

September 2022

BUILDING THE TRUST

Investment Management



**Teacher Retirement System of
Texas**

1000 Red River Street
Austin, Texas
78701-2698

**TEACHER RETIREMENT SYSTEM OF TEXAS MEETING
BOARD OF TRUSTEES
AND
INVESTMENT MANAGEMENT COMMITTEE**

*(Committee Chair and Members: Mr. Corpus, Chair; Mr. Hollingsworth; Mr. Moss,
Ms. Sissney and Mr. Walls, Jr.)*

*All or part of the September 15, 2022, meeting of the TRS Investment Management Committee and Board of Trustees may be held by telephone or video conference call as authorized under Sections 551.130 and 551.127 of the Texas Government Code. The Board intends to have a quorum and the presiding officer of the meeting physically present at the following location, which will be open to the public during the open portions of the meeting: **1000 Red River, Austin, Texas 78701 in the TRS East Building, 5th Floor, Boardroom.***

The open portions of the September 15, 2022, meeting are being broadcast over the Internet. Access to the Internet broadcast and agenda materials of the meeting is provided at www.trs.texas.gov. A recording of the meeting will be available at www.trs.texas.gov.

**AGENDA
September 15, 2022 – 10:30 a.m.**

1. Call roll of Committee members.
2. Consider the approval of the proposed minutes of the July 2022 committee meeting – Committee Chair.
3. CIO Update including Fleet Strategy; Talent Management; Accomplishments; Notices, Key Dates and Upcoming Events, and Market Update – Jase Auby.
4. Discuss the Second Quarter 2022 Performance Review – Steve Voss and Mike McCormick, Aon Hewitt.
5. Review of the Semi-annual Risk Report – James Nield and Stephen Kim.

NOTE: The Board of Trustees (Board) of the Teacher Retirement System of Texas will not consider or act upon any item before the Investment Management Committee (Committee) at this meeting of the Committee. This meeting is not a regular meeting of the Board. However, because the full Committee constitutes a quorum of the Board, the meeting of the Committee is also being posted as a meeting of the Board out of an abundance of caution.

**Minutes of the Investment Management Committee
July 14, 2022**

The Investment Management Committee of the Board of Trustees of the Teacher Retirement System of Texas met on Thursday, July 14, 2022, in the boardroom located on the Fifth Floor in the East Building of TRS' offices located at 1000 Red River Street, Austin, Texas, 78701.

Committee members present:

Mr. David Corpus, Chair
Mr. Jarvis Hollingsworth
Mr. Christopher Moss
Mrs. Nanette Sissney

Other TRS Board Members present:

Mr. Mike Ball
Mr. John Elliott
Mr. James D. Nance

Others present:

Brian Guthrie, TRS
Andrew Roth, TRS
Heather Traeger, TRS
Jase Auby, TRS
Amanda Jenami, TRS
Don Green, TRS
Katy Hoffman, TRS
Eric Lang, TRS
Kimberly Carey, TRS
Carolyn Hansard, TRS
Neil Randall, TRS
Grant Walker, TRS
Katherine Farrell, TRS
Suzanne Dugan, Cohen Milstein
Dr. Keith Brown, Board Advisor
Mike McCormick, AON.

Investment Management Committee Chair, Mr. David Corpus, called the meeting to order at 3:38 p.m.

1. Call roll of Committee members.

Ms. Farrell called the roll. A quorum was present, Mr. Moss was absent.

2. Consider the approval of the proposed minutes of the April 2022, Investment Management Committee meeting – Chair David Corpus.

On a motion by Mr. Hollingsworth, seconded by Ms. Sissney, the committee approved the proposed minutes for the April 2022 Investment Management Committee meeting as presented.

3. CIO Update including Fleet Strategy; Talent Management; Accomplishments; Notices; Key Dates and Upcoming Events, and Market Update – Jase Auby.

Mr. Jase Auby began by referencing the ongoing market volatility. He reported finishing up his CIO fireside chat cycle where he meets in small groups with 100 percent of the Investment Management Division (IMD). He reviewed IMD staff turnover stating if the pace continues approximately one-third of IMD will have turned over by end of year over a 24 month period. He said they are actively recruiting for 17 open positions and the internship program is in full swing.

Mr. Auby reviewed the standard reporting metrics. He noted the public market was negative but was on the upswing. He further discussed the market volatility seen recently. He reported that 2021, a spectacular year for the S&P 500 ended with a 28.7 percent return and as of date, the S&P 500 is at exactly minus 20 percent. He said the standard definition of a bear market would be a 20 percent drawdown and provided a historical perspective of bear markets.

4. Discuss the First Quarter 2022 Performance Review –Mike McCormick, Aon

Mr. Mike McCormick began by referencing how rates have already risen materially since the data he was reporting on was collected through March 31, 2022. He reviewed the primary benchmarks for the Trust noting equities were down about 2.2 percent and stable value down by 8.1 percent, with Treasury bonds being negatively impacted by an 80-basis point increase in the ten-year Treasury for the quarter. He reported the real estate was up 7 percent for the quarter. He stated though it was a difficult quarter for risk parity with stocks falling and rates rising. Dr. Brown pointed out risk parity was not the same as risk hedge, there is still exposure to risk. Mr. McCormick said that while the first quarter of 2022 is not great news on a total return basis, the Trust is up over the benchmark by about 20 basis points.

5. Annual Review of external Private Markets – Eric Lang, Carolyn Hansard, Neil Randall, Grant Walker and Kimberly Carey.

Mr. Eric Lang provided an overview of private markets. He said at \$75 billion, this is one of the largest private market portfolios in the world. He noted returns were exceptional, 30 percent return on the one-year number. He said that while all the portfolios delivered good returns, excess return was a bit hard to come by for Energy, Natural Resources, and Infrastructure (ENRI) and Private equity. The ENRI lagged its benchmark due to the timing of large investments and Private Equity lagged due to the benchmark but had a good return as well. He provided a preview of the first quarter returns and discussed the turnover they have experienced since 2021. He concluded with TRICOT, the London office, with \$33 billion invested in Europe, 18 percent of the Trust.

Ms. Kimberly Carey provided the TRICOT update. She reported establishing an ENRI presence in London. She said the biggest goal and accomplishment is being able to hire local employees out of the TRICOT office.

Mr. Lang concluded his remarks by noting this year they have started examining entry points into the digital assets area.

Ms. Carolyn Hansard provided an overview of the ENRI portfolio which is part of the 21 percent real return allocation. She noted this portfolio to provide protection during inflation and said for the first quarter they actually outperformed inflation. She said 53.3 percent of the portfolio was in infrastructure and 41 ½ percent in energy. She reviewed the natural gas markets, the global growth, and the investments TRS has made over the past five or six years in years in gas related sectors including upstream, liquified natural gas (LNG) facilities and other gas related infrastructure.

Mr. Neil Randall provided an overview of the private equity (PE) portfolio. He noted last year's performance was historically strong on a 1-year basis and generated \$9 billion of distributions back to the portfolio. He said for 2022 the first quarter has reversed and the portfolio is down approximately two percent. He reported for the last 18 months there was a 50 percent team turnover. He stated that the PE industry is growing at a rate that is faster than how much TRS's commitments are growing in private equity. He said TRS is still a large-scale investor but the relative market positions is declining and more competition is entering the co-investment space. He concluded by noting talent is going to be the differentiator going forward.

Mr. Grant Walker provided an overview on the real estate portfolio. He reported the portfolio has produced excess returns relative to the benchmark across all time periods with 700 basis points of outperformance on the one-year. He reviewed the key drivers of the outperformance. He said one was the underweight on office, retail and hotel sectors prior to COVID, which strategically worked well, as the outperformers were industrial and residential, which we targeted to be overweight. The other drivers were the outstanding investment performance of our limited partners, and prioritizing innovation within the portfolio to focus on niche property sectors. He said a few years ago they began focusing on property sectors such as life sciences and studio and media space which all saw an increase in demand during the pandemic. He reviewed the performance against the benchmark. He said historically there is a gradual decline after the peak of a cycle, but we are not able to predict what lies ahead for real estate as we likely enter a recession. However, an inflationary environment really favors real estate and the recent returns are still favorable.

There being no more business before the Investment Management Committee, the committee adjourned at 5:13 p.m.

Approved by the Investment Management Committee of the Board of Trustees of the Teacher Retirement System of Texas on September __, 2022.

Katherine H. Farrell
Secretary to the Board of Trustees
Teacher Retirement Systems of Texas

Date

CIO Update

Jase Auby, Chief Investment Officer

September 2022



CIO Update

IMD at a Glance

Priorities

- **Performance.** Trust value is \$184.4 billion as of June 30th with 75 bp of excess return in the 2nd quarter
- **Credit Rating.** TRS received issuer credit rating of AAA with a stable outlook by Standard & Poor’s (S&P)
- **Engagement.** Presenting at Texas Retired Teacher Association (TRTA) regional conferences to share key initiatives, performance, and engage with plan members
- **Annual Reviews.** Completed Management Committee (MC) Annual Offsite Talent Review

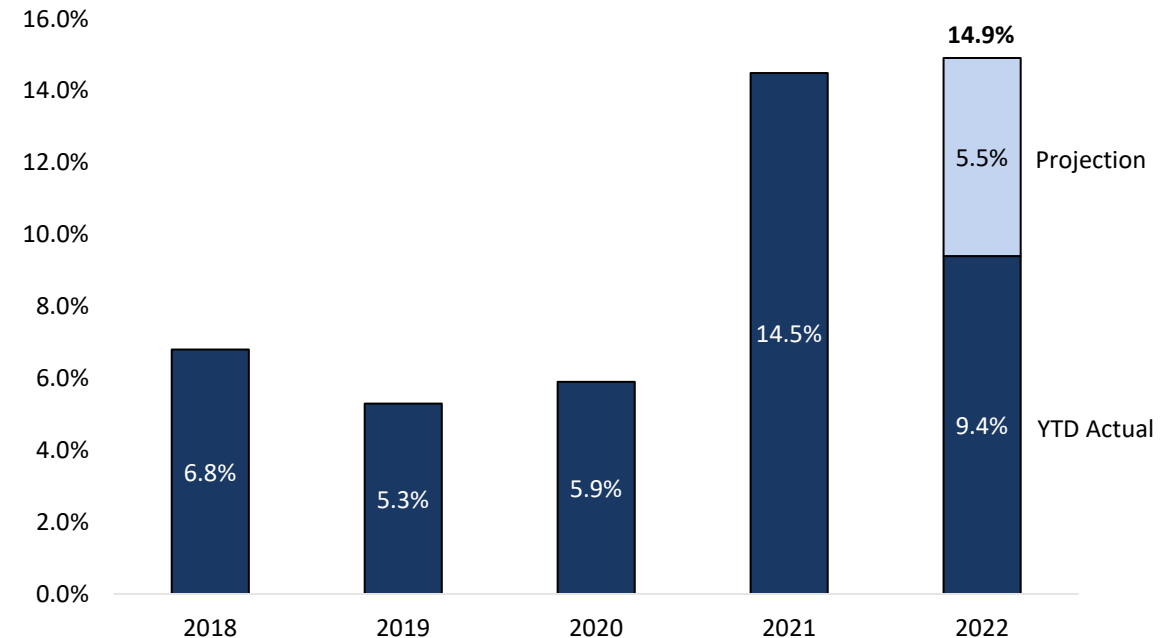
Key Dates and Upcoming Events

Event	Location	Dates
Council of Institutional Investors (CII) Fall 2022 Conference	Boston, MA	September 21-23, 2022
GCM Small and Emerging Managers Conference	Chicago, IL	October 12-13, 2022
Strategic Partnership Network (SPN) Summit	New York City	November 2, 2022
TRS Legal Summit	Austin, TX	November 9, 2022

