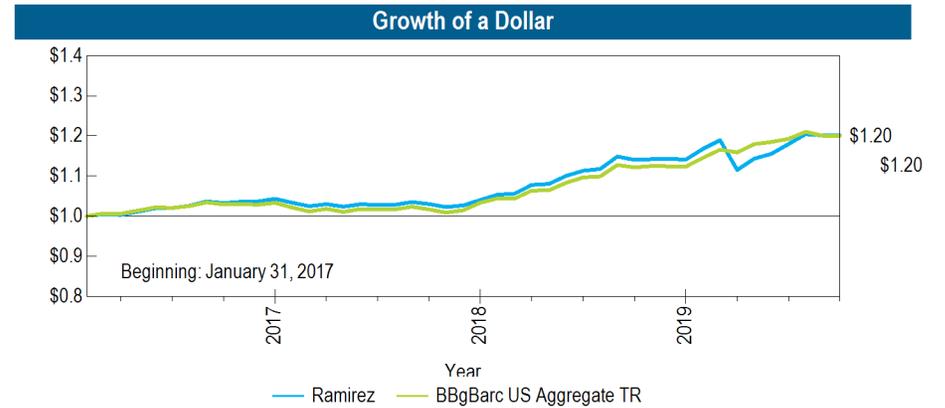
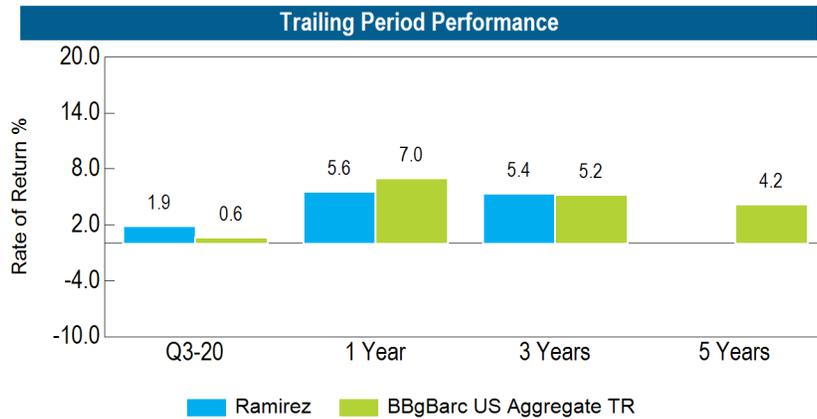
### SGA ACWI ex-U.S. Equity | As of September 30, 2020

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Mkt Capture Ratio	Down Mkt Capture Ratio
SGA ACWI ex-U.S. Equity	-0.46%	0.86	-0.81	-0.27	5.11%	0.97	70.62%	90.44%
MSCI ACWI ex USA Gross	0.00%	1.00	--	-0.06	0.00%	1.00	100.00%	100.00%



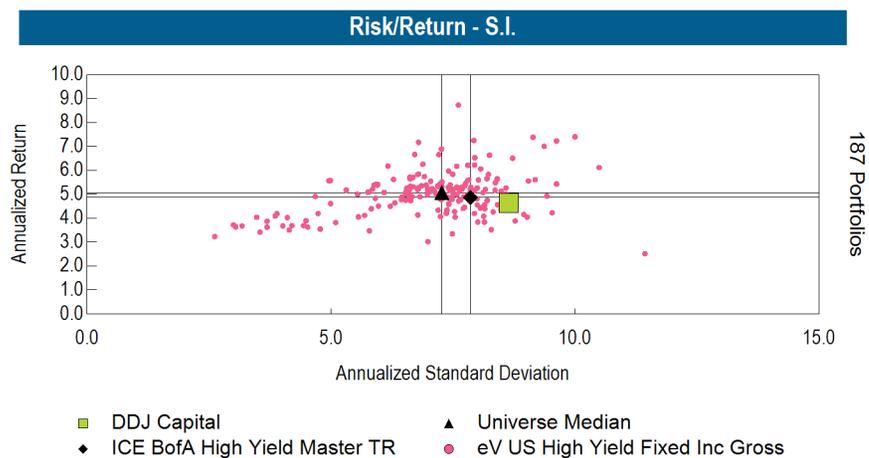
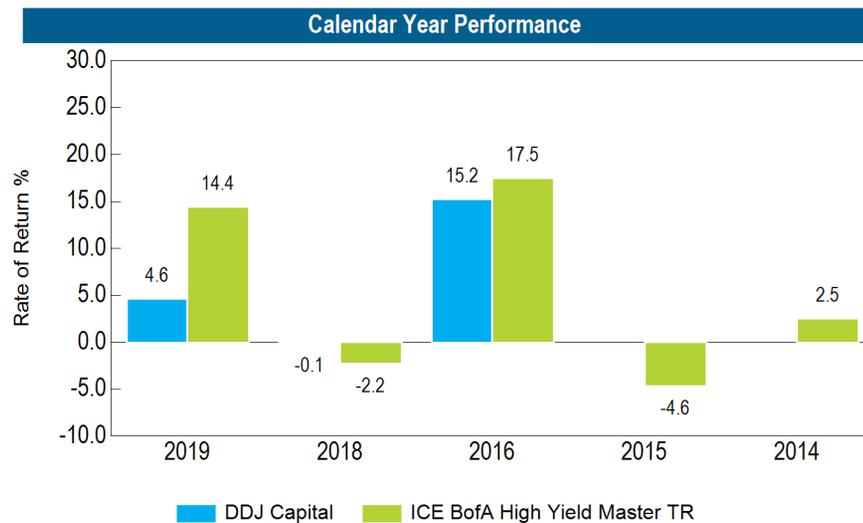
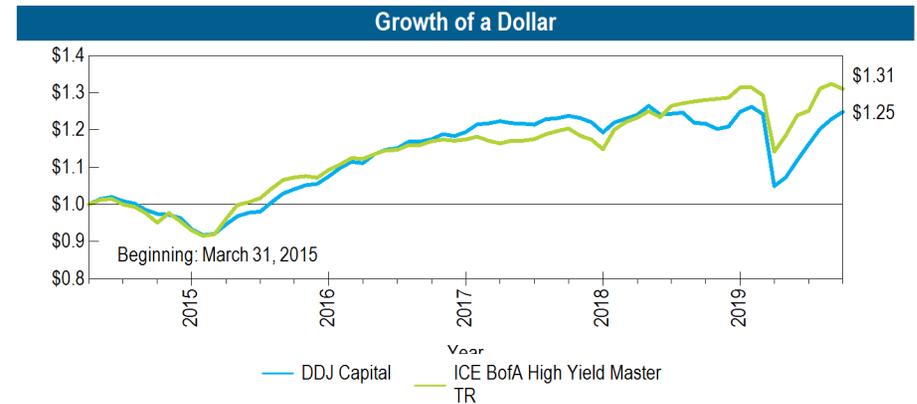
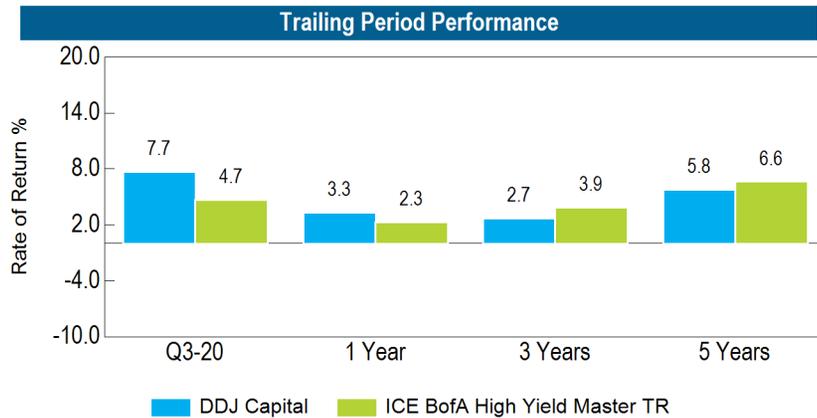
Ramirez | As of September 30, 2020

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Mkt Capture Ratio	Down Mkt Capture Ratio
Ramirez	-0.05%	1.18	0.08	0.80	3.21%	0.58	121.17%	149.04%
BBgBarc US Aggregate TR	0.00%	1.00	--	1.17	0.00%	1.00	100.00%	100.00%



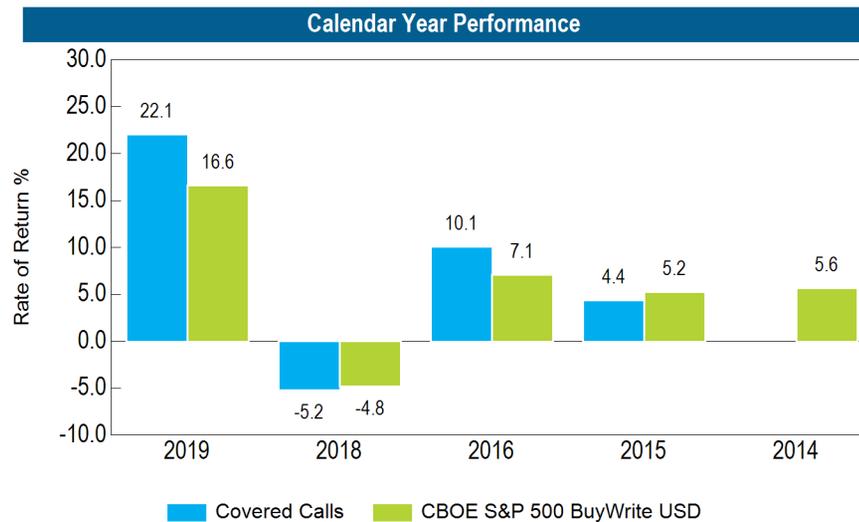
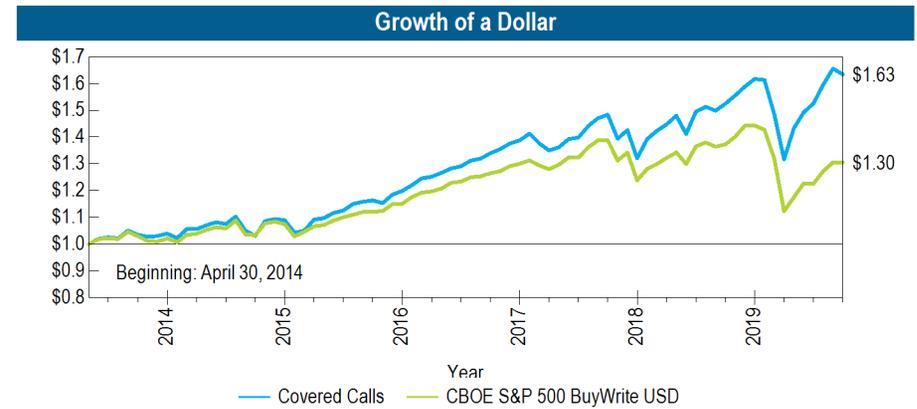
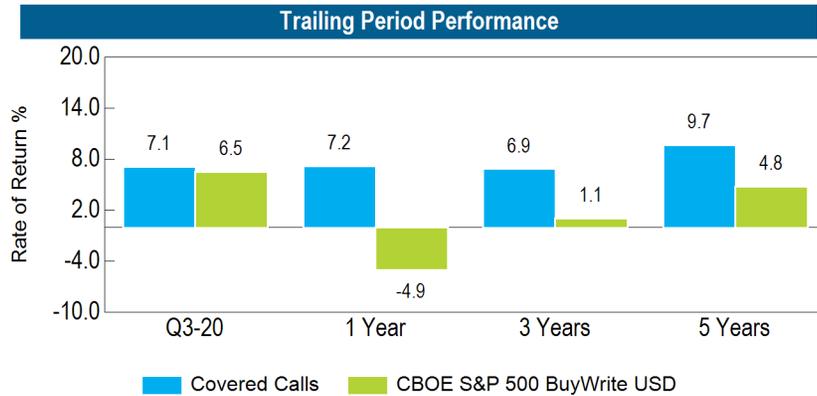
### DDJ Capital | As of September 30, 2020

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Mkt Capture Ratio	Down Mkt Capture Ratio
DDJ Capital	0.00%	0.97	-0.06	0.42	4.06%	0.78	86.77%	88.13%
ICE BofA High Yield Master TR	0.00%	1.00	--	0.49	0.00%	1.00	100.00%	100.00%