Our People

Snapshot as of August 2022		Activity	Phase I	Phase II	Phase III
IMD FTEs	208	Hired	32	30	11
Shared-Services	20	Recruiting	0	0	2
Contractors	14	Pipeline	0	1	12
Secondees	5		32	31	25

Attrition Trend 2018 – 2022 (As of August 2022)



CIO Update

Metrics Reporting – As of June 30, 2022

Metric	Objective	Target	Q4 2021	Q1 2022	Q2 2022
Total Trust Excess Return	Return in excess of the benchmark return for the Total Trust (3 Year Rolling)	+100 bp	+10 bp	+33 bp	+66 bp
Private Markets Excess Return	Return in excess of the benchmark return for Private Markets investments (3 Year Rolling)	+155 bp	+174 bp	+127 bp	+77 bp
Active Public Markets Excess Return	Return in excess of the benchmark return for Active Public Markets investments (3 Year Rolling)	+100 bp	-36 bp	-14 bp	+36 bp
Principal Investments	Percent of portfolio capital plan in principal investments approved (cumulative year-to-date) ¹	2021: 42% 2022: 42%	2021: 52%	YTD: 45%	YTD: 45%
Public Equity Allocation	Percent of internal public equity allocation	45%	51%	52%	50%
Estimated Net Fee Savings	External manager annual net fee savings ²	2018: \$53M 2019: \$64M 2020: \$80M 2021: \$105M 2022: \$138M	2018: \$46M 2019: \$65M 2020: \$93M 2021: \$117M 2022: To be reported April 2023 Total: \$321M		



Source: State Street Bank, TRS IMD

¹ – Calculation represents approved principal investments (PI) in relation to approved portfolio (PI and Fund investments)

² – Estimated net fee savings includes management fees only and is presented net of inception to date marginal direct and overhead costs attributed to employees hired as part of the Building the Fleet initiative. CY2021 estimated net fee savings includes any cumulative prior period adjustments.

Market Update

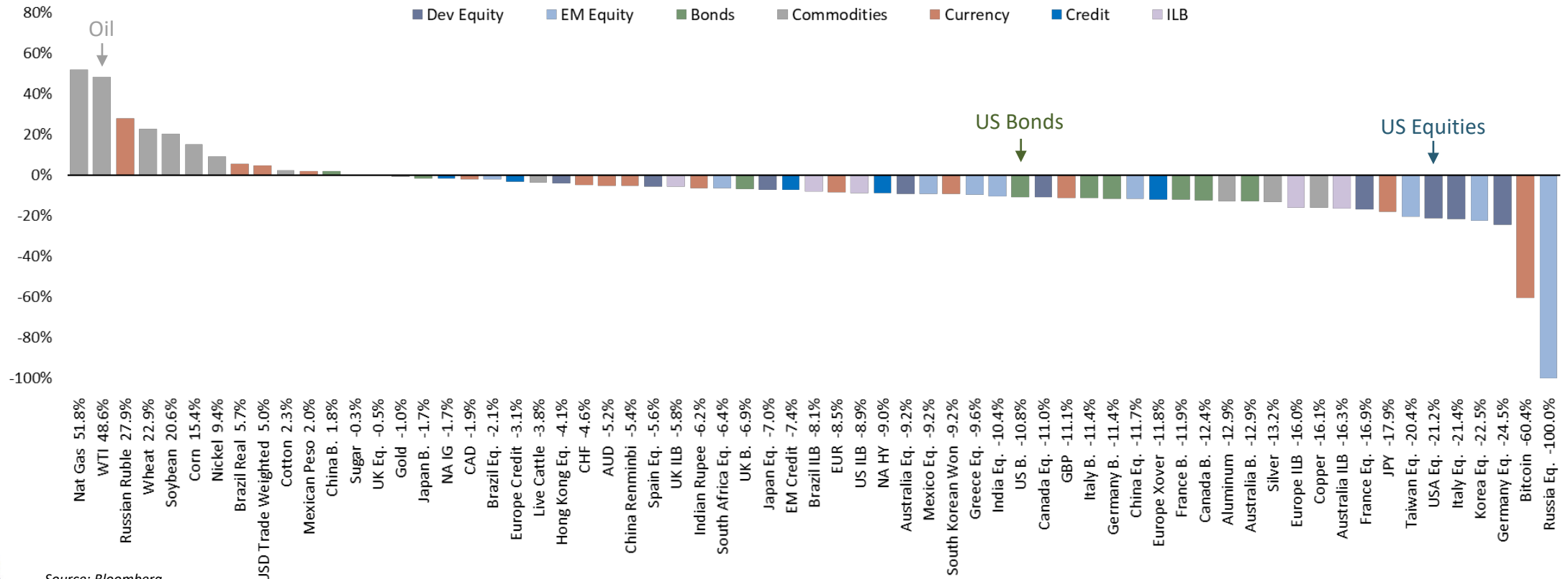
2022 First Half Review

Market Returns

18% of assets had positive returns throughout the first half of 2022

- **Top 5:** Natural Gas 52%, WTI 49%, Russian Ruble 28%, Wheat 23%, Soybean 21%
- **Bottom 5:** Russian Equities -100%, Bitcoin -60%, German Equities -25%, Korean Equities -23%, Italian Equities -21%

Asset Class Performance - YTD 2022
January 1, 2022 - June 30, 2022 • Local • Percent (%)

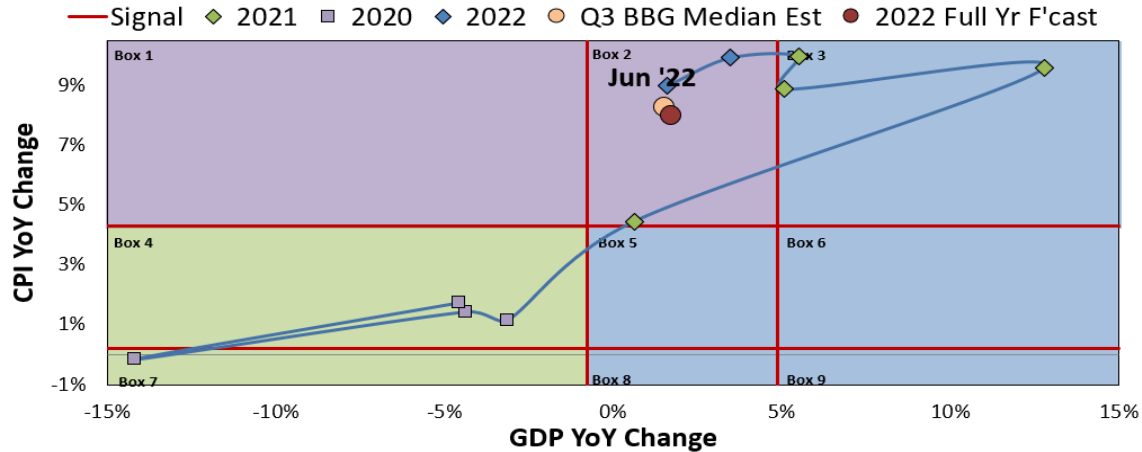


Source: Bloomberg

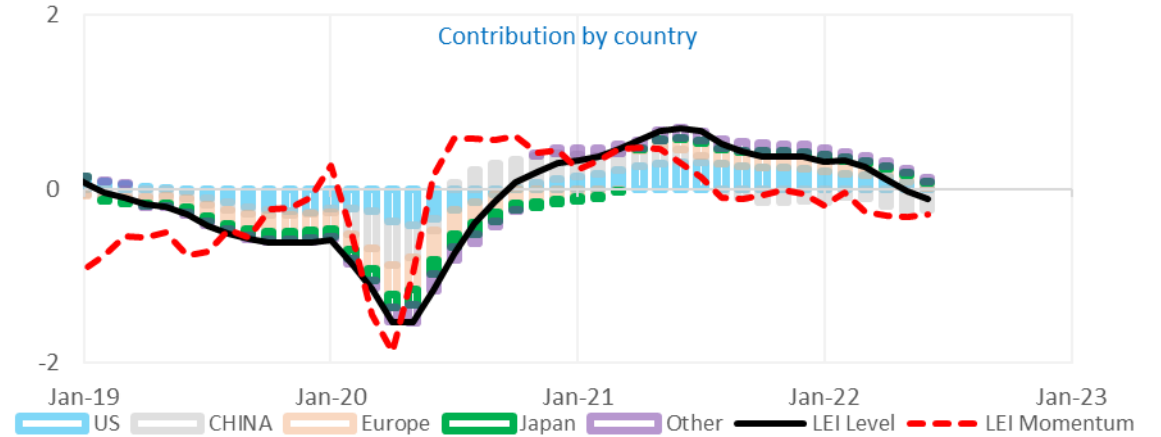
Macroeconomic Update

Inflation, Growth, Leading Economic Indicators (LEI)

USA 9-Box



Leading Economic Indicators



Global 9-Box

	December 2021	March 2022	June 2022
US	Box 3	Box 2	Box 2
Europe	Box 2	Box 2	Box 2
Japan	Box 5	Box 5	Box 2
China	Box 5	Box 5	Box 4
EM ex-China	Box 4	Box 3	Box 3

Government Bond Yields and ERP¹

Region	10yr gov. bond yields ²	Equity Risk Premium	
		Current	10-Year Average
USA	3.0%	2.2%	3.4%
Eurozone	1.3%	6.3%	6.1%
UK	2.2%	6.7%	5.6%
Japan	0.2%	7.0%	6.2%
Emerging Markets	4.1%	4.2%	3.8%



Source: Bloomberg, FactSet, TRS IMD, Blackrock as of 6/30/2022

¹ Equity Risk Premium is the forward earnings yield of the local equity market index less applicable 10 year government bond yield

² For USA, 10yr US Treasuries; for Europe, 10yr German gov. bonds; for Japan, 10yr Japanese gov. bonds; for EM, a blend of 10yr Chinese, South Korean, and Brazilian gov. bonds

Special Topic: Sentiment

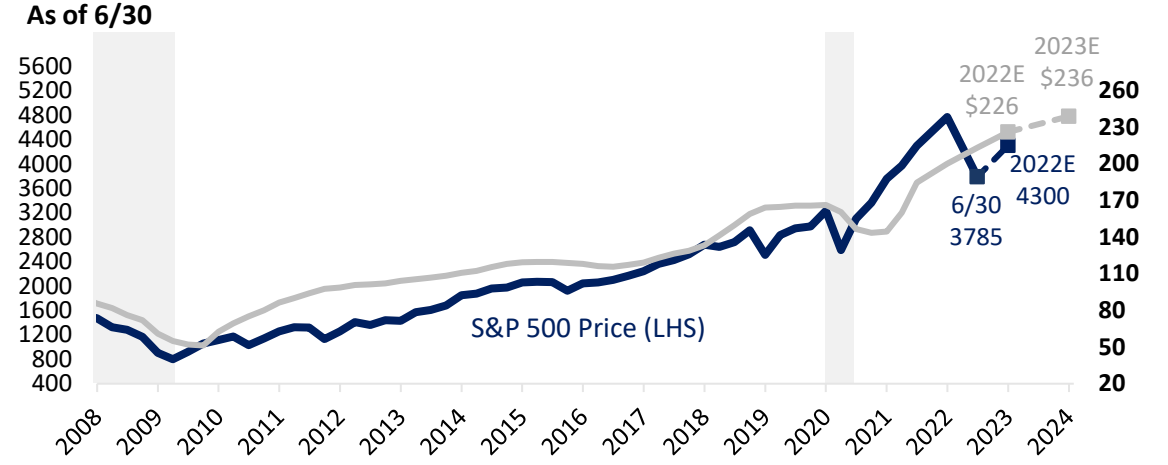
Special Topic: Sentiment

Overview

Special Topics

Topic	Date
1 Recession	September 2017
2 Growth	February 2018
3 Inflation	September 2018
4 Strategic Asset Allocation	February 2019
5 Value	September 2019
6 Diversification	February 2020
7 Interest Rates	September 2020
8 Long-Term Investing	February 2021
9 Commodities	September 2021
10 China	February 2022
11 Sentiment	September 2022

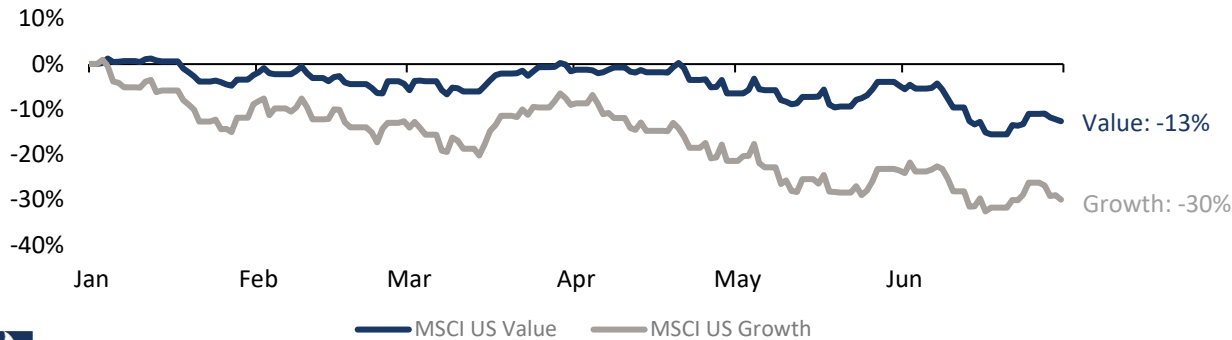
Update on Growth Special Topic



Update on Value Special Topic

Year to date, as of 6/30

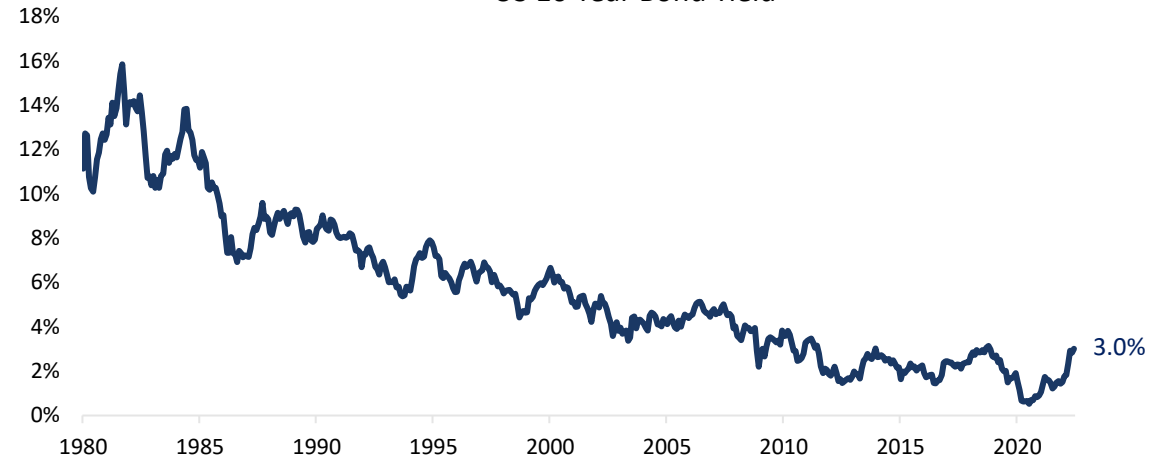
MSCI US Value vs. MSCI US Growth



Update on Interest Rates Special Topic

As of 6/30

US 10 Year Bond Yield

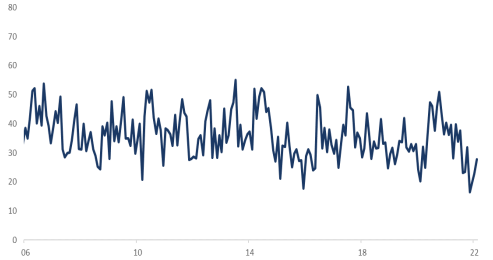
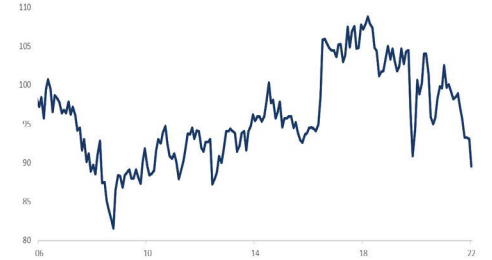
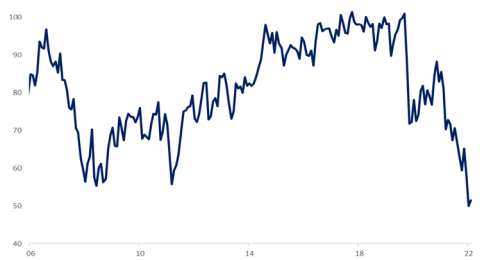
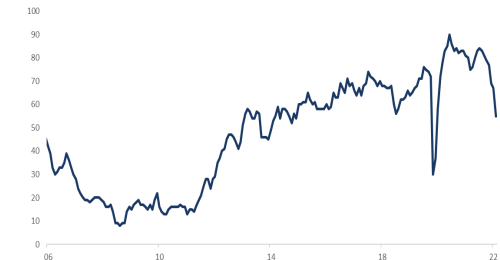


Source: US Bureau of Economic Analysis (BEA), Federal Reserve Economic Data (FRED), Goldman Sachs, Bloomberg
Note: Adjusted S&P 500 EPS calculated as twelve trailing months on a quarterly basis

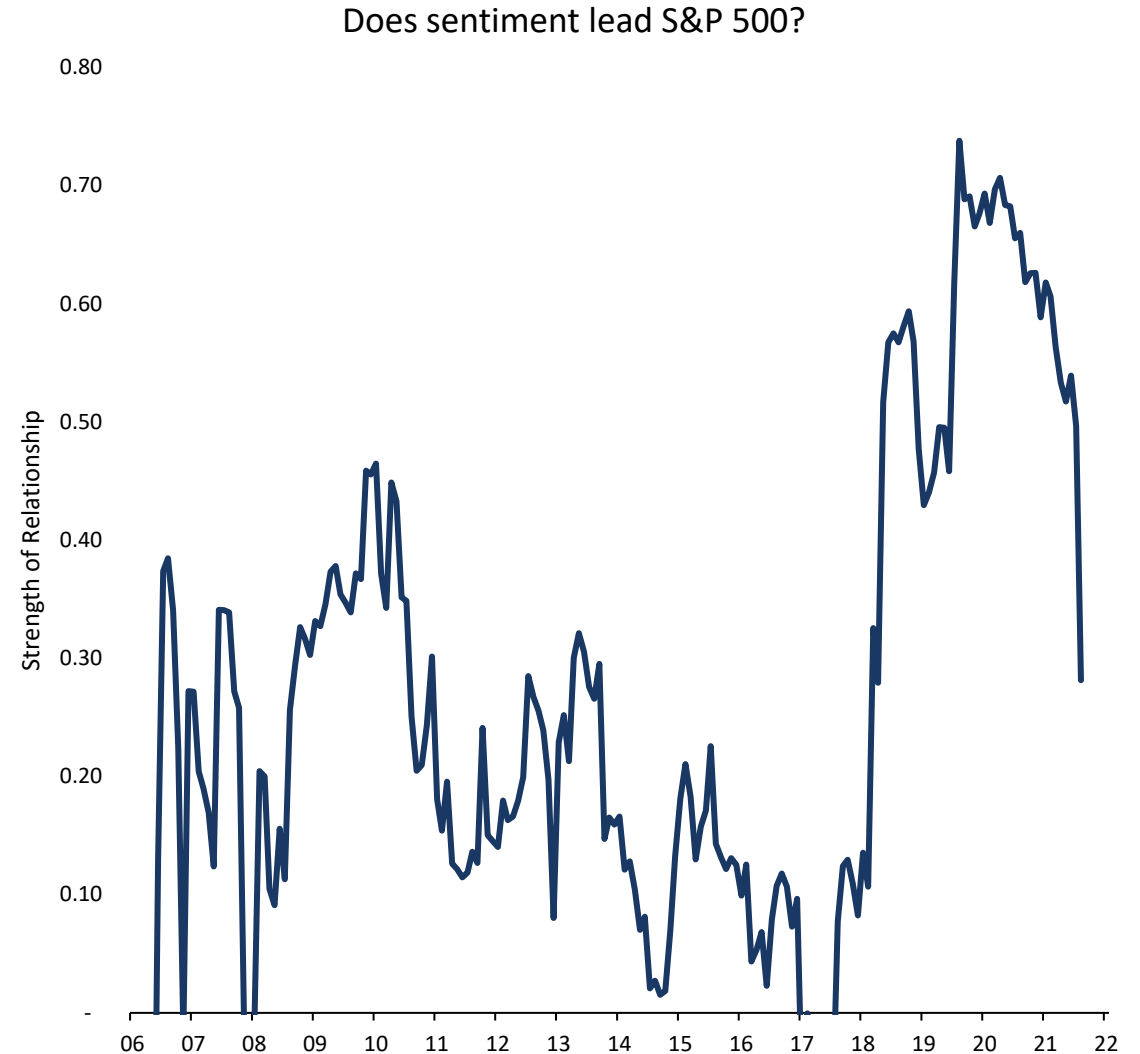
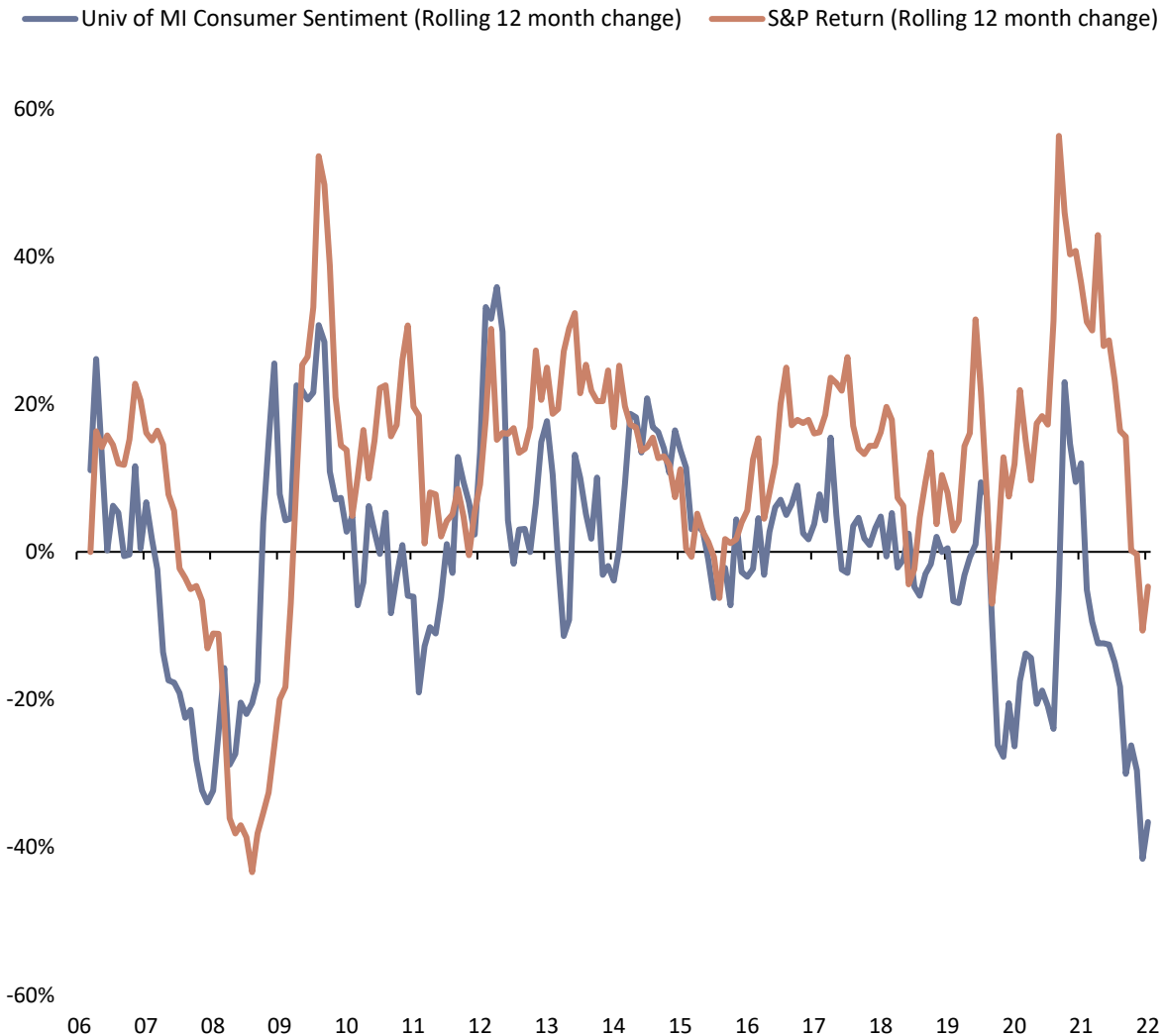
Market Sentiment