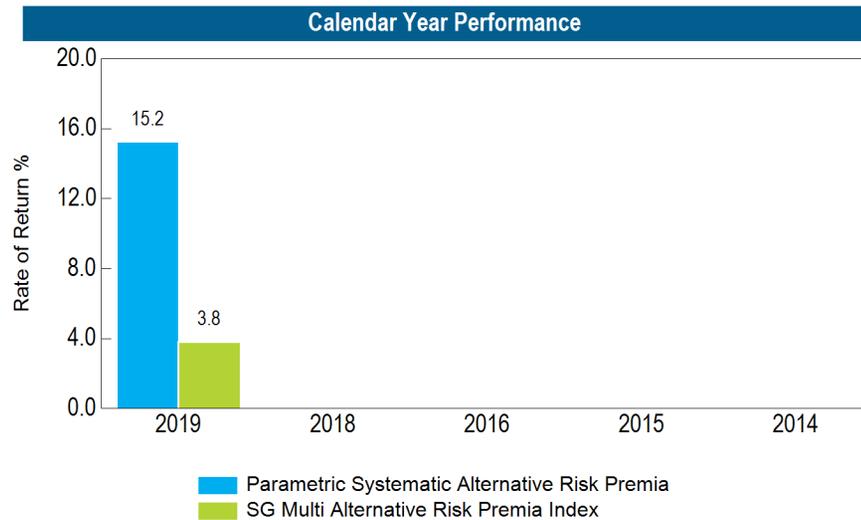
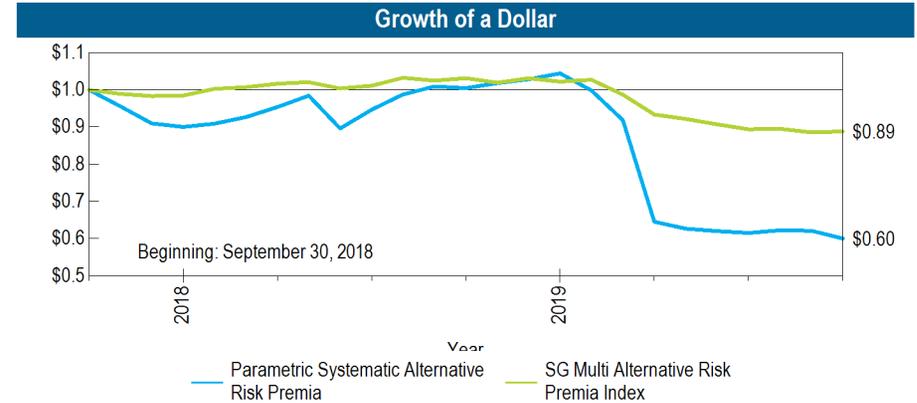
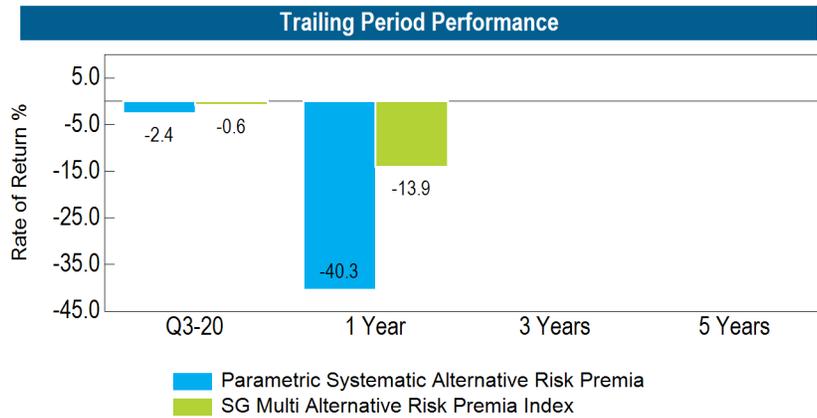
### Covered Calls | As of September 30, 2020

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Mkt Capture Ratio	Down Mkt Capture Ratio
Covered Calls	0.30%	0.99	1.13	0.67	3.30%	0.90	138.24%	97.36%
CBOE S&P 500 BuyWrite USD	0.00%	1.00	--	0.33	0.00%	1.00	100.00%	100.00%

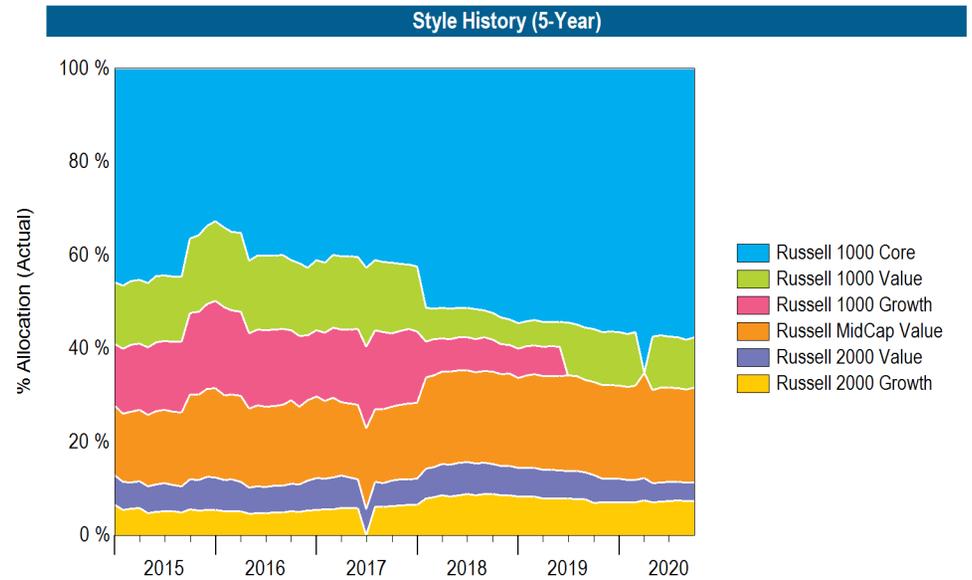
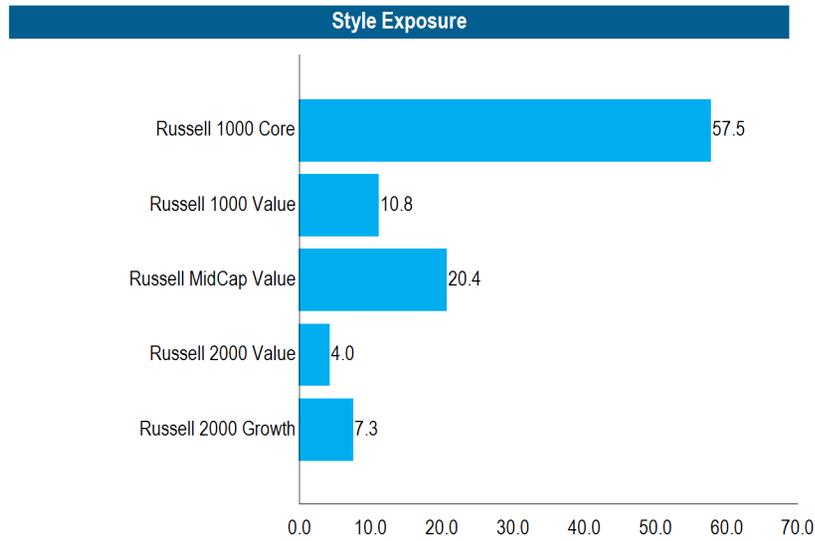
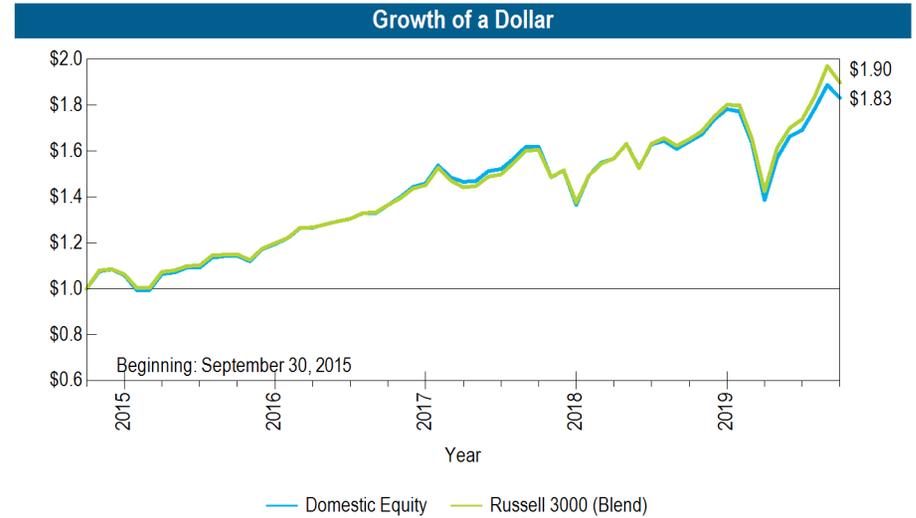
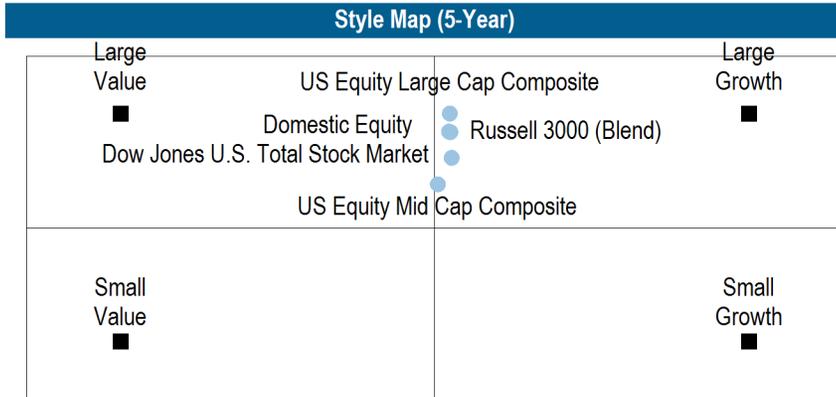


### Parametric Systematic Alternative Risk Premia | As of September 30, 2020

	Alpha	Beta	Information Ratio	Sharpe Ratio	Tracking Error	R-Squared	Up Mkt Capture Ratio	Down Mkt Capture Ratio
Parametric Systematic Alternative Risk Premia	-0.13%	3.31	-0.77	-0.92	19.68%	0.63	158.91%	243.77%
SG Multi Alternative Risk Premia Index	0.00%	1.00	--	-1.23	0.00%	1.00	100.00%	100.00%

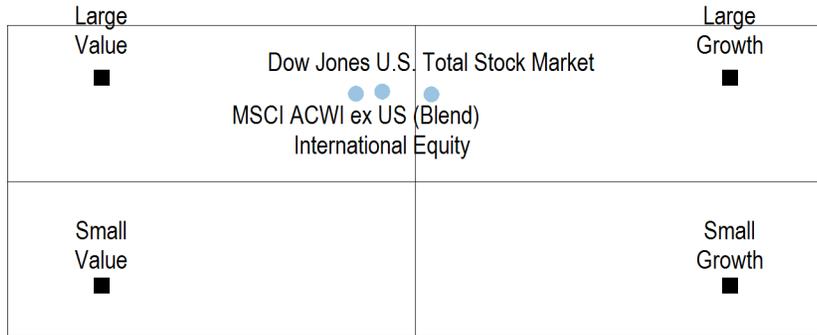


### Domestic Equity | As of September 30, 2020

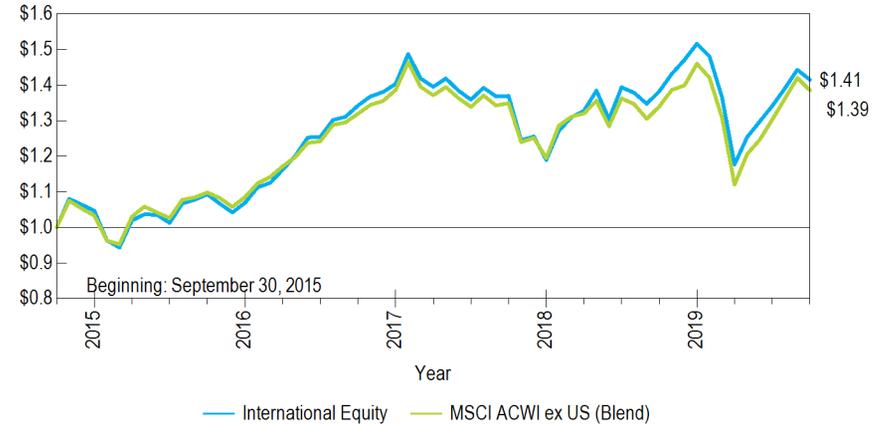


### International Equity | As of September 30, 2020

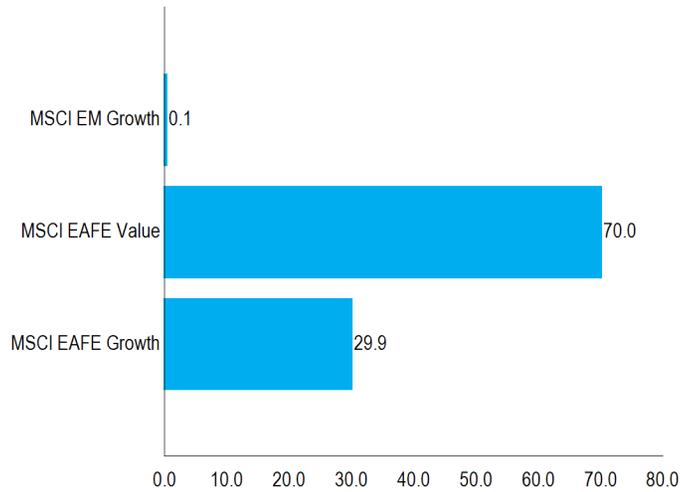
**U.S. Effective Style Map**  
5 Years Ending September 30, 2020



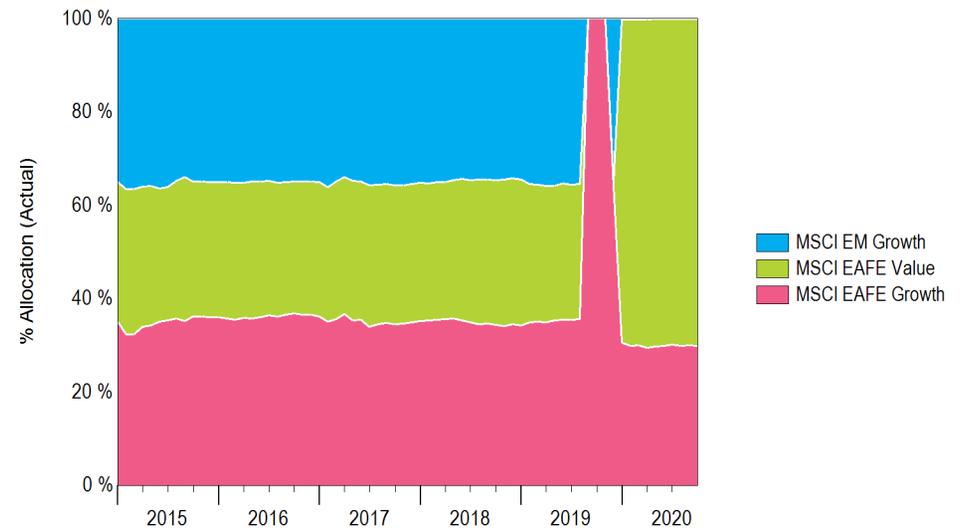
**Growth of a Dollar**  
5 Years Ending September 30, 2020