- Market sentiment refers to the **aggregated public opinions, views, feelings, mood, or outlook** that make up the market psychology at any point in time
- Economists use survey data as an **important compliment** to underlying economic data
- In the short-term, **markets are driven by emotion** – fear and greed
- Empirical evidence suggests that **investor sentiment is one of the most reliable indicators** of future price movements
- It is used as a **contrarian leading indicator** in our business cycle analysis

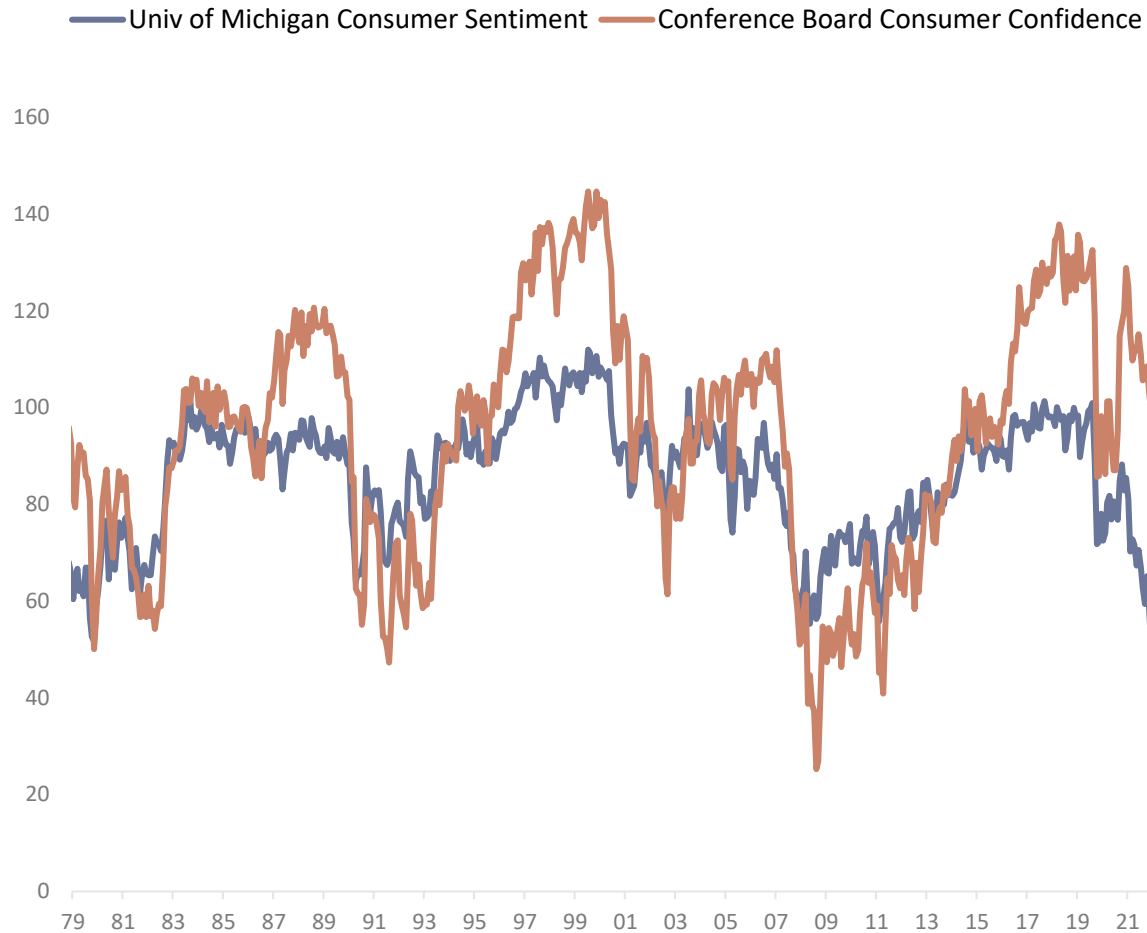
Sentiment Indicators

AAII Investor Sentiment	NAFB Small Business Optimism	University of MI Consumer Sentiment	NAHB Housing Market Index
Weekly survey on thoughts about where the market is heading in six months	Survey tracks the health of US small businesses which accounts for ~50% of the private workforce	Survey of consumers reflecting attitudes toward finances, business and market conditions	Checks the pulse of the single-family housing market, according to a monthly survey
			
Sentiment Low, Rising	Sentiment Low, Falling	Sentiment Lowest, Rising	Sentiment Low, Falling

Consumer Sentiment tends to lead S&P Returns



Consumer Surveys

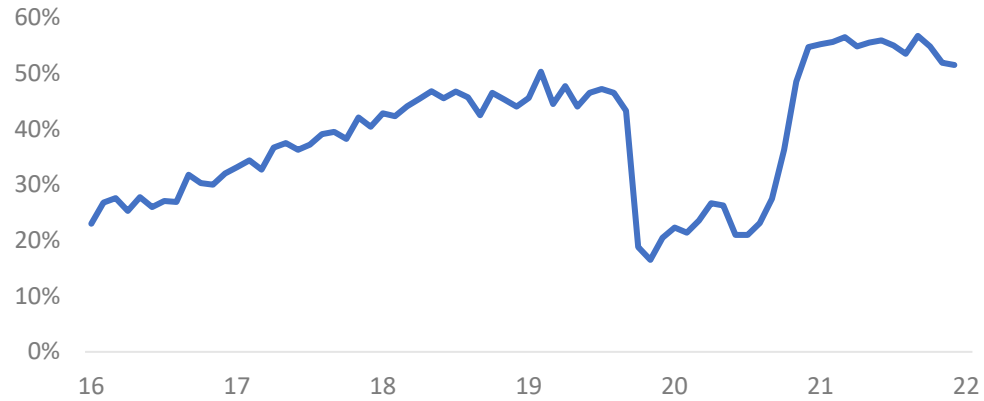


- The University of Michigan surveys 500 households
 - It is highly sensitive to volatility in gasoline prices
 1. *Are you better or worse off than you were a year ago?*
 2. *Will you be better or worse off one year from now?*
 3. *Will business conditions over next 12 months be good or bad?*
 4. *Economic conditions over next 5 years?*
 5. *Is now a good or bad time to buy major household items?*

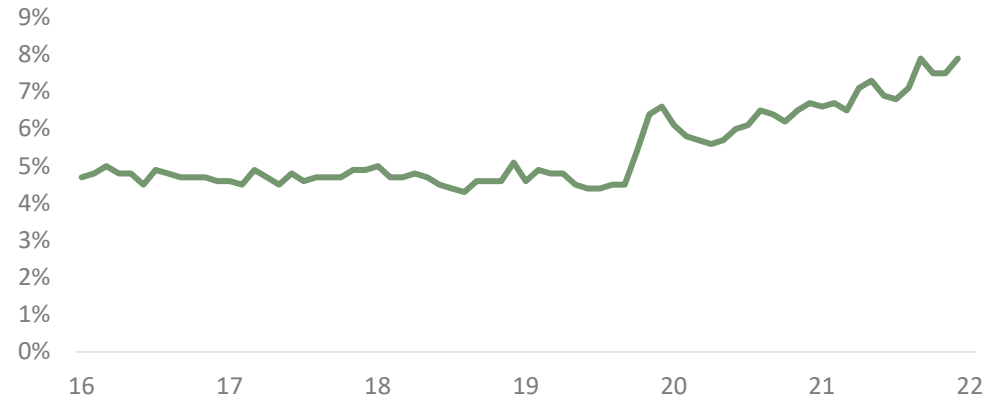
- The Conference Board surveys 3,000 households
 - It reflects movements in the unemployment rate and inflation-adjusted gasoline prices
 1. *Perception of job prospects over the next 12 months?*
 2. *Perception of own personal finances over the next 12 months?*
 3. *Perception of how good of a time it is to buy goods and services?*

Univ. of MI Components: People are employed, but they are not happy about it

Employment Jobs Plentiful



Inflation Rate Expectation



Business Conditions (Good)