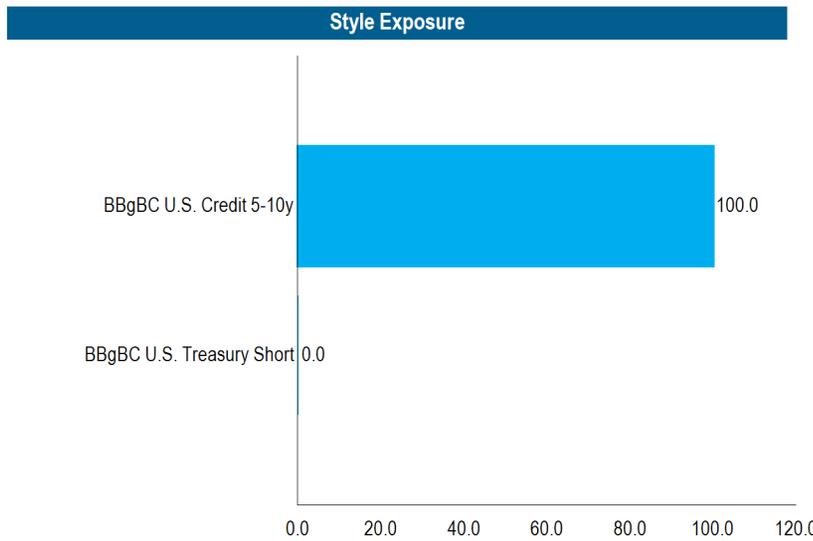
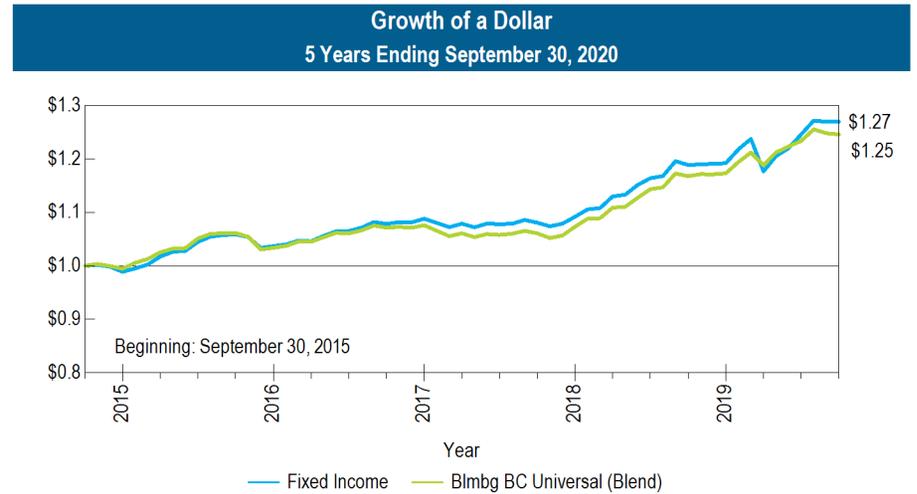
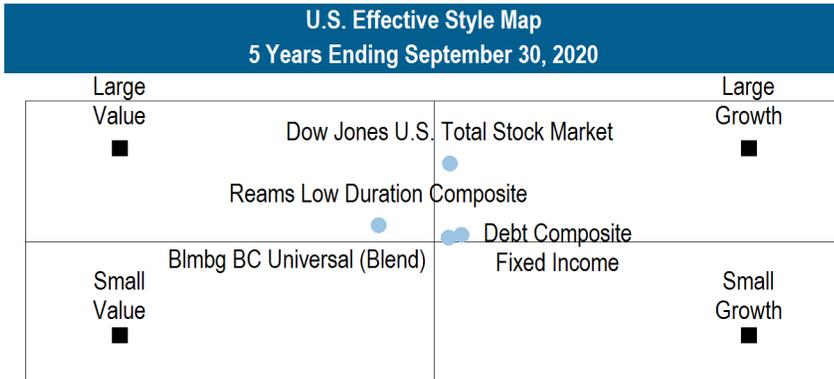
**Style Exposure**



**Style History (5-Year)**



### Fixed Income | As of September 30, 2020



## **Disclaimer, Glossary, and Notes**

WE HAVE PREPARED THIS REPORT (THIS "REPORT") FOR THE SOLE BENEFIT OF THE INTENDED RECIPIENT (THE "RECIPIENT").

SIGNIFICANT EVENTS MAY OCCUR (OR HAVE OCCURRED) AFTER THE DATE OF THIS REPORT AND THAT IT IS NOT OUR FUNCTION OR RESPONSIBILITY TO UPDATE THIS REPORT. ANY OPINIONS OR RECOMMENDATIONS PRESENTED HEREIN REPRESENT OUR GOOD FAITH VIEWS AS OF THE DATE OF THIS REPORT AND ARE SUBJECT TO CHANGE AT ANY TIME. ALL INVESTMENTS INVOLVE RISK. THERE CAN BE NO GUARANTEE THAT THE STRATEGIES, TACTICS, AND METHODS DISCUSSED HERE WILL BE SUCCESSFUL.

INFORMATION USED TO PREPARE THIS REPORT WAS OBTAINED FROM INVESTMENT MANAGERS, CUSTODIANS, AND OTHER EXTERNAL SOURCES. WHILE WE HAVE EXERCISED REASONABLE CARE IN PREPARING THIS REPORT, WE CANNOT GUARANTEE THE ACCURACY OF ALL SOURCE INFORMATION CONTAINED HEREIN.

CERTAIN INFORMATION CONTAINED IN THIS REPORT MAY CONSTITUTE "FORWARD - LOOKING STATEMENTS," WHICH CAN BE IDENTIFIED BY THE USE OF TERMINOLOGY SUCH AS "MAY," "WILL," "SHOULD," "EXPECT," "AIM," "ANTICIPATE," "TARGET," "PROJECT," "ESTIMATE," "INTEND," "CONTINUE" OR "BELIEVE," OR THE NEGATIVES THEREOF OR OTHER VARIATIONS THEREON OR COMPARABLE TERMINOLOGY. ANY FORWARD-LOOKING STATEMENTS, FORECASTS, PROJECTIONS, VALUATIONS, OR RESULTS IN THIS PRESENTATION ARE BASED UPON CURRENT ASSUMPTIONS. CHANGES TO ANY ASSUMPTIONS MAY HAVE A MATERIAL IMPACT ON FORWARD - LOOKING STATEMENTS, FORECASTS, PROJECTIONS, VALUATIONS, OR RESULTS. ACTUAL RESULTS MAY THEREFORE BE MATERIALLY DIFFERENT FROM ANY FORECASTS, PROJECTIONS, VALUATIONS, OR RESULTS IN THIS PRESENTATION.

PERFORMANCE DATA CONTAINED HEREIN REPRESENT PAST PERFORMANCE. PAST PERFORMANCE IS NO GUARANTEE OF FUTURE RESULTS.

**Credit Risk:** Refers to the risk that the issuer of a fixed income security may default (i.e., the issuer will be unable to make timely principal and/or interest payments on the security.)

**Duration:** Measure of the sensitivity of the price of a bond to a change in its yield to maturity. Duration summarizes, in a single number, the characteristics that cause bond prices to change in response to a change in interest rates. For example, the price of a bond with a duration of three years will rise by approximately 3% for each 1% decrease in its yield to maturity. Conversely, the price will decrease 3% for each 1% increase in the bond's yield. Price changes for two different bonds can be compared using duration. A bond with a duration of six years will exhibit twice the percentage price change of a bond with a three-year duration. The actual calculation of a bond's duration is somewhat complicated, but the idea behind the calculation is straightforward. The first step is to measure the time interval until receipt for each cash flow (coupon and principal payments) from a bond. The second step is to compute a weighted average of these time intervals. Each time interval is measured by the present value of that cash flow. This weighted average is the duration of the bond measured in years.

**Information Ratio:** This statistic is a measure of the consistency of a portfolio's performance relative to a benchmark. It is calculated by subtracting the benchmark return from the portfolio return (excess return), and dividing the resulting excess return by the standard deviation (volatility) of this excess return. A positive information ratio indicates outperformance versus the benchmark, and the higher the information ratio, the more consistent the outperformance.

**Jensen's Alpha:** A measure of the average return of a portfolio or investment in excess of what is predicted by its beta or "market" risk.  $\text{Portfolio Return} - [\text{Risk Free Rate} + \text{Beta} * (\text{market return} - \text{Risk Free Rate})]$ .

**Market Capitalization:** For a firm, market capitalization is the total market value of outstanding common stock. For a portfolio, market capitalization is the sum of the capitalization of each company weighted by the ratio of holdings in that company to total portfolio holdings; thus it is a weighted-average capitalization. Meketa Investment Group considers the largest 65% of the broad domestic equity market as large capitalization, the next 25% of the market as medium capitalization, and the smallest 10% of stocks as small capitalization.

**Market Weighted:** Stocks in many indices are weighted based on the total market capitalization of the issue. Thus, the individual returns of higher market-capitalization issues will more heavily influence an index's return than the returns of the smaller market-capitalization issues in the index.

**Maturity:** The date on which a loan, bond, mortgage, or other debt/security becomes due and is to be paid off.

**Prepayment Risk:** The risk that prepayments will increase (homeowners will prepay all or part of their mortgage) when mortgage interest rates decline; hence, investors' monies will be returned to them in a lower interest rate environment. Also, the risk that prepayments will slow down when mortgage interest rates rise; hence, investors will not have as much money as previously anticipated in a higher interest rate environment. A prepayment is any payment in excess of the scheduled mortgage payment.

**Price-Book Value (P/B) Ratio:** The current market price of a stock divided by its book value per share. Meketa Investment Group calculates P/B as the current price divided by Compustat's quarterly common equity. Common equity includes common stock, capital surplus, retained earnings, and treasury stock adjusted for both common and nonredeemable preferred stock. Similar to high P/E stocks, stocks with high P/B's tend to be riskier investments.

**Price-Earnings (P/E) Ratio:** A stock's market price divided by its current or estimated future earnings. Lower P/E ratios often characterize stocks in low growth or mature industries, stocks in groups that have fallen out of favor, or stocks of established blue chip companies with long records of stable earnings and regular dividends. Sometimes a company that has good fundamentals may be viewed unfavorably by the market if it is an industry that is temporarily out of favor. Or a business may have experienced financial problems causing investors to be skeptical about its future. Either of these situations would result in lower relative P/E ratios. Some stocks exhibit above-average sales and earnings growth or expectations for above average growth. Consequently, investors are willing to pay more for these companies' earnings, which results in elevated P/E ratios. In other words, investors will pay more for shares of companies whose profits, in their opinion, are expected to increase faster than average. Because future events are in no way assured, high P/E stocks tend to be riskier and more volatile investments. Meketa Investment Group calculates P/E as the current price divided by the I/B/E/S consensus of twelve-month forecast earnings per share.

**Quality Rating:** The rank assigned a security by such rating services as Fitch, Moody's, and Standard & Poor's. The rating may be determined by such factors as (1) the likelihood of fulfillment of dividend, income, and principal payment of obligations; (2) the nature and provisions of the issue; and (3) the security's relative position in the event of liquidation of the company. Bonds assigned the top four grades (AAA, AA, A, BBB) are considered investment grade because they are eligible bank investments as determined by the controller of the currency.

**Sharpe Ratio:** A commonly used measure of risk-adjusted return. It is calculated by subtracting the risk free return (usually three-month Treasury bill) from the portfolio return and dividing the resulting excess return by the portfolio's total risk level (standard deviation). The result is a measure of return per unit of total risk taken. The higher the Sharpe ratio, the better the fund's historical risk adjusted performance.

**STIF Account:** Short-term investment fund at a custodian bank that invests in cash-equivalent instruments. It is generally used to safely invest the excess cash held by portfolio managers.

**Standard Deviation:** A measure of the total risk of an asset or a portfolio. Standard deviation measures the dispersion of a set of numbers around a central point (e.g., the average return). If the standard deviation is small, the distribution is concentrated within a narrow range of values. For a normal distribution, about two thirds of the observations will fall within one standard deviation of the mean, and 95% of the observations will fall within two standard deviations of the mean.

**Style:** The description of the type of approach and strategy utilized by an investment manager to manage funds. For example, the style for equities is determined by portfolio characteristics such as price-to-book value, price-to-earnings ratio, and dividend yield. Equity styles include growth, value, and core.

**Tracking Error:** A divergence between the price behavior of a position or a portfolio and the price behavior of a benchmark, as defined by the difference in standard deviation.