Stock Prices Decrease Expectation

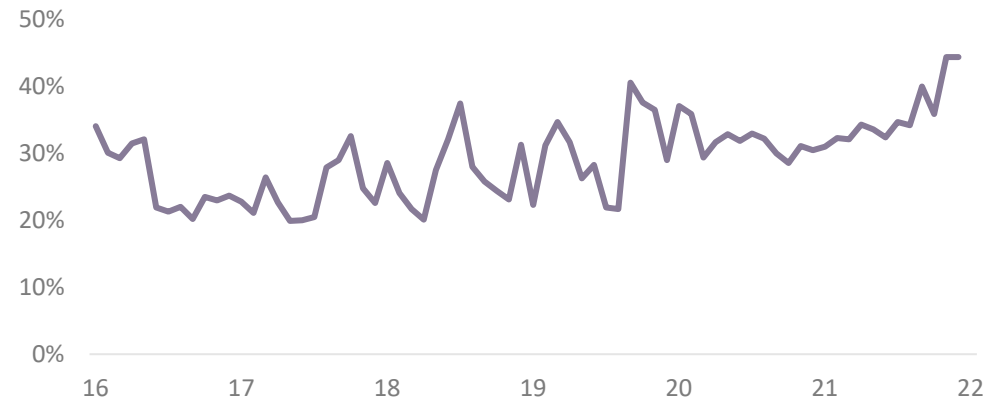
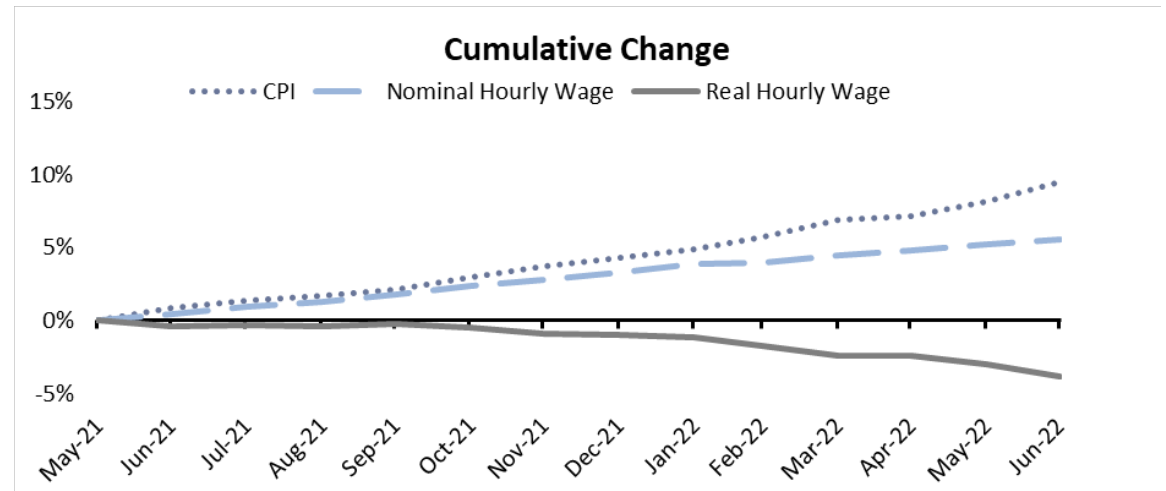
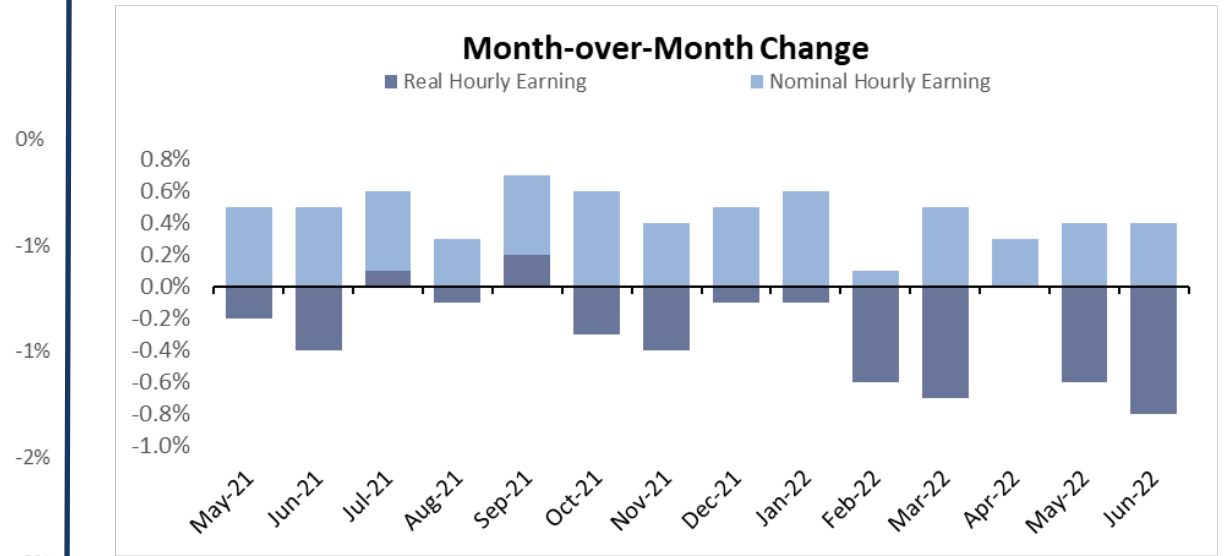
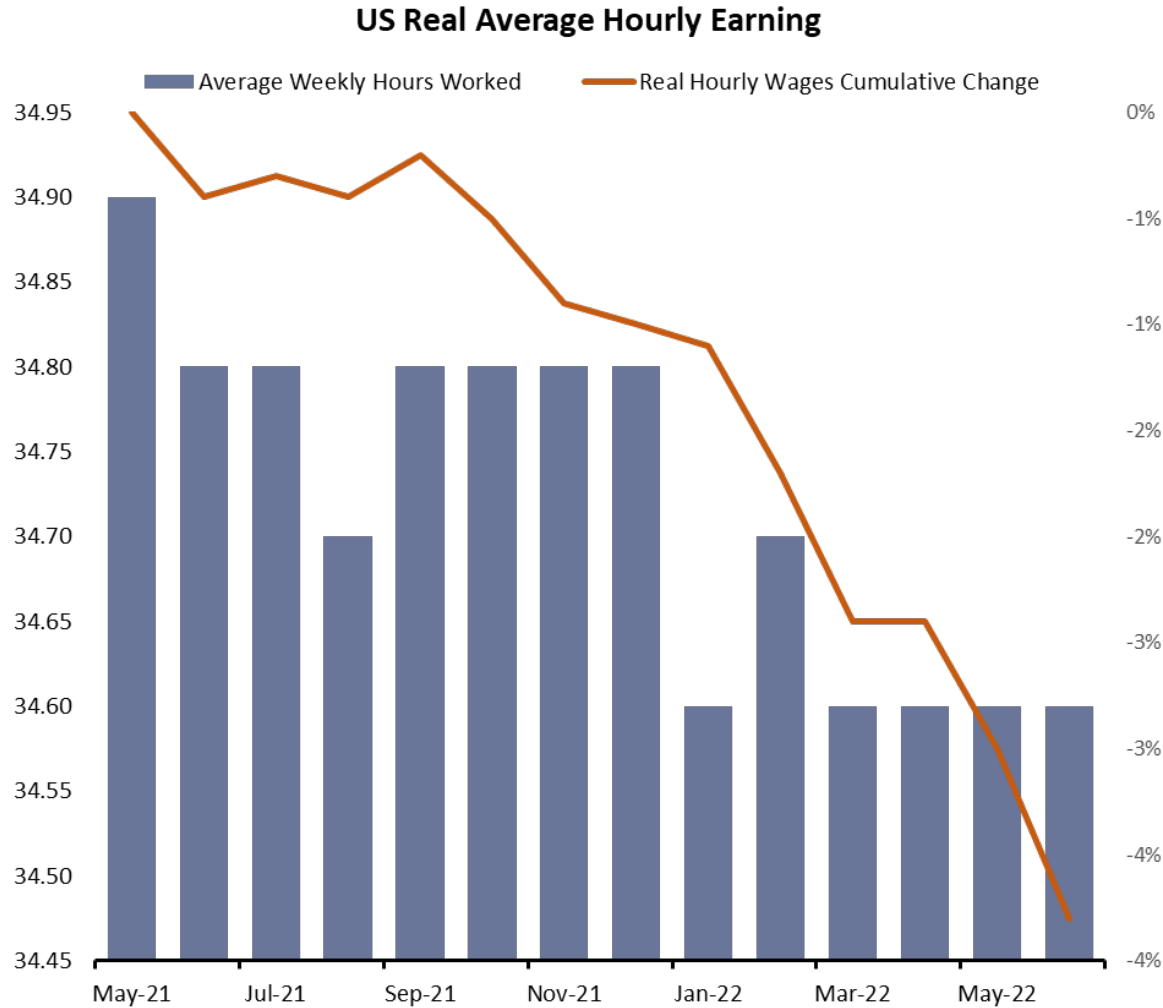


Chart updated through: 08/01/22

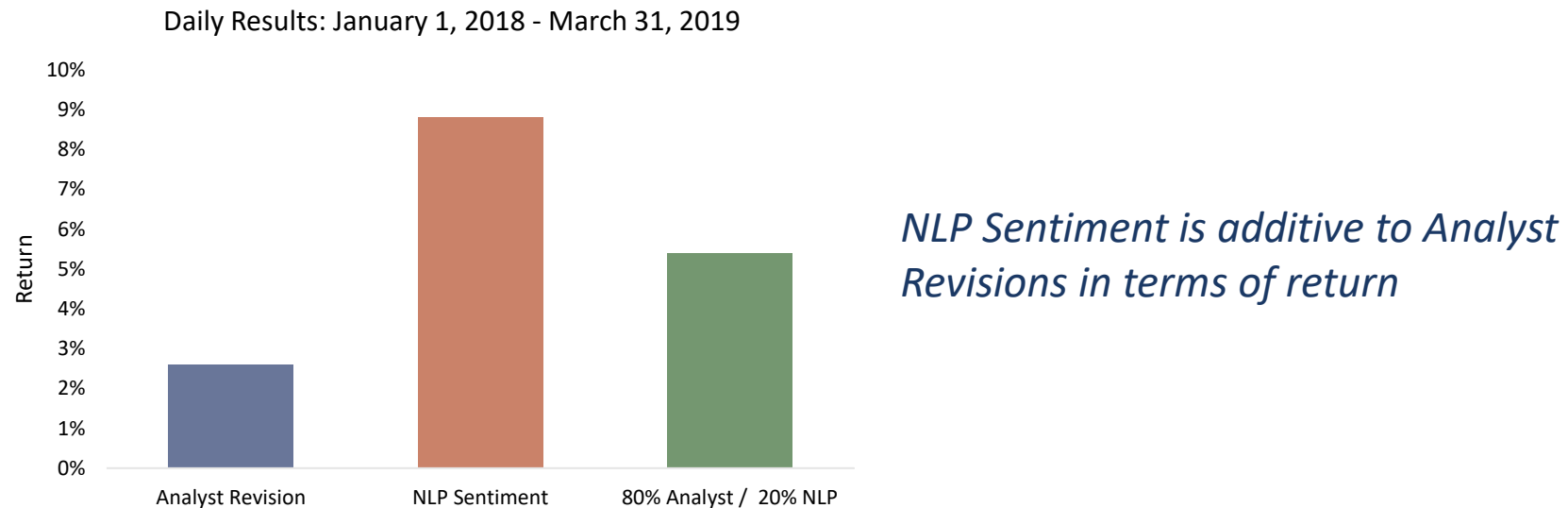
Chart updated through: 08/01/22

Negative real wage growth is likely causing current negative sentiment



Using sentiment as a factor in quant investing

- Advances in data science, A.I. and natural language processing (NLP) are being incorporated into sentiment models