**Yield to Maturity:** The yield, or return, provided by a bond to its maturity date; determined by a mathematical process, usually requiring the use of a “basis book.” For example, a 5% bond pays \$5 a year interest on each \$100 par value. To figure its current yield, divide \$5 by \$95—the market price of the bond—and you get 5.26%. Assume that the same bond is due to mature in five years. On the maturity date, the issuer is pledged to pay \$100 for the bond that can be bought now for \$95. In other words, the bond is selling at a discount of 5% below par value. To figure yield to maturity, a simple and approximate method is to divide 5% by the five years to maturity, which equals 1% pro rata yearly. Add that 1% to the 5.26% current yield, and the yield to maturity is roughly 6.26%.

$$\frac{5\% \text{ (discount)}}{5 \text{ (yrs. to maturity)}} = 1\% \text{ pro rata, plus } 5.26\% \text{ (current yield)} = 6.26\% \text{ (yield to maturity)}$$

**Yield to Worst:** The lowest potential yield that can be received on a bond without the issuer actually defaulting. The yield to worst is calculated by making worst-case scenario assumptions on the issue by calculating the returns that would be received if provisions, including prepayment, call, or sinking fund, are used by the issuer.

**NCREIF Property Index (NPI):** Measures unleveraged investment performance of a very large pool of individual commercial real estate properties acquired in the private market by tax-exempt institutional investors for investment purposes only. The NPI index is capitalization-weighted for a quarterly time series composite total rate of return.

**NCREIF Fund Index - Open End Diversified Core Equity (NFI-ODCE):** Measures the investment performance of 28 open-end commingled funds pursuing a core investment strategy that reflects funds' leverage and cash positions. The NFI-ODCE index is equal-weighted and is reported gross and net of fees for a quarterly time series composite total rate of return.

Sources: Investment Terminology, International Foundation of Employee Benefit Plans, 1999.  
The Handbook of Fixed Income Securities, Fabozzi, Frank J., 1991

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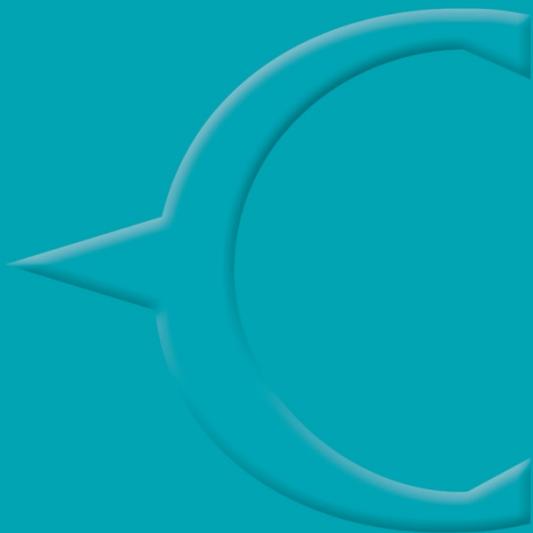
Throughout this report, numbers may not sum due to rounding.

Returns for periods greater than one year are annualized throughout this report.

Values shown are in millions of dollars, unless noted otherwise.

**ATTACHMENT B:**

**Oakland Police and Fire System Actuarial  
Valuation Report**



## **Oakland Police and Fire Retirement System**

**Actuarial Valuation Report  
as of July 1, 2020**

**Produced by Cheiron**

**January 2021**

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January 14, 2021

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, 2020. 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. 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.

The assumptions used in this report were adopted by the Board of Administration with our input at the February 28, 2018 Board meeting based on recommendations from our experience study covering plan experience for the period from July 1, 2014 through ending June 30, 2017. We believe these assumptions are reasonable for the purpose of the valuation.

The funding ratios in this report are for the purpose of establishing contribution rates. These measures are not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations.

Cheiron utilizes ProVal actuarial valuation software leased from Winklevoss Technologies (WinTech) to calculate liabilities and project benefit payments. We have relied on WinTech as the developer of ProVal. We have a basic understanding of ProVal and have used ProVal in accordance with its original intended purpose. We have not identified any material inconsistencies in assumptions or output of ProVal that would affect this valuation.

Deterministic projections in this valuation report were developed using P-scan, a proprietary tool used to illustrate the impact of changes in assumptions, methods, plan provisions, or actual experience (particularly investment experience) on the future financial status of the Plan. P-scan uses standard roll-forward techniques. Because P-scan does not automatically capture how changes in one variable affect all other variables, some scenarios may not be consistent.

Stochastic projections in this valuation report were developed using R-scan, our proprietary tool for assessing the probability of different outcomes based on a range of potential investment

City of Oakland Police and Fire  
Retirement System Board  
January 14, 2021

returns. We relied on Cheiron colleagues for the development of the model. The stochastic projections of investment returns assume that each future year's investment return is independent from all other years and is identically distributed according to a lognormal distribution. The standard deviation used in the stochastic projection of investment returns was provided by the Plan's investment consultant.

Future actuarial measurements may differ significantly from the current measurements due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; and changes in plan provisions or applicable law.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. 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, 2020**

**FOREWORD**

Cheiron has performed the actuarial valuation of the Oakland Police and Fire Retirement System (PFRS, the Plan) as of July 1, 2020. 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 – Identification and Assessment of Risks
  - Section III – Assets
  - Section IV – Liabilities
  - Section V – Contributions
  - Section VI – 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 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, 2020**

**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,
- Calculation of the actuarially determined contributions for years beginning in Fiscal Year 2021-2022, and
- An assessment and disclosure of key risks.

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 2021-2022.

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. A new Memorandum of Understanding (MOU) went effect for Fire members since the previous valuation, changing Fire retirees' expected Cost-of-Living Adjustments (COLAs). There has been no other changes to the actuarial assumptions or methods since the prior valuation.

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2020**

**SECTION I – EXECUTIVE SUMMARY**

**B. Key Findings of this Valuation**

The key results of the July 1, 2020 actuarial valuation are as follows:

- The actuarially determined employer contribution amount for Fiscal Year 2021-2022 is \$43.8 million, based on projecting the Actuarial Liabilities and the Actuarial Value of Assets to the end of the 2020-2021 Fiscal Year. This represents a decrease of \$0.3 million from the estimated amount in the prior valuation for the same Fiscal Year. The contribution is assumed to be paid in equal installments throughout the year, or on average at approximately January 1, 2022.
- During the year ended June 30, 2020, the return on Plan assets was 1.85% on a market value basis net of investment expenses, as compared to the 6.00% assumption for the 2019-2020 Plan year. This resulted in a market value loss on investments of \$15.7 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 6.53%, for an actuarial asset gain of \$1.9 million.
- The Plan experienced a gain on the Actuarial Liability of \$0.4 million, the net result of changes in the population and changes in benefits. Combining the liability and asset gains, the Plan experienced a total gain of \$2.3 million.
- A new Memorandum of Understanding (MOU) went into effect for Fire members since the previous valuation, changing Fire retirees' Cost-of-Living Adjustments (COLAs). This change in COLAs decreased the Actuarial Liability by \$6.5 million since the scheduled increases under the new MOUs were lower than the amounts originally assumed, in aggregate.
- The Plan's smoothed funded ratio, the ratio of Actuarial Value of Assets over Actuarial Liability, increased from 58.0% last year to 62.2% on an AVA basis as of June 30, 2020.
- The Plan's funded ratio increased from 61.8% to 63.5% on a Market Value of Assets (MVA) basis.
- The Unfunded Actuarial Liability (UAL) is the excess of the Plan's Actuarial Liability over the Actuarial Value of Assets. The Plan experienced a decrease in the UAL from \$261.8 million to \$225.5 million as of July 1, 2020.
- Overall participant membership decreased compared to last year. 28 members died, 15 of whom had their benefits continue to a surviving spouse. In addition, 17 surviving beneficiaries died. There are no active members of the Plan.

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2020**

**SECTION I – EXECUTIVE SUMMARY**

- If the contribution was determined using a projected asset value based on the current market (i.e., non-smoothed) value of assets, the contribution for FY 2021-2022 would be \$42.4 million. The contribution is smaller than that determined using the projected AVA, because the current market value reflects the full amount of prior investment gains, while under the AVA projection a portion of those gains are deferred until years after FY 2021-2022.

Below we present Table I-1 that 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, 2019	July 1, 2020	% Change
<b><u>Participant Counts</u></b>			
Active Participants	0	0	
Participants Receiving a Benefit	798	768	-3.8%
<b>Total</b>	<b>798</b>	<b>768</b>	<b>-3.8%</b>
Annual Pay of Active Members	\$ 0	\$ 0	
<b><u>Assets and Liabilities</u></b>			
Actuarial Liability (AL)	\$ 622,836	\$ 597,014	-4.1%
Actuarial Value of Assets (AVA)	361,037	371,467	2.9%
Unfunded Actuarial Liability (UAL)	\$ 261,798	\$ 225,547	-13.8%
Funded Ratio (AVA)	58.0%	62.2%	4.3%
Funded Ratio (MVA)	61.8%	63.5%	1.7%
<b><u>Contributions</u></b>			
Employer Contribution (FY2020-21)	\$ 43,648	N/A	
Employer Contribution (FY2021-22)	\$ 44,091	\$ 43,820	-0.6%

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2020**

**SECTION I – EXECUTIVE SUMMARY**

**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.

**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 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 that 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 decreased from 67.2% to 49.5% between 2013 and 2017 due to assumption changes, liability losses, new Police MOUs, and the lack of contributions since the July 2012 payment. The funded ratio has increased from 49.5% to 62.2% over the past three years due to recommencement of contributions, and to a lesser extent, asset and liability gains.

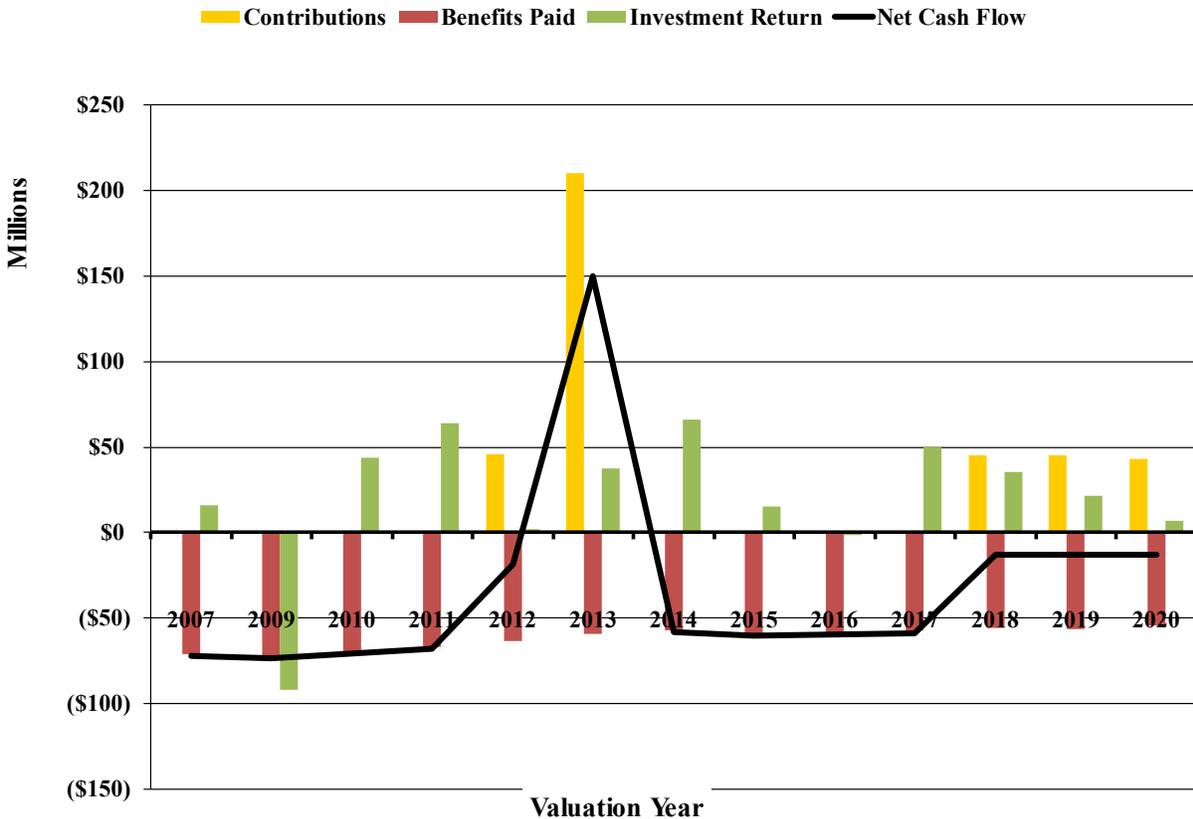


**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2020**

**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 12 of the last 13 fiscal years, primarily due to the lack of contributions except in 2013 and in the most recent three years. Even with the recommencing of contributions under the Plan’s funding policy, benefit payments exceeded contributions for the prior three years.