Sentiment

- Sentiment is an essential component of both economics and asset management
 - The Federal Reserve produces and incorporates many sentiment indicators into their view of the economy
 - Investment managers have historically built powerful processes using sentiment and are now augmenting their processes with advanced techniques such as natural language processing
- Current economic indicators show
 - Inflation expectations are elevated
 - Employment satisfaction is also elevated



Teacher Retirement System of Texas

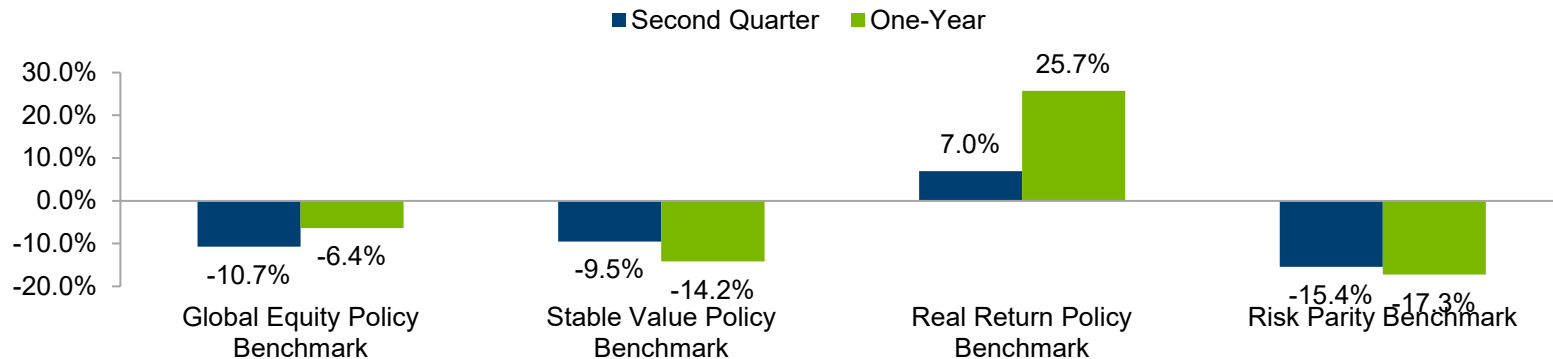
Performance Review: Second Quarter 2022

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Summary

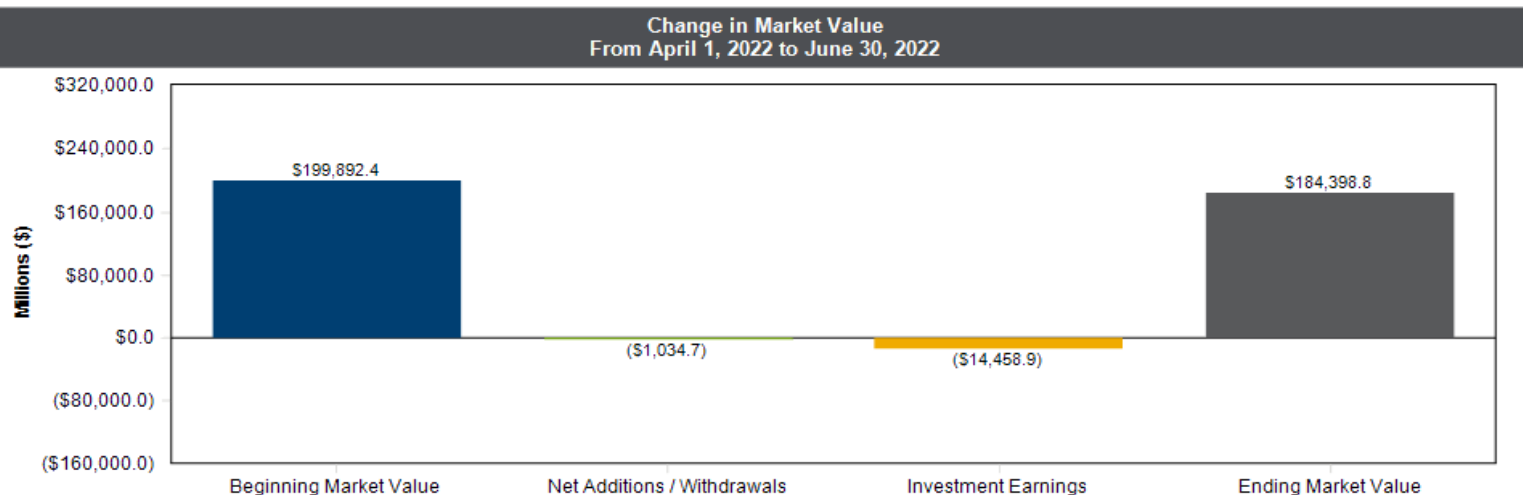


- Capital markets were dominated by geopolitical uncertainty and higher interest rates amidst soaring inflation during the second quarter of 2022, with global equities returning -10.7% for the period
- U.S. Treasury yields saw notable increases across the maturities which moved the yield curve upwards over the quarter. The 10-year Treasury yield was up 66bps to 2.98%, and the 30-year Treasury yield was up 70bps to 3.14% over the quarter.
- TRS returned -7.2% for the quarter which was 0.8 percentage points above its benchmark
 - Outperformance at the asset class level for Risk Parity and Stable Value were the primary drivers for relative results.
- For the trailing twelve months, TRS returned -2.3% versus the benchmark return of -3.8%
 - Outperformance from the Stable Value, Risk Parity and Real Return asset classes were the primary drivers of relative performance

1. Market Summary – Second Quarter 2022

	Second Quarter	YTD	One Year	Three Years	Five Years	Ten Years
Global Equity:						
TF USA Benchmark	-16.8%	-21.1%	-13.7%	10.0%	10.7%	12.7%
MSCI EAFE + Canada Index	-14.8	-18.8	-16.8	1.7	2.7	5.4
MSCI Emerging Markets Index	-11.5	-17.6	-25.3	0.6	2.2	3.1
HFRI Fund of Funds Composite Index	-3.9	-6.5	-5.4	4.0	3.6	--
State Street Private Equity Index (qtr lagged)	-1.2	4.7	23.5	22.9	18.8	14.7
Global Equity Policy Benchmark	-10.8	-12.7	-6.4	10.3	9.7	9.8
Stable Value:						
Bloomberg Barclays Long Treasury Index	-11.9%	-21.3%	-18.5%	-2.9%	0.5%	1.6%
HFRI Fund of Funds Conservative Index	-1.5	-1.3	0.3	4.7	4.1	--
Absolute Return Benchmark	1.2	2.2	3.8	3.2	3.6	3.0
90 Day U.S. Treasury Bill	0.1	0.1	0.2	0.6	1.1	0.6
Stable Value Policy Benchmark	-9.5	-16.8	-14.2	-1.0	1.5	2.2
Real Return:						
Bloomberg Barclays U.S. TIPS Index	-6.1%	-8.9%	-5.1%	3.0%	3.2%	1.7%
NCREIF ODCE (qtr lagged)	7.1	15.3	27.3	10.3	8.9	9.9
Energy, Natural Resources & Infrastructure Benchmark	6.5	12.2	21.8	7.9	7.5	--
Goldman Sachs Commodities Index	2.0	35.8	45.1	14.7	11.7	-1.8
Real Return Policy Benchmark	7.0	14.5	25.7	9.7	8.2	7.8
Risk Parity:						
Risk Parity Benchmark	-15.4%	-19.6%	-17.3%	1.3%	4.1%	4.3
TRS Policy Benchmark	-8.0%	-10.0%	-3.8%	7.5%	7.6%	7.8%

2. Market Value Change



Summary of Cash Flow

	1 Quarter	Year To Date	1 Year	3 Years	5 Years
Beginning Market Value	199,892,433,403	204,712,889,318	193,050,542,291	156,402,995,341	142,039,096,944
+ Additions / Withdrawals	-1,034,709,479	-2,039,591,247	-4,430,269,645	-12,485,269,649	-20,735,187,621
+ Investment Earnings	-14,458,939,484	-18,274,513,631	-4,221,488,207	40,481,058,748	63,094,875,117
= Ending Market Value	184,398,784,440	184,398,784,440	184,398,784,440	184,398,784,440	184,398,784,440