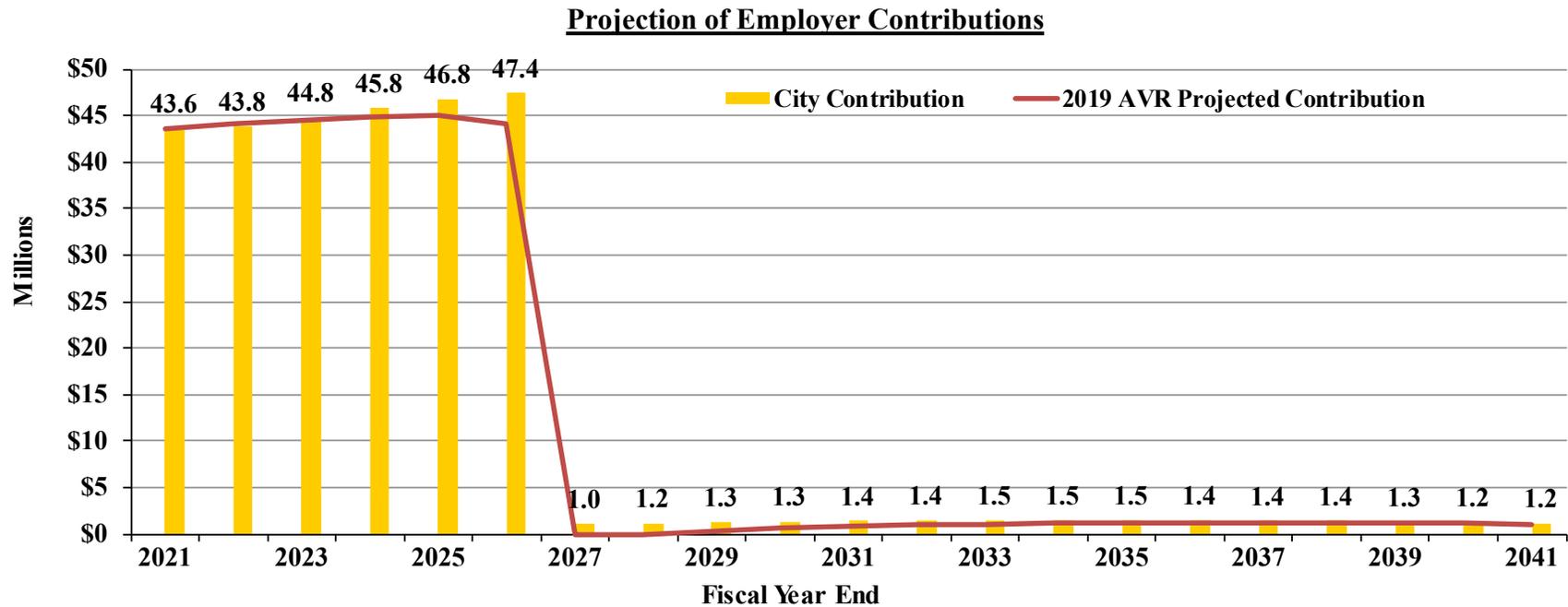
A negative cash flow magnifies the losses during a market decline, hindering the Plan in its ability to absorb market fluctuations. The implications of a plan in negative cash flow are that the impact of market fluctuations can be more severe: as assets are being depleted to pay benefits in down markets, 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, 2020**

**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, 2020 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).



The above graph shows a projection of the City’s required contributions compared to the same projections from last year’s report. The City’s required contribution increased from \$43.6 million in fiscal year 2021 to \$43.8 million in fiscal year 2022, and then is expected to increase by about \$1 million per year for the next four years 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.

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**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 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 could push the employer contribution over \$50 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.

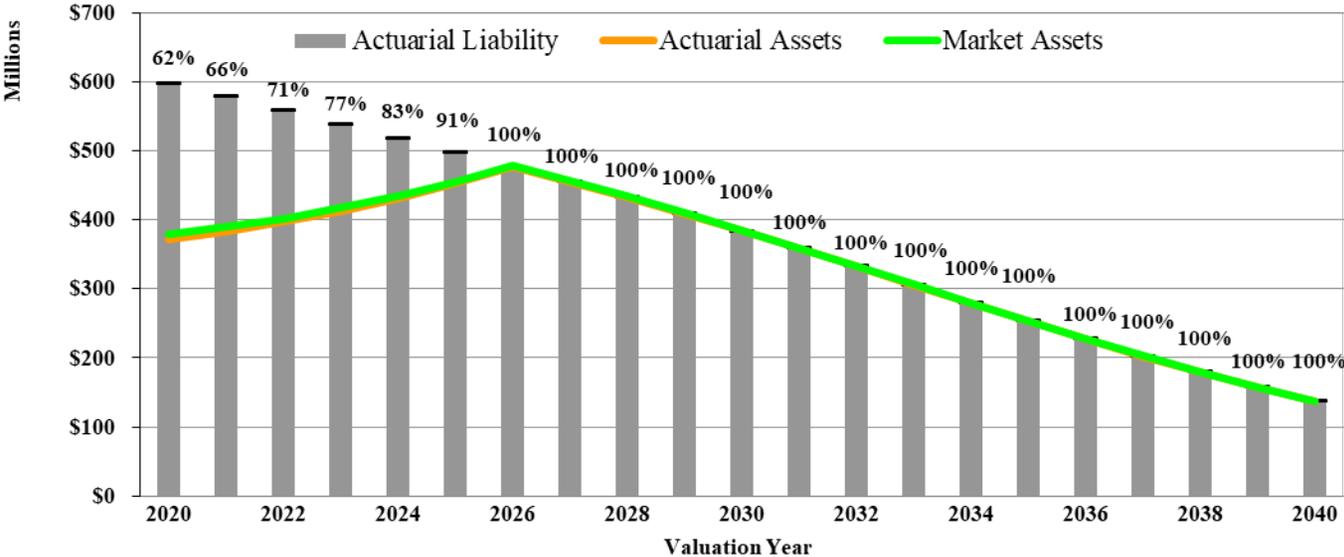
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**SECTION I – EXECUTIVE SUMMARY**

**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. Once the Plan is projected to reach 100% funding, both the assets and liabilities are expected to decline as the Plan continues to mature.

## SECTION II – IDENTIFICATION AND ASSESSMENT OF RISKS

Actuarial valuations are based on a set of assumptions about future economic and demographic experience. These assumptions represent a reasonable estimate of future experience, but actual future experience will undoubtedly be different and may be significantly different. This section of the report is intended to identify the primary risks to the plan, provide some background information about those risks, and provide an assessment of those risks.

### Identification of Risks

The fundamental risk to a pension plan is that the contributions needed to pay the benefits become unaffordable. While the Plan cannot determine on its own what contribution level is unaffordable, we can project expected contributions and illustrate the potential impact of key sources of risk on those contribution rates so the City can assess affordability. While there are a number of factors that could lead to contribution amounts becoming unaffordable, we believe the primary sources are:

- Investment risk,
- COLA risk,
- Longevity risk, and
- Contribution risk.

Other risks that we have not identified may also turn out to be important.

*Investment Risk* is the potential for investment returns to be different than expected. Lower investment returns than anticipated will increase the Unfunded Actuarial Liability necessitating higher contributions in the future unless there are other gains that offset these investment losses. In contrast, higher investment returns than anticipated may create a potentially significant surplus that could be difficult to use until all benefits have been paid. Expected future investment returns and their potential volatility are determined by the Plan’s asset allocation.

*COLA Risk* is the potential for future COLAs to increase contributions. Retirement allowances are based on the pensionable compensation attached to the average rank held during the three years immediately preceding retirement. Cost-of-living adjustments are therefore based on salary increases for current employees with the retiree’s same rank at retirement. Salary increases less than or greater than those assumed cause gains or losses, respectively. COLA increases different from those expected over the last eight years are reflected in the “MOU Changes” column in the chart on the next page.

*Longevity risk* is the potential for mortality experience to be different than expected. Generally, longevity risk emerges slowly over time and is often exceeded by other changes, particularly those due to investment returns. However, for a closed plan such as PFRS the mortality experience will have a significant impact on future cash flows. The chart below shows the demographic gains and losses over the last eight years compared to the total change in the UAL for each year, a portion of which is associated with mortality experience.

*Contribution risk* is the potential for actual future actuarially determined contributions to deviate from expected future contributions. The City Charter sets the Plan’s contribution policy. It

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**SECTION II – IDENTIFICATION AND ASSESSMENT OF RISKS**

requires the unfunded liability of the plan to be fully amortized by June 20, 2026. The Actuarially Determined Contribution (ADC) is based on a short remaining amortization period. As a result, a significant loss or change in assumptions may cause a large increase in the ADC. Furthermore, any change to the contribution policy would necessitate an amendment to the City Charter, which requires voter approval.

The table below shows an eight-year history of changes in the UAL by source.

<b>TABLE II-1 UAL Change by Source (\$ in Thousands) Contributions</b>							
<b>FYE</b>	<b>MOU Changes</b>	<b>Assumption Changes</b>	<b>vs. Tread Water</b>		<b>Investments</b>	<b>Liability Experience</b>	<b>Total UAL Change</b>
<b>2013</b>	\$ 4,091	\$ 0	\$ (188,922)	\$ (3,803)	\$ 2,592	\$ (186,042)	
<b>2014</b>	0	30,598	15,146	(10,729)	(19,869)	15,147	
<b>2015</b>	0	0	17,023	(6,171)	6,522	17,374	
<b>2016</b>	43,480	0	15,033	486	2,830	61,829	
<b>2017</b>	0	22,730	22,888	(4,958)	(9,959)	30,702	
<b>2018</b>	(1,475)	0	(24,214)	(7,128)	(7,467)	(40,284)	
<b>2019</b>	(7,173)	0	(26,691)	(5,919)	1,797	(37,986)	
<b>2020</b>	(6,541)	0	(27,417)	(1,877)	(417)	(36,252)	
<b>Total</b>	<b>\$ 32,383</b>	<b>\$ 53,328</b>	<b>\$ (197,152)</b>	<b>\$ (40,099)</b>	<b>\$ (23,971)</b>	<b>\$ (175,511)</b>	

The UAL was reduced by approximately \$175.5 million over the last eight years. Contributions in excess of the “tread water” level (i.e. interest on the UAL plus administrative expenses) reduced the UAL by \$197.2 million, liability experience reduced the UAL by \$24.0 million, and investment returns decreased the UAL by \$40.1 million. Meanwhile changes to MOUs increased the UAL by \$32.4 million and assumption changes increased the UAL by \$53.3 million.

**Plan Maturity Measures**

The future financial condition of a mature pension plan is more sensitive to each of the risks identified above than a less mature plan. Before assessing each of these risks, it is important to understand the maturity of the plan.

Plan maturity can be measured in a variety of ways, but they all get at one basic dynamic – the larger the plan is compared to the contribution or revenue base that supports it; the more sensitive the plan will be to risk. Given that the Plan has been closed to new entrants since 1976 with no remaining active members, the Plan considered as a standalone entity is very mature, though because of the diminishing benefit cash flows it is expected to have a declining impact on the overall City finances.

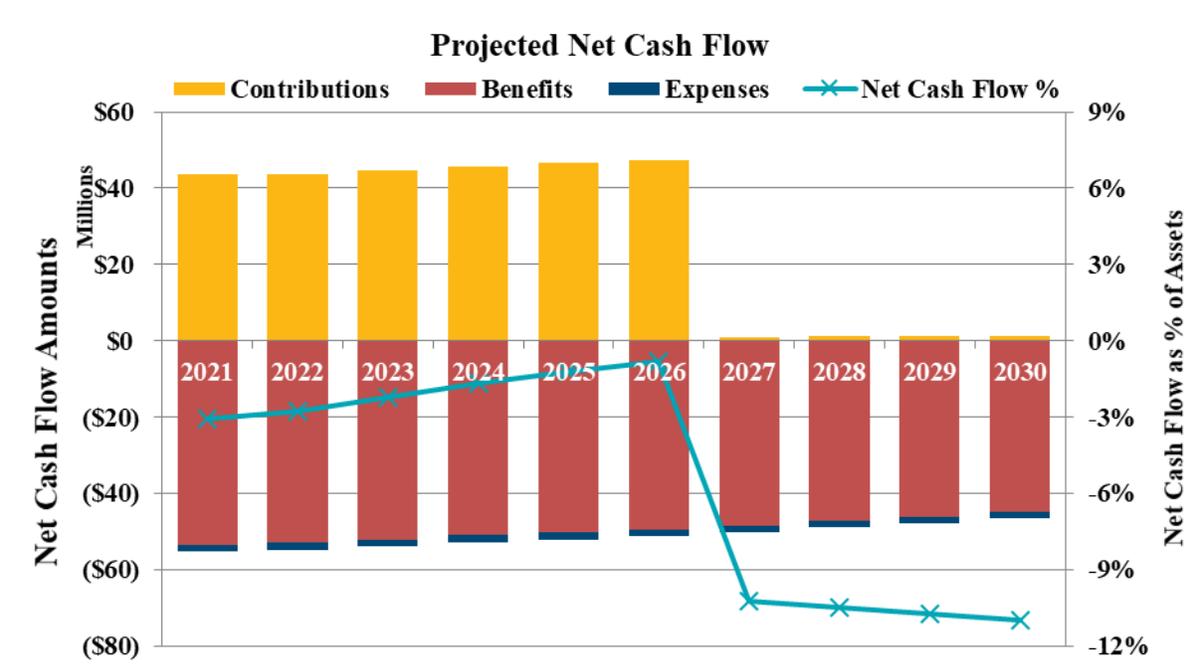
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**SECTION II – IDENTIFICATION AND ASSESSMENT OF RISKS**

**Net Cash Flow**

The net cash flow of the plan as a percentage of the beginning of year assets indicates the sensitivity of the plan to short-term investment returns. Net cash flow is equal to contributions less benefit payments and administrative expenses. Mature plans can have large amounts of benefit payments compared to contributions, particularly if they are well funded.

The chart below shows the projected net cash flow for the next 10 fiscal years. The bars represent the dollar amounts of the different components of the projected net cash flow, and the line represents the net cash flow as a percentage of the assets as of the beginning of the fiscal year.



The Plan’s contributions are expected to cease following the 2025-2026 Fiscal Year once the unfunded liability has been paid off, other than for payments needed to cover the administrative expenses. Beyond that point, the negative net cash flows are expected to continue until all benefits are paid.

The first issue this change presents to the Plan is a need for liquidity in the investments so that benefits can be paid. When the cash flow was positive or close to neutral, benefits could be paid out of contributions without liquidating investments. As net cash flow becomes increasingly negative, the benefit payments will require liquidation of some investments (at least to the extent the bond portfolio doesn’t generate sufficient cash income).

The other change of note is the sensitivity to short-term investment returns. Investment losses in the short term are compounded by the net withdrawal from the plan leaving a smaller asset base to try to recover from the investment losses. On the other hand, large investment gains in the

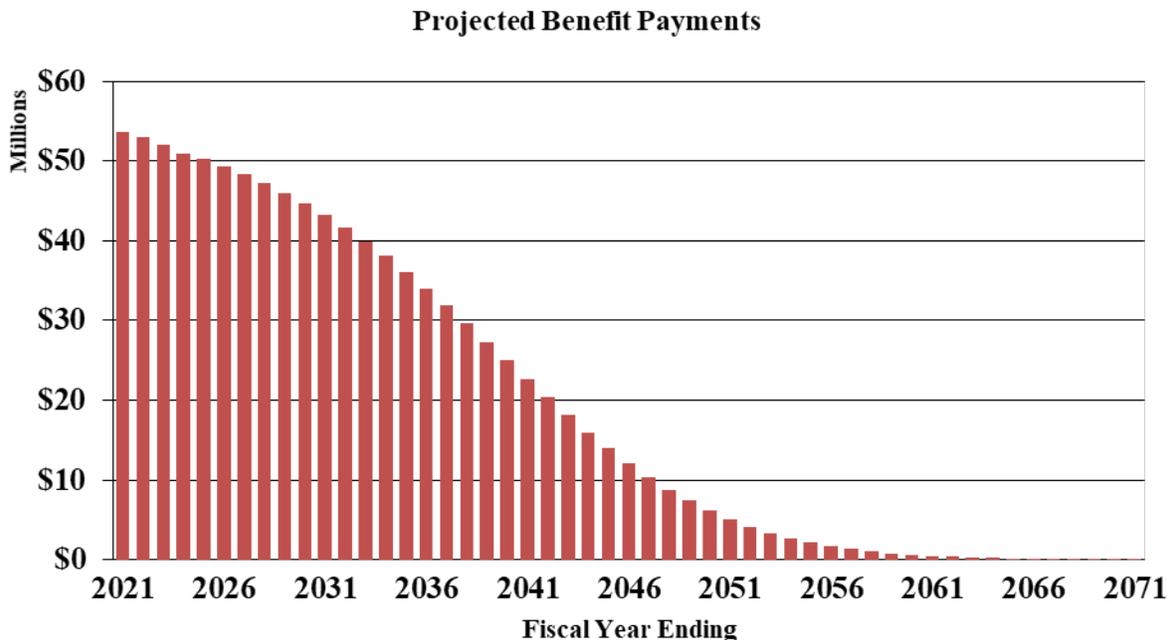
## SECTION II – IDENTIFICATION AND ASSESSMENT OF RISKS

short term also tend to have a longer beneficial effect as any future losses are relative to a smaller liability base due to the negative cash flow.

### Assessing Costs and Risks

A closed pension plan will ultimately either end up with excess assets after all benefits have been paid or run out of assets before all benefits have been paid. The declining investment return assumption adopted by the Board implies an expectation the Plan will pursue a strategy of de-risking the Plan to minimize the impact of these scenarios, potentially by reducing the risk in its investment portfolio, immunizing investments, and/or purchase annuities to settle the remaining obligation.

However, even if the Plan were to run out of assets, PFRS would be forced to pay benefits directly on a pay-as-you-go basis. As long as PFRS (and the City) can afford the pay-as-you-go costs, benefits would remain secure. The chart below shows a projection of expected benefit payments for the closed plan.

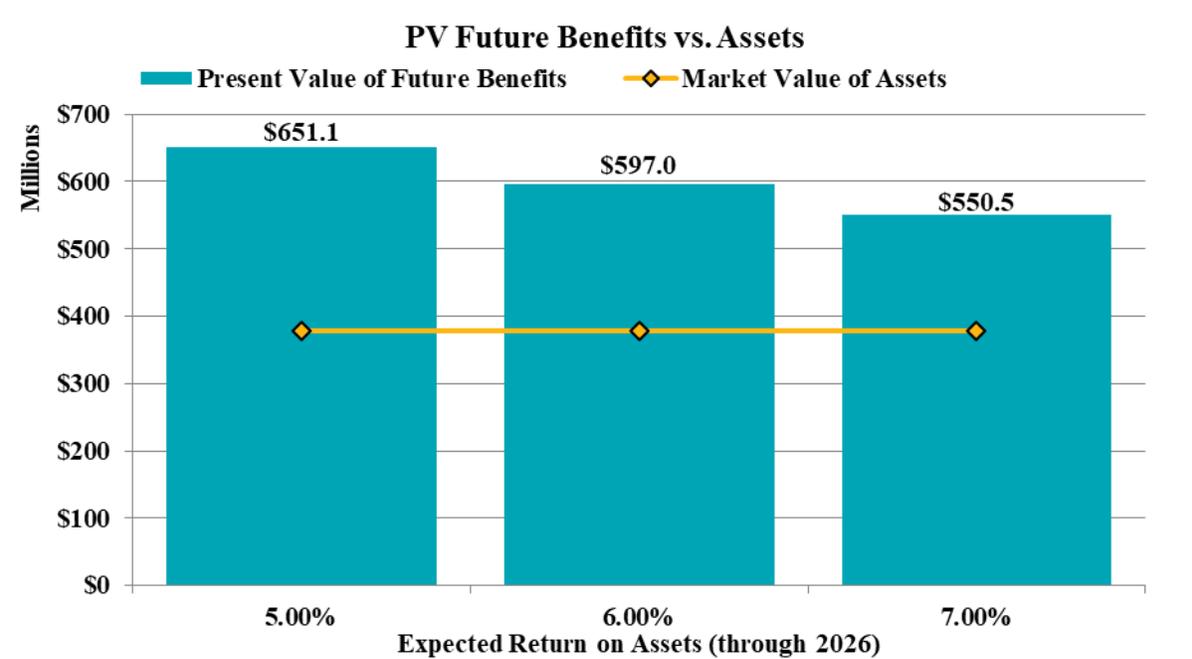


### Sensitivity to Investment Returns

The chart on the next page compares assets to the present value of all projected future benefits discounted at the current expected rates of return – starting at 6.00% through 2026 and trending down to 3.25% over the next 10 years - and at investment returns 100 basis points above and below the expected rates of return. The present value of future benefits is shown as a teal bar and the Market Value of Assets is shown by the gold line.

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If actual investment returns meet the expected returns annually, the Plan would need approximately \$597 million in assets today to pay all projected benefits compared to current assets of \$379 million. If investment returns are 100 basis points lower each year, the Plan would need approximately \$651 million in assets today, and if investment returns are 100 basis points higher, the Plan would need approximately \$551 million in assets today.

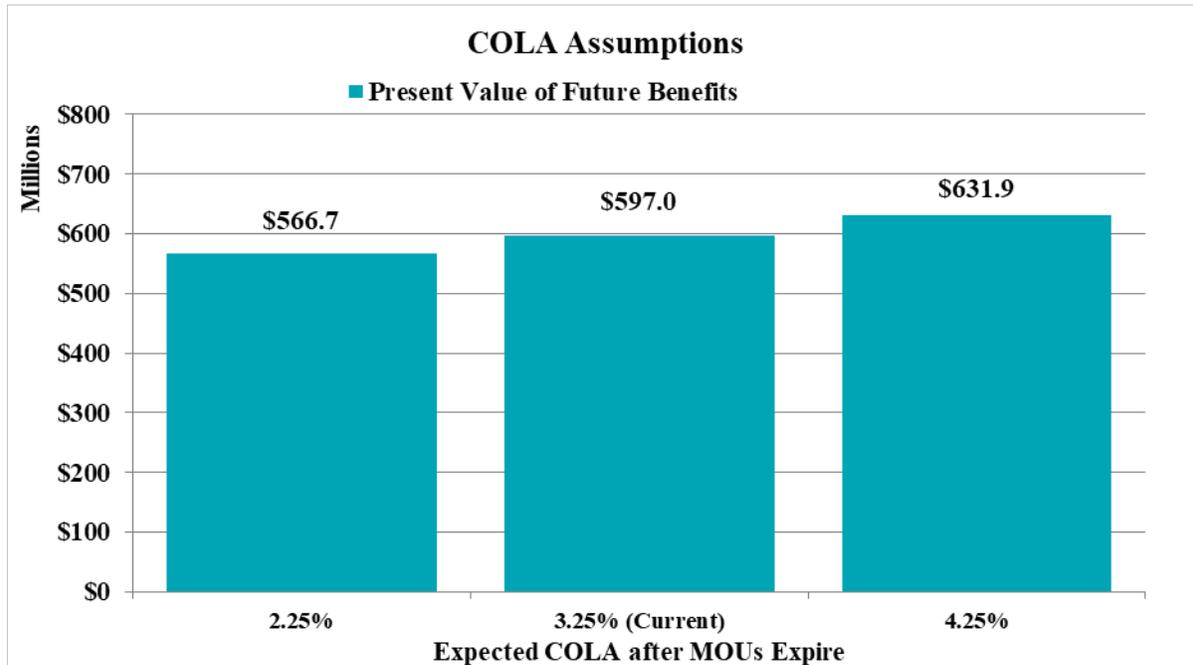
**Sensitivity to COLA Changes**

The present value of future benefits shown above assumes annual COLA increases of 3.25% per year once the current MOUs have expired. If COLA inflation is higher (because of higher than expected increases in the salaries of active employees); more assets would be needed to pay the benefits, and if COLA inflation is lower; fewer assets would be needed to pay benefits.

The chart on the next page shows the present value of all projected future benefits (discounted using the current expected rates of return) based on annual COLA increases of 3.25% per year once the current MOUs have expired - and at COLA increases 100 basis points above and below the current COLA assumptions.

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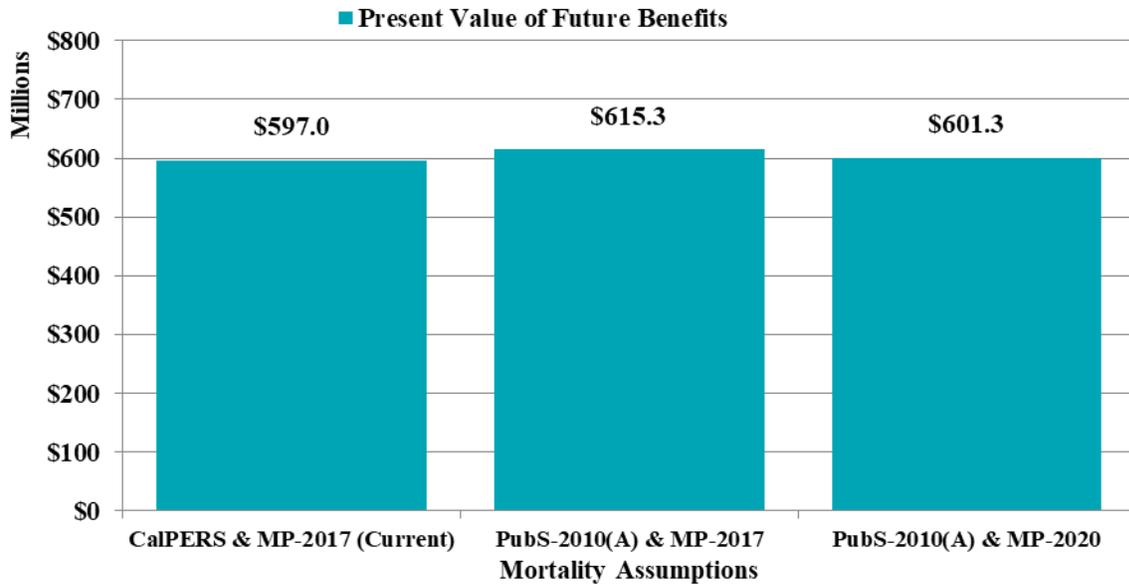
**Sensitivity to Mortality Assumption Changes**

The following chart on the next page shows the sensitivity of the Plan to longevity / mortality experience. In the first bar we have shown the present value of benefits using the Plan’s current mortality assumptions (i.e. using the most recent CalPERS mortality assumptions, with projections for generational improvements using the Society of Actuary’s MP-2017 improvement scales). In the second bar, we have shown the impact on the present value of benefits if actual longevity experience follows an alternative set of assumptions, reflecting new tables that have been developed using the experience Public Safety employees of U.S. public employers. In the third bar we have shown an additional alternative, using the Public Sector table described above, but also reflecting a slower rate of future improvements in longevity, as reflected by the Society of Actuary’s latest improvement scale (MP-2020). As always, actual experience will drive costs, but this exhibit provides an example of the level of sensitivity of the Plan’s liabilities to recent changes in outlooks on mortality.