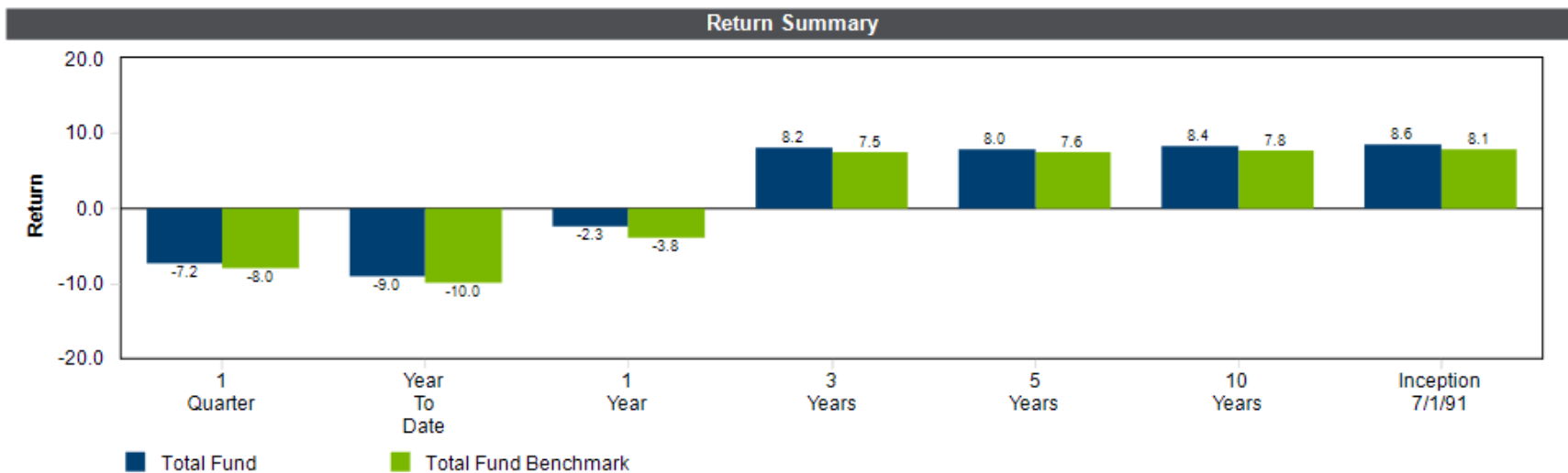
3. Asset Allocation Detail

	Market Value \$ in millions) as of 6/30/2022		Interim Policy Target	Relative to Interim Policy Target	Long Term Policy Target	Long Term Policy Ranges
	(\$)	(%)				
Investment Exposure	--	103.4%	104.0%	-0.6%	104.0%	99-115%
Total U.S.A.	\$28,003	15.2%	17.6%	-2.4%	18.0	13-23%
Non-U.S. Developed	\$21,879	11.9%	12.7%	-0.8%	13.0	8-18%
Emerging Markets	\$14,788	8.0%	8.8%	-0.8%	9.0	4-14%
Private Equity	\$34,003	18.4%	17.7%	+0.8%	14.0	9-24%*
Global Equity	\$98,674	53.5%	56.6%	-3.1%	54.0	47-61%
Government Bonds	\$23,635	12.8%	15.6%	-2.8%	16.0	0-21%
Stable Value Hedge Funds	\$9,732	5.3%	4.9%	+0.4%	5.0	0-10%
Absolute Return	\$5,300	2.9%	0.0%	+2.9%	0.0	0-20%
Stable Value	\$38,668	21.0%	20.4%	+0.5%	21.0	14-28%
Real Estate	\$28,966	15.7%	13.8%	+1.9%	15.0	10-20%
Energy, Natural Resource and Inf.	\$11,045	6.0%	5.3%	+0.7%	6.0	1-11%
Commodities	\$245	0.1%	0.0%	+0.1%	0.0	0-5%
Real Return	\$40,256	21.8%	19.1%	+2.7%	21.0	14-28%
Risk Parity	\$13,151	7.1%	7.8%	-0.7%	8.0	0-13%
Risk Parity	\$13,151	7.1%	7.8%	-0.7%	8.0	0-13%
Cash	\$2,711	1.5%	2.0%	-0.5%	2.0	0-7%
Asset Allocation Leverage	-\$9,059	-4.9%	-6.0%	+1.1%	-6.0	--
Net Asset Allocation	-\$6,349	-3.4%	-4.0%	+0.6%	-4.0	--
Total Fund	\$184,399	100.0%		---	100.0%	--

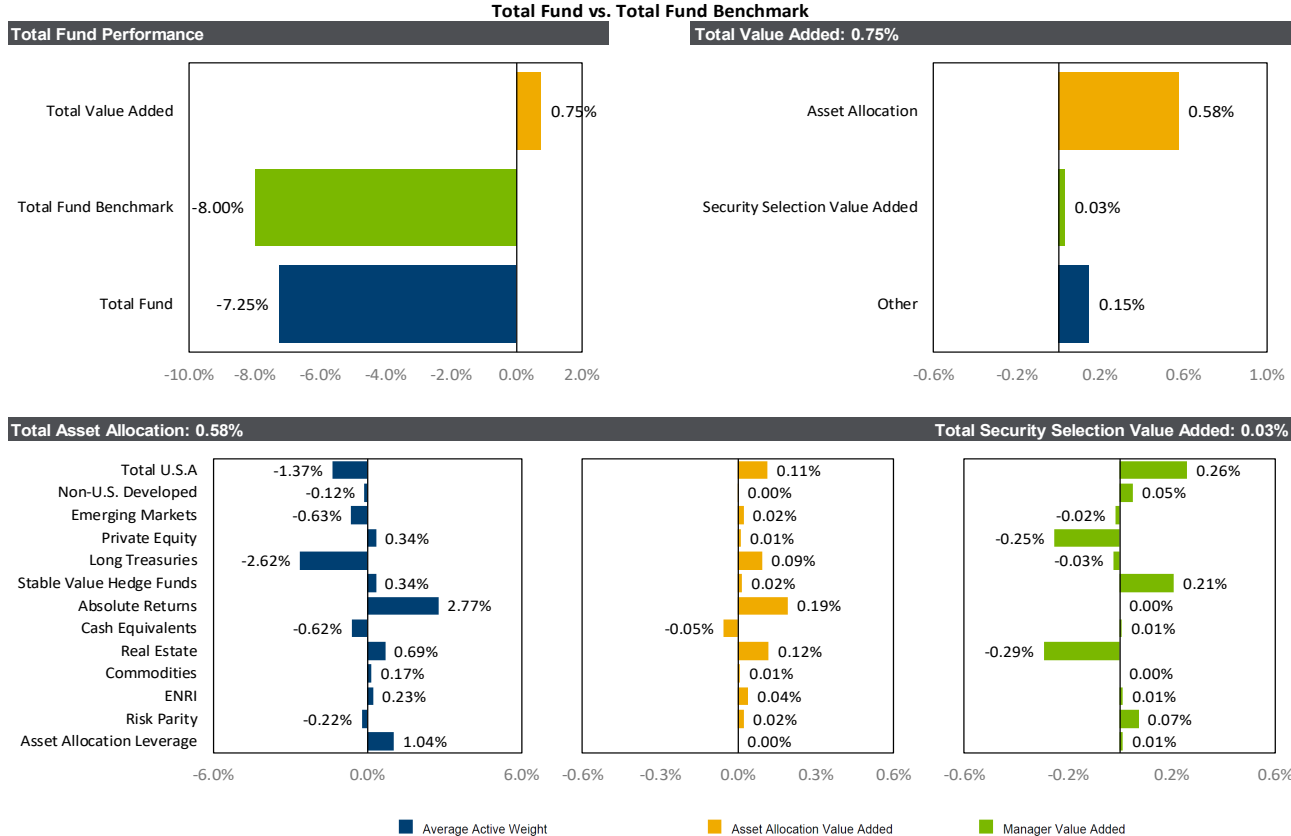
Note: Asset allocation information shown above is based upon MOPAR reporting. The excess returns shown above may not be a perfect difference between the actual and benchmark returns due entirely to rounding.

*Reverts to 9-19% on 7/31/23

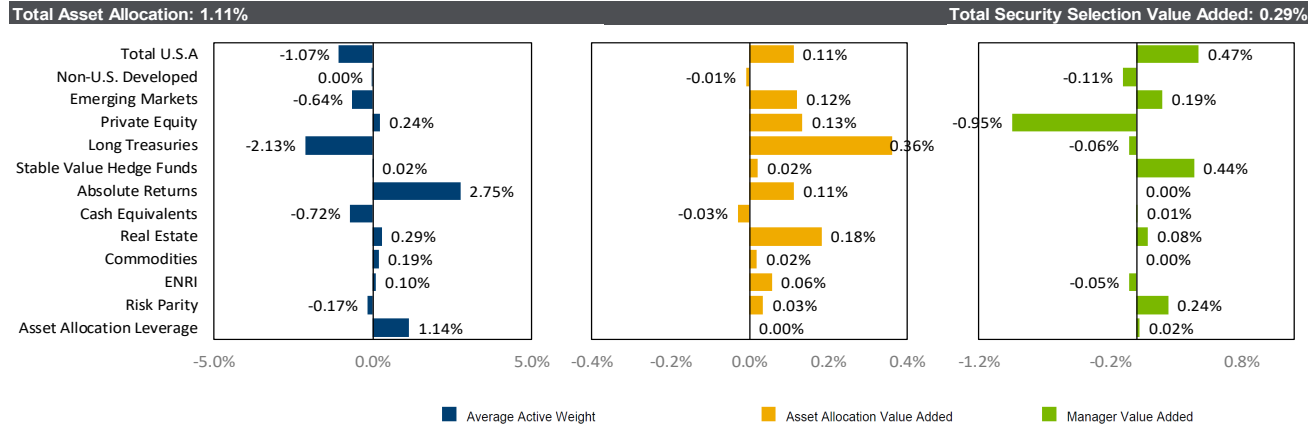
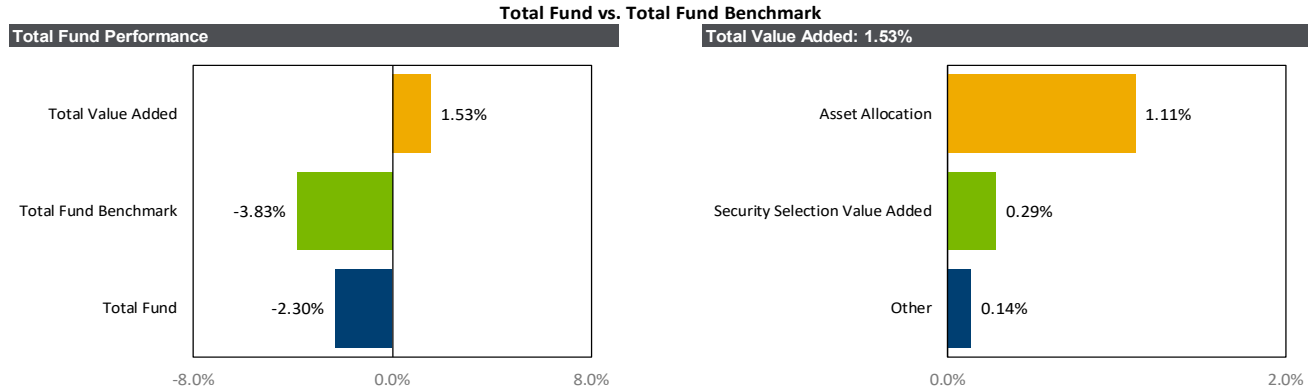
4. Total TRS Performance Ending 6/30/2022