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SECTION II – IDENTIFICATION AND ASSESSMENT OF RISKS

Mortality and Mortality Improvement Assumptions



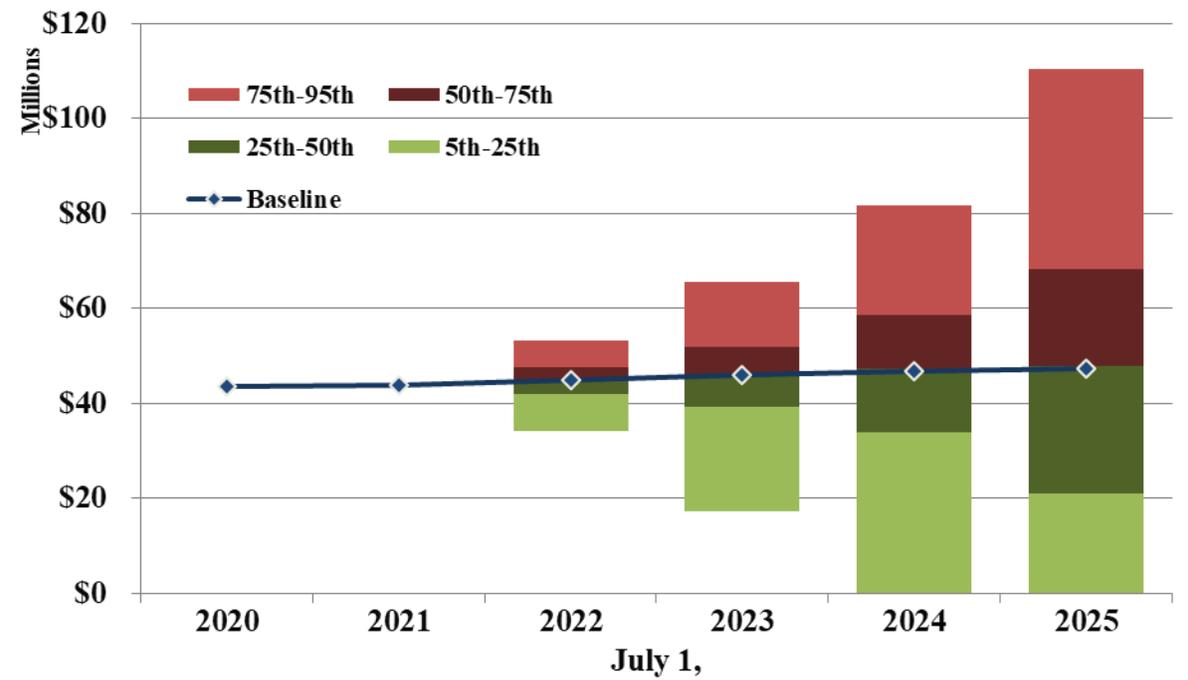
Stochastic Projections

The stochastic projections of contributions through the full funded date (June 30, 2026) in the chart on the following page shows a very wide range in future ADC's. This range is driven both by the volatility of investment returns (assumed to be 11.0% in these projections, based on previous information provided by Meketa) and by the short amortization period used to calculate the ADC. We note that if the Plan is required to remain fully funded after 2026, the contributions required will also vary widely.

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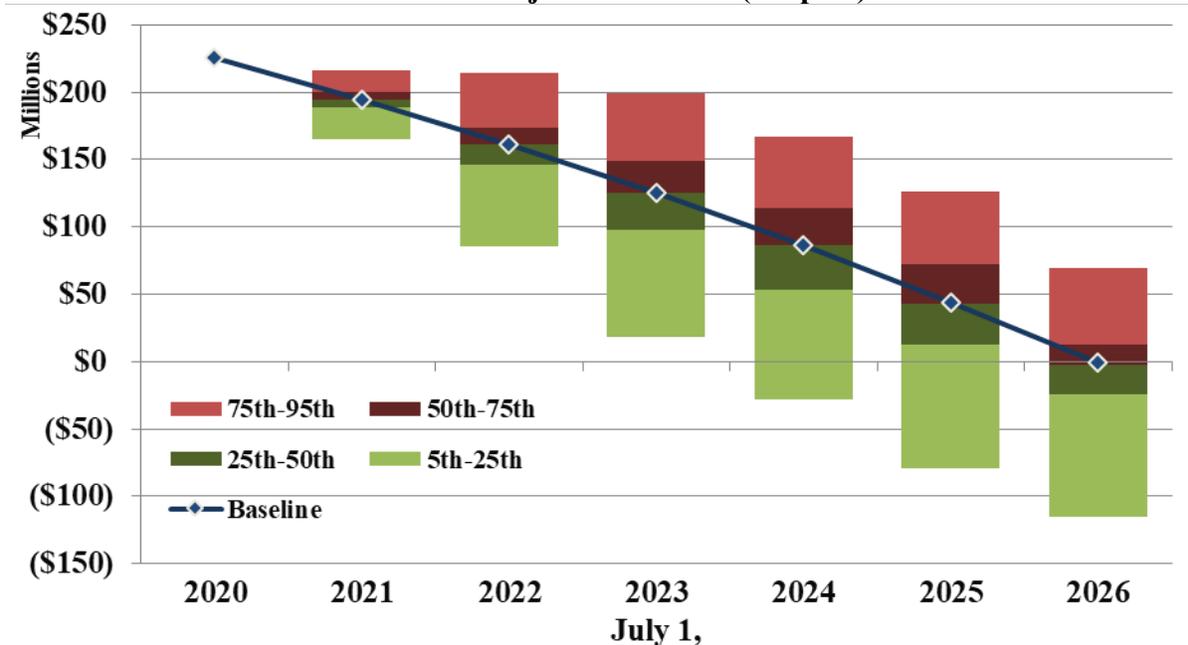
**SECTION II – IDENTIFICATION AND ASSESSMENT OF RISKS**

**Stochastic Projection of Actuarially Determined Contribution (ADC)**



The chart below shows the projection of the UAL through the full funding date. While the UAL is projected in the baseline to be eliminated by 2026, because of the statutory requirement to fully fund the Plan by that time, there is still a wide range of potential outcomes.

**Stochastic Projection of UAL/(Surplus)**



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**SECTION II – IDENTIFICATION AND ASSESSMENT OF RISKS**

**More Detailed Assessment**

A detailed assessment of risk would be valuable in understanding the risks identified above, especially given the closed nature of the plan. We encourage the Board to consider a more detailed analysis of some of the risks identified above, in particularly in developing a funding strategy to deal with changes in the UAL after the required full funding date.

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**SECTION III – 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, 2019 and June 30, 2020,
- 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 “snapshot” 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 III-1 discloses and compares each component of the market asset value as of June 30, 2019 and June 30, 2020.

<b>TABLE III-1</b> <b>Statement of Assets at Market Value</b> <b>June 30,</b> <b>(in thousands)</b>			
		<b>2019</b>	<b>2020</b>
Cash and Cash Equivalents	\$	6,484	\$ 6,346
Receivables		4,428	8,079
Investments, at Fair Value		420,245	404,721
Total Assets	\$	431,157	\$ 419,146
Liabilities		46,446	40,171
<b>Market Value of Assets</b>	<b>\$</b>	<b>384,711</b>	<b>\$ 378,975</b>

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SECTION III – 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 III-2 on the following page shows the components of a change in the Market Value of Assets during 2019 and 2020.

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**SECTION III – ASSETS**

**TABLE III-2  
Changes in Market Values  
June 30,  
(in thousands)**

	<u>2019</u>	<u>2020</u>
<b>Contributions</b>		
Contributions of Plan Members	\$ 0	\$ 0
Contributions from the City	<u>44,821</u>	<u>43,409</u>
Total Contributions	<u>44,821</u>	<u>43,409</u>
<b>Investment Income</b>		
Miscellaneous Income	20	0
Investment Income	<u>21,552</u>	<u>6,997</u>
Total Investment Income	<u>21,572</u>	<u>6,997</u>
<b>Disbursements</b>		
Benefit Payments	(56,212)	(54,619)
Administrative Expenses	<u>(1,446)</u>	<u>(1,523)</u>
Total Disbursements	<u>(57,658)</u>	<u>(56,142)</u>
<b>Net increase (Decrease)</b>	8,734	(5,736)
<b>Net Assets Held in Trust for Benefits:</b>		
Beginning of Year	<u>375,976</u>	<u>384,711</u>
End of Year	\$ <u>384,711</u>	\$ <u>378,975</u>
Approximate Return	5.83%	1.85%

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**SECTION III – 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 6.00% return assumption from 2019-2020) and the actual market value each year. The actuarial value is restricted to fall between 90% and 110% of the market value.

<b>TABLE III-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, 2019	\$ 361,037
b. Total Contributions and Misc Income	43,409
c. Administrative Expense	(1,523)
d. Benefit Payments	(54,619)
e. Expected Investment Earnings	<u>21,286</u>
f. Expected Actuarial Value of Assets - July 1, 2020 [1a + 1b + 1c + 1d + 1e]	\$ 369,590
2. Calculate Final Actuarial Value of Assets	
a. Value of Market Value of Assets - July 1, 2020	\$ 378,975
b. Excess of MVA over Expected AVA [2a - 1f]	9,385
c. Preliminary AVA [1f + 0.2 * 2b]	371,467
d. 90% of MVA [90% * 2a]	341,077
e. 110% of MVA [110% * 2a]	416,872
3. Final Actuarial Value of Assets [2c, not less than 2d or greater than 2e]	<b>\$ 371,467</b>

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**SECTION III – 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 6.00% assumption.

<b>TABLE III-4 Asset Gain/(Loss) (in thousands)</b>		
	<b>Market Value</b>	<b>Actuarial Value</b>
<b>July 1, 2019 value</b>	<b>\$ 384,711</b>	<b>\$ 361,037</b>
Contributions of Plan Members	0	0
Contributions from the City	43,409	43,409
Miscellaneous Income	0	0
Benefit Payments	(54,619)	(54,619)
Administrative Expenses	(1,523)	(1,523)
Expected Investment Earnings (6.00%)	<u>22,706</u>	<u>21,286</u>
Expected Value June 30, 2020	<b>\$ 394,684</b>	<b>\$ 369,590</b>
Investment Gain / (Loss)	<u>(15,709)</u>	<u>1,877</u>
<b>July 1, 2020 value</b>	<b>378,975</b>	<b>371,467</b>
Return	1.85%	6.53%

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**SECTION IV – LIABILITIES**

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

- **Disclosure** of Plan liabilities on July 1, 2019 and July 1, 2020
- 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 IV-1 on the next page discloses each of these liabilities for the current and prior valuations.

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**SECTION IV – LIABILITIES**

<b>TABLE IV-1</b>		
<b>Liabilities/Net (Surplus)/Unfunded</b>		
<b>(in thousands)</b>		
	<b>July 1, 2019</b>	<b>July 1, 2020</b>
<b><u>Present Value of Future Benefits</u></b>		
Active Participant Benefits	\$ 0	\$ 0
Retiree and Inactive Benefits	<u>622,836</u>	<u>597,014</u>
<b>Present Value of Future Benefits (PVB)</b>	<b>\$ 622,836</b>	<b>\$ 597,014</b>
<b><u>Actuarial Liability</u></b>		
Present Value of Future Benefits (PVB)	\$ 622,836	\$ 597,014
Present Value of Future Normal Costs (PVFNC)	<u>0</u>	<u>0</u>
<b>Actuarial Liability (AL = PVB – PVFNC)</b>	<b>\$ 622,836</b>	<b>\$ 597,014</b>
Actuarial Value of Assets (AVA)	<u>361,037</u>	<u>371,467</u>
<b>Net (Surplus)/Unfunded (AL – AVA)</b>	<b>\$ 261,798</b>	<b>\$ 225,547</b>

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**SECTION IV – LIABILITIES**

**Changes in Liabilities**

Each of the liabilities disclosed in the prior table is 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 IV-2</b> <b>Changes in Actuarial Liability</b> <b>(in thousands)</b>	
Actuarial Liability at July 1, 2019	\$ 622,836
Actuarial Liability at July 1, 2020	\$ 597,014
Liability Increase (Decrease)	\$ (25,822)
Change due to:	
Plan Design Changes	\$ (6,541)
Assumption Change	0
Accrual of Benefits	0
Actual Benefit Payments	(54,619)
Interest	35,755
Data Corrections	0
Actuarial Liability (Gain)/Loss	\$ (417)

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**SECTION IV – LIABILITIES**

<b>TABLE IV-3</b>			
<b>Liabilities by Group as of July 1, 2020</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	224,958	74,233	299,191
Disabled Retirees	89,168	80,979	170,147
Beneficiaries	<u>71,247</u>	<u>56,429</u>	<u>127,676</u>
<b>Total Accrued Liability</b>	<b>\$ 385,373</b>	<b>\$ 211,641</b>	<b>\$ 597,014</b>

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**SECTION IV – LIABILITIES**

**TABLE IV-4  
Development of Actuarial Gain / (Loss)  
(in thousands)**

1. Unfunded Actuarial Liability at Start of Year (not less than zero)	\$	261,798
2. Employer Normal Cost at Start of Year		0
3. Interest on 1. and 2. to End of Year		15,708
4. Contributions and Miscellaneous Income for Prior Year		43,409
5. Administrative Expenses		(1,523)
6. Interest on 4. and 5. to End of Year		1,238
7. Change in Unfunded Actuarial Liability Due to Changes in Assumptions		0
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		(6,541)
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.]	\$	227,841
12. Actual Unfunded Actuarial Liability at End of Year (not less than zero)		225,547
13. Unfunded Actuarial Liability Gain / (Loss) [11. - 12.]	\$	2,294

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
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**SECTION V – 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 V-1 on the next page shows the employer contribution amount for the 2021-2022 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, 2021.

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 2020-2021 Fiscal Year.

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
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**SECTION V – CONTRIBUTIONS**

**TABLE V-I  
Development of Projected 2021-2022 Employer Contribution Amount  
(in thousands)**

	Actuarial Value of Assets	Market Value of Assets
1. Value of Assets at June 30, 2020:	\$ 371,467	\$ 378,975
a. Expected Contributions and Misc Income	\$ 43,648	\$ 43,648
b. Expected Administrative Expense	\$ (1,646)	\$ (1,646)
c. Expected Benefit Payments	\$ (53,403)	\$ (53,403)
d. Expected Investment Earnings	<u>\$ 21,951</u>	<u>\$ 22,401</u>
2. Expected Value of Assets at June 30, 2021:	\$ 382,018	\$ 389,976
a. Excess of Expected MVA over Expected AVA	\$ 7,958	
b. Preliminary AVA [ Expected AVA + 20% * 2a]	\$ 383,609	
c. 90% of Expected MVA	\$ 350,978	
d. 110% of Expected MVA	\$ 428,974	
3. Final Expected AVA [2b, not less than 2c or greater than 2d]	\$ 383,609	\$ 389,976
4. Entry Age Liability at June 30, 2020	\$ 597,014	\$ 597,014
5. Expected Benefit Payments	\$ (53,403)	\$ (53,403)
6. Expected Interest	<u>\$ 34,242</u>	<u>\$ 34,242</u>
7. Expected Entry Age Liability at June 30, 2021	\$ 577,853	\$ 577,853
8. Projected Unfunded Actuarial Liability: (7) - (3)	\$ 194,243	\$ 187,877
9. Funded Ratio: (3) / (7)	66.4%	67.5%
10. Unfunded Actuarial Liability Amortization at Middle of Year as a Level Percentage of Payroll (5 Years Remaining) as of June 30, 2021	\$ 42,127	\$ 40,746
11. Expected Administrative Expenses for Fiscal 2021-2022	<u>\$ 1,693</u>	<u>\$ 1,693</u>
12. Total Contribution: (10) + (11)	\$ 43,820	\$ 42,439

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2020**

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

**TABLE VI-1  
Benefit Payment and Headcount Projection**

Fiscal Year Ending June 30,	Police		Fire		Total	
	Count	Benefits (in thousands)	Count	Benefits (in thousands)	Count	Benefits (in thousands)
2021	460.0	\$ 32,293	308.0	\$ 21,110	768.0	\$ 53,403
2022	445.1	\$ 32,070	292.5	\$ 20,753	737.6	\$ 52,824
2023	430.2	\$ 31,965	277.2	\$ 19,973	707.4	\$ 51,938
2024	415.5	\$ 31,815	262.1	\$ 19,019	677.5	\$ 50,834
2025	400.7	\$ 31,536	247.3	\$ 18,603	648.0	\$ 50,139
2026	385.9	\$ 31,198	233.0	\$ 18,008	618.9	\$ 49,205
2027	371.0	\$ 30,792	219.0	\$ 17,393	590.0	\$ 48,185
2028	355.9	\$ 30,311	205.5	\$ 16,760	561.4	\$ 47,071
2029	340.5	\$ 29,747	192.4	\$ 16,108	532.9	\$ 45,855
2030	324.9	\$ 29,091	179.8	\$ 15,436	504.6	\$ 44,527
2031	308.8	\$ 28,336	167.5	\$ 14,743	476.3	\$ 43,080
2032	292.4	\$ 27,478	155.5	\$ 14,027	447.9	\$ 41,506
2033	275.6	\$ 26,512	143.9	\$ 13,289	419.5	\$ 39,801
2034	258.4	\$ 25,440	132.5	\$ 12,528	390.9	\$ 37,968
2035	240.9	\$ 24,264	121.5	\$ 11,748	362.5	\$ 36,012
2036	223.3	\$ 22,992	110.8	\$ 10,951	334.1	\$ 33,943
2037	205.5	\$ 21,634	100.4	\$ 10,143	305.9	\$ 31,776
2038	187.7	\$ 20,203	90.5	\$ 9,329	278.2	\$ 29,533
2039	170.2	\$ 18,717	80.9	\$ 8,518	251.1	\$ 27,235
2040	153.0	\$ 17,194	71.8	\$ 7,717	224.8	\$ 24,911
2041	136.4	\$ 15,656	63.2	\$ 6,935	199.5	\$ 22,590
2042	120.5	\$ 14,125	55.1	\$ 6,180	175.6	\$ 20,305
2043	105.4	\$ 12,624	47.7	\$ 5,461	153.1	\$ 18,084
2044	91.3	\$ 11,172	40.9	\$ 4,783	132.3	\$ 15,955
2045	78.4	\$ 9,788	34.8	\$ 4,154	113.2	\$ 13,942
2046	66.5	\$ 8,488	29.3	\$ 3,576	95.9	\$ 12,064
2047	55.9	\$ 7,284	24.5	\$ 3,052	80.4	\$ 10,336
2048	46.5	\$ 6,185	20.3	\$ 2,582	66.7	\$ 8,767
2049	38.2	\$ 5,196	16.6	\$ 2,167	54.8	\$ 7,363
2050	31.1	\$ 4,321	13.5	\$ 1,804	44.6	\$ 6,124

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2020**

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

**TABLE VI-1  
Benefit Payment and Headcount Projection (Continued)**

Fiscal Year Ending June 30,	Police		Fire		Total	
	Count	Benefits (in thousands)	Count	Benefits (in thousands)	Count	Benefits (in thousands)
2051	25.1	\$ 3,556	10.9	\$ 1,490	36.0	\$ 5,046
2052	20.0	\$ 2,898	8.7	\$ 1,222	28.7	\$ 4,120
2053	15.8	\$ 2,338	6.9	\$ 996	22.7	\$ 3,334
2054	12.3	\$ 1,869	5.4	\$ 807	17.8	\$ 2,676
2055	9.6	\$ 1,480	4.3	\$ 650	13.8	\$ 2,130
2056	7.3	\$ 1,163	3.3	\$ 520	10.7	\$ 1,683
2057	5.6	\$ 906	2.6	\$ 415	8.1	\$ 1,321
2058	4.2	\$ 702	2.0	\$ 329	6.2	\$ 1,031
2059	3.2	\$ 540	1.5	\$ 260	4.7	\$ 800
2060	2.4	\$ 413	1.1	\$ 204	3.5	\$ 617
2061	1.8	\$ 314	0.9	\$ 159	2.6	\$ 473
2062	1.3	\$ 237	0.6	\$ 124	1.9	\$ 360
2063	0.9	\$ 177	0.5	\$ 95	1.4	\$ 272
2064	0.7	\$ 131	0.4	\$ 72	1.0	\$ 203
2065	0.5	\$ 96	0.3	\$ 54	0.7	\$ 150
2066	0.4	\$ 70	0.2	\$ 40	0.5	\$ 109
2067	0.2	\$ 49	0.1	\$ 29	0.4	\$ 78
2068	0.2	\$ 34	0.1	\$ 20	0.3	\$ 54
2069	0.1	\$ 23	0.1	\$ 14	0.2	\$ 36
2070	0.1	\$ 14	0.0	\$ 9	0.1	\$ 23
2071	0.0	\$ 8	0.0	\$ 6	0.1	\$ 14
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
2078	0.0	\$ 0	0.0	\$ 0	0.0	\$ 0
2079	0.0	\$ 0	0.0	\$ 0	0.0	\$ 0

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2020**

**APPENDIX A – MEMBERSHIP INFORMATION**

**Summary of Participant Data as of**

Active Participants	July 1, 2019			July 1, 2020		
	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	241	100	341	229	95	324
Average Age	75.7	80.9	77.2	76.6	81.5	78.1
Average Annual Benefit	\$76,879	\$80,605	\$77,972	\$78,850	\$81,876	\$79,737
<b>Disabled Retirees</b>						
Number	107	99	206	99	96	195
Average Age	75.2	76.4	75.8	75.9	77.1	76.5
Average Annual Benefit	\$73,598	\$74,879	\$74,214	\$74,864	\$75,923	\$75,385
<b>Beneficiaries</b>						
Number	127	124	251	132	117	249
Average Age	80.6	83.2	81.8	80.5	83.1	81.7
Average Annual Benefit	\$54,889	\$55,549	\$55,215	\$55,725	\$56,194	\$55,946
<b>All Inactives</b>						
Number	475	323	798	460	308	768
Average Age	76.9	80.4	78.3	77.6	80.8	78.8
Average Annual Benefit	\$70,261	\$69,231	\$69,844	\$71,356	\$70,265	\$70,919

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

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2020**

**APPENDIX A – MEMBERSHIP INFORMATION**

**Changes in Plan Membership: Police**

	Actives	Service Retirees	Disabled Retirees	Beneficiaries	Total
July 1, 2019	0	241	107	127	475
Retired	0	0	0	0	0
Disabled	0	0	0	0	0
Deceased	0	(12)	(8)	(6)	(26)
New Beneficiary	0	0	0	11	11
July 1, 2020	<b>0</b>	<b>229</b>	<b>99</b>	<b>132</b>	<b>460</b>

**Changes in Plan Membership: Fire**

	Actives	Service Retirees	Disabled Retirees	Beneficiaries	Total
July 1, 2019	0	100	99	124	323
Retired	0	0	0	0	0
Disabled	0	0	0	0	0
Deceased	0	(5)	(3)	(11)	(19)
New Beneficiary	0	0	0	4	4
July 1, 2020	<b>0</b>	<b>95</b>	<b>96</b>	<b>117</b>	<b>308</b>

**Changes in Plan Membership: All**

	Actives	Service Retirees	Disabled Retirees	Beneficiaries	Total
July 1, 2019	0	341	206	251	798
Retired	0	0	0	0	0
Disabled	0	0	0	0	0
Deceased	0	(17)	(11)	(17)	(45)
New Beneficiary	0	0	0	15	15
July 1, 2020	<b>0</b>	<b>324</b>	<b>195</b>	<b>249</b>	<b>768</b>

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2020**

**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	0	\$0	0	\$0	0	\$0
65-69	23	\$1,777,267	0	\$0	23	\$1,777,267
70-74	78	\$6,276,173	21	\$1,474,645	99	\$7,750,818
75-79	80	\$5,984,336	31	\$2,606,491	111	\$8,590,827
80-84	27	\$2,080,540	13	\$1,034,257	40	\$3,114,796
85-89	11	\$1,057,010	13	\$1,153,340	24	\$2,210,350
90-94	8	\$712,274	12	\$1,159,797	20	\$1,872,071
95-99	2	\$169,124	5	\$349,694	7	\$518,818
100+	0	\$0	0	\$0	0	\$0
<b>Total</b>	<b>229</b>	<b>\$18,056,724</b>	<b>95</b>	<b>\$7,778,223</b>	<b>324</b>	<b>\$25,834,947</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	0	\$0	0	\$0	0	\$0
65-69	3	\$216,288	8	\$564,708	11	\$780,996
70-74	50	\$3,801,265	29	\$2,011,326	79	\$5,812,591
75-79	30	\$2,137,626	34	\$2,617,554	64	\$4,755,180
80-84	11	\$831,149	16	\$1,370,309	27	\$2,201,458
85-89	5	\$425,200	4	\$304,430	9	\$729,630
90-94	0	\$0	4	\$355,113	4	\$355,113
95-99	0	\$0	1	\$65,195	1	\$65,195
100+	0	\$0	0	\$0	0	\$0
<b>Total</b>	<b>99</b>	<b>\$7,411,529</b>	<b>96</b>	<b>\$7,288,635</b>	<b>195</b>	<b>\$14,700,164</b>

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2020**

**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	\$50,602	1	\$85,277	2	\$135,879
60-64	3	\$170,562	4	\$212,960	7	\$383,522
65-69	14	\$816,499	5	\$320,391	19	\$1,136,890
70-74	27	\$1,364,399	16	\$897,233	43	\$2,261,632
75-79	29	\$1,520,104	17	\$1,013,126	46	\$2,533,230
80-84	12	\$658,412	17	\$1,016,633	29	\$1,675,045
85-89	16	\$1,086,277	22	\$1,114,420	38	\$2,200,697
90-94	24	\$1,356,037	27	\$1,479,502	51	\$2,835,539
95-99	4	\$194,177	8	\$435,205	12	\$629,382
100+	2	\$138,651	0	\$0	2	\$138,651
<b>Total</b>	132	\$7,355,720	117	\$6,574,747	249	\$13,930,466

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2020**

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

The assumptions and methods used in the actuarial valuation as of July 1, 2020 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 2021-2022 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, 2020**

**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 5.37%.

<b>Benefit Payment Year</b>	<b>Expected Return</b>
2020-2026	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**

Administrative expenses for the Fiscal Year Ending June 30, 2021 are assumed to be \$1,645,600, 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, 2020**

**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 contract that expires on June 30, 2023 and the Fire contract that expires on December 31, 2023. 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>
July 1, 2020	2.50%	N/A
January 1, 2021	N/A	2.50%/4.50% <sup>1</sup>
July 1, 2021	3.00%	1.50%
January 1, 2022	N/A	2.00%
July 1, 2022	3.50%	1.00%
July 1, 2023	3.50%	0.00%
December 1, 2023	N/A	2.00%
Annual Increases		
Starting	3.25%	3.25%
July 1, 2024		

<sup>1</sup> 4.50% for Fire Engineers, 2.50% for all other Fire.

**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, 2020**

**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**

A new Memorandum of Understanding (MOU) went into effect for Fire members after the previous valuation, changing Fire retirees' Cost-of-Living Adjustments (COLAs). No other changes have been made to the actuarial assumptions.

**OAKLAND POLICE AND FIRE RETIREMENT SYSTEM  
ACTUARIAL VALUATION REPORT AS OF JULY 1, 2020**

**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, 2020**

**APPENDIX C – SUMMARY OF PLAN PROVISIONS**

**10. Benefit Forms**

Benefit is paid for the lifetime of the member. For deaths following a service retirement or non-duty disability, a 66-2/3% continuance is paid for the lifetime of the spouse. If the member retired under a duty-related disability, a continuance of 100% is paid.

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

None

## 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 that 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.

### 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.

**APPENDIX D – GLOSSARY**

**9. Amortization Payment**

The portion of the pension plan contribution that 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 that 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.



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