5. Total Fund Attribution – One Quarter Ending 6/30/2022

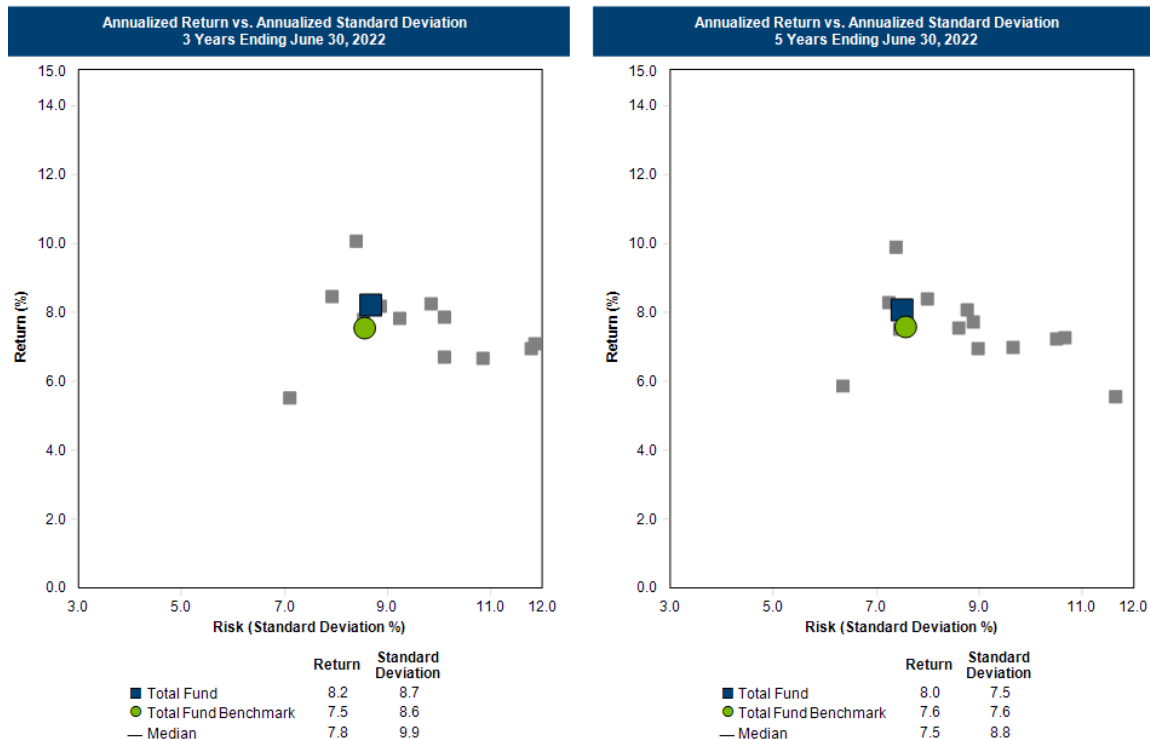


5. Total Fund Attribution – One Year Ending 6/30/2022



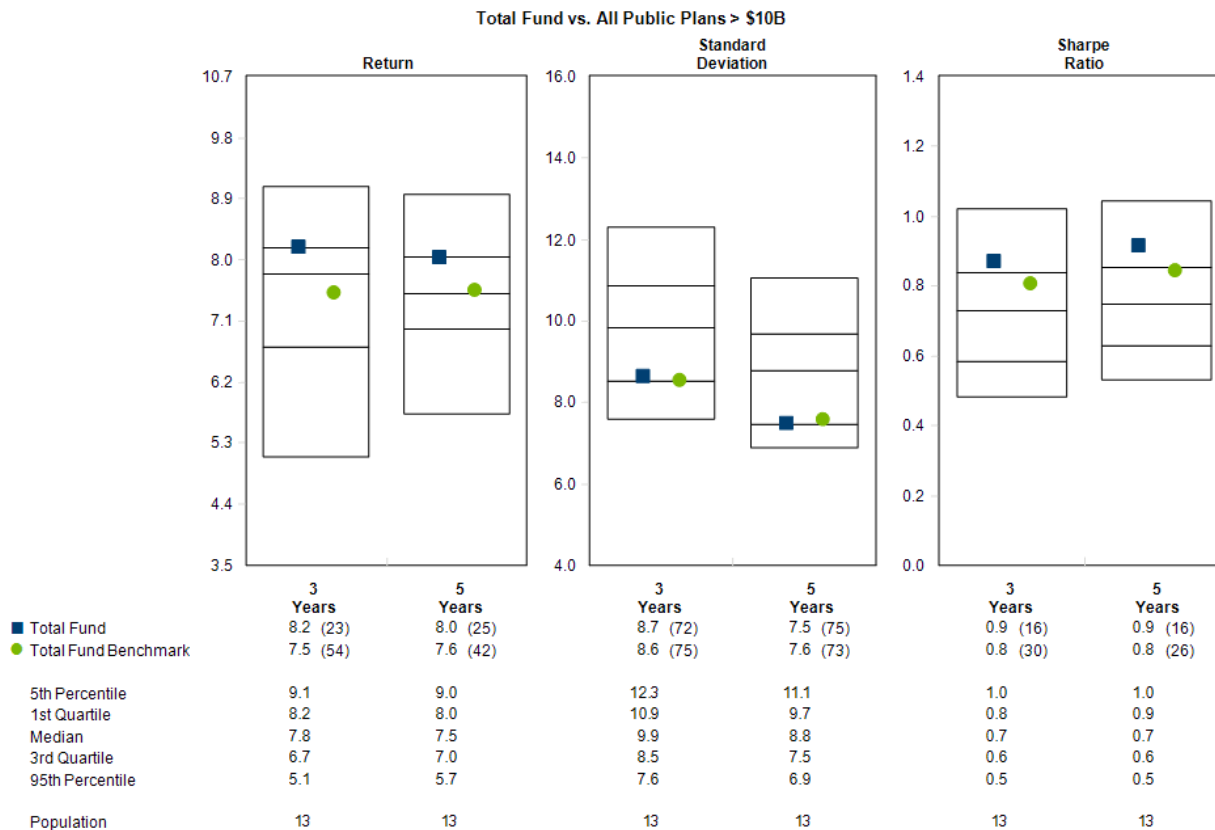
6. Risk Profile: Total Fund Risk-Return vs. Peers

All Public Plans > \$10B-Total Fund



Note: Public Plan peer group composed of 13 public funds with total assets in excess of \$10B as of 6/30/2022 respectively for the periods above. An exhibit outlining the asset allocation of the peer portfolios is provided in the appendix of this report.

6. Risk Profile: Trailing 3-Year and 5-Year Risk Metrics Peer Comparison



7. IPS Stated Trust Return Objectives Ending 6/30/2022

	Five Years	Seven Years	Ten Years	Twenty Years
Total Fund	8.0%	7.7%	8.4%	7.6%
Total Fund Benchmark	7.6	7.2	7.8	7.2
<i>Difference</i>	+0.4	+0.5	+0.6	+0.4
Total Fund	8.0%	7.7%	8.4%	7.6%
Assumed Rate of Return	7.4	7.6	7.7	7.9
<i>Difference</i>	+0.6	+0.1	+0.7	-0.3
Total Fund	8.0%	7.7%	8.4%	7.6%
Inflation + 5%	8.9	8.2	7.6	7.5
<i>Difference</i>	-0.9	-0.5	+0.8	+0.1

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

8. Global Equity: Performance Summary Ending 6/30/2022

	Second Quarter	YTD	One Year	Three Years	Five Years	Ten Years
Total Global Equity	-10.5%	-12.6%	-6.5%	10.0%	9.2%	9.8%
Global Equity Benchmark	-10.7	-12.7	-6.4	10.3	9.7	9.8
<i>Difference</i>	<i>+0.3</i>	<i>+0.1</i>	<i>-0.1</i>	<i>-0.3</i>	<i>-0.5</i>	<i>+0.1</i>
Total U.S. Equity	-15.3	-18.6	-11.2	9.2	9.6	11.4
Total U.S. Equity Benchmark	-16.8	-21.1	-13.7	10.0	10.7	12.7
<i>Difference</i>	<i>+1.4</i>	<i>+2.6</i>	<i>+2.6</i>	<i>-0.8</i>	<i>-1.2</i>	<i>-1.2</i>
Non-U.S. Equity	-13.3	-18.8	-19.9	2.0	2.9	5.2
Non-U.S. Benchmark	-13.4	-18.3	-20.3	1.4	2.6	4.6
<i>Difference</i>	<i>+0.1</i>	<i>-0.5</i>	<i>+0.4</i>	<i>+0.6</i>	<i>+0.3</i>	<i>+0.6</i>
Non-U.S. Developed	-14.4	-19.6	-17.5	1.8	2.6	5.9
MSCI EAFE + Canada	-14.8	-18.8	-16.8	1.7	2.7	5.4
<i>Difference</i>	<i>+0.4</i>	<i>-0.8</i>	<i>-0.7</i>	<i>+0.2</i>	<i>-0.1</i>	<i>+0.5</i>
Emerging Markets	-11.7	-17.6	-23.5	2.1	3.2	4.2
MSCI Emerging Markets	-11.4	-17.6	-25.3	0.6	2.2	3.1
<i>Difference</i>	<i>-0.2</i>	<i>+0.1</i>	<i>+1.9</i>	<i>+1.5</i>	<i>+1.0</i>	<i>+1.1</i>

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

8. Global Equity: Performance Summary Ending 6/30/2022 (cont'd)

	Second Quarter	YTD	One Year	Three Years	Five Years	Ten Years
Total Public Equity	-14.2%	-18.7%	-16.1%	5.1%	5.7%	7.7%
Public Equity Benchmark	-14.9	-19.6	-17.3	5.3	6.1	7.8
<i>Difference</i>	<i>+0.7</i>	<i>+0.9</i>	<i>+1.2</i>	<i>-0.1</i>	<i>-0.4</i>	<i>-0.2</i>
Total Private Equity	-2.7	1.5	18.1	21.6	18.0	16.0
Private Equity Benchmark	-1.2	4.7	23.5	22.9	18.8	14.7
<i>Difference</i>	<i>-1.5</i>	<i>-3.2</i>	<i>-5.4</i>	<i>-1.3</i>	<i>-0.8</i>	<i>+1.3</i>

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

9. Stable Value: Performance Summary Ending 6/30/2022

	Second Quarter	YTD	One Year	Three Years	Five Years	Ten Years
Total Stable Value	-7.2%	-13.3	-10.2%	1.0%	2.8%	3.7%
Total Stable Value Benchmark	-9.5	-16.8	-14.2	-1.0	1.5	2.2
<i>Difference</i>	+2.3	+3.5	+4.0	+2.0	+1.3	+1.5
Total Government Bonds	-12.1	-21.6	-18.8	-3.0	0.5	2.0
Treasury Benchmark	-11.9	-21.3	-18.5	-2.9	0.5	1.6
<i>Difference</i>	-0.2	-0.3	-0.4	-0.1	0.0	+0.3
Stable Value Hedge Funds	2.7	4.8	9.4	8.3	6.7	5.9
Hedge Funds Benchmark	-1.5	-1.3	0.3	4.7	4.1	3.8
<i>Difference</i>	+4.2	+6.2	+9.1	+3.6	+2.6	+2.1
Absolute Return	-1.0	-2.7	-0.1	6.7	6.5	9.8
Absolute Return Benchmark	1.2	2.2	3.8	3.2	3.6	3.0
<i>Difference</i>	-2.2	-4.9	-3.9	+3.5	+2.9	+6.8

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

10. Real Return: Performance Summary Ending 6/30/2022

	Second Quarter	YTD	One Year	Three Years	Five Years	Ten years
Total Real Return	5.9%	13.0%	27.4%	12.2%	10.7%	9.2%
Real Return Benchmark	7.0	14.5	25.7	9.7	8.2	7.8
<i>Difference</i>	<i>-1.1</i>	<i>-1.5</i>	<i>+1.6</i>	<i>+2.5</i>	<i>+2.5</i>	<i>+1.4</i>
Real Estate	5.5	13.5	30.0	14.4	12.8	12.4
Real Estate Benchmark	7.1	15.3	27.3	10.3	8.9	9.9
<i>Difference</i>	<i>-1.6</i>	<i>-1.8</i>	<i>+2.7</i>	<i>+4.1</i>	<i>+3.9</i>	<i>+2.5</i>
Energy, Natural Resource and Infrastructure	7.2	11.6	21.6	6.7	7.2	--
Energy and Natural Res. Benchmark	6.5	12.2	21.8	7.9	7.5	--
<i>Difference</i>	<i>+0.7</i>	<i>-0.6</i>	<i>-0.2</i>	<i>-1.2</i>	<i>-0.3</i>	<i>--</i>
Commodities	-3.8	9.0	10.1	23.2	2.7	-6.2
Commodities Benchmark	2.0	35.8	45.0	14.7	11.7	-1.8
<i>Difference</i>	<i>-5.8</i>	<i>-26.8</i>	<i>-35.0</i>	<i>+8.5</i>	<i>-9.0</i>	<i>-4.3</i>

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

11. Risk Parity: Performance Summary Ending 6/30/2022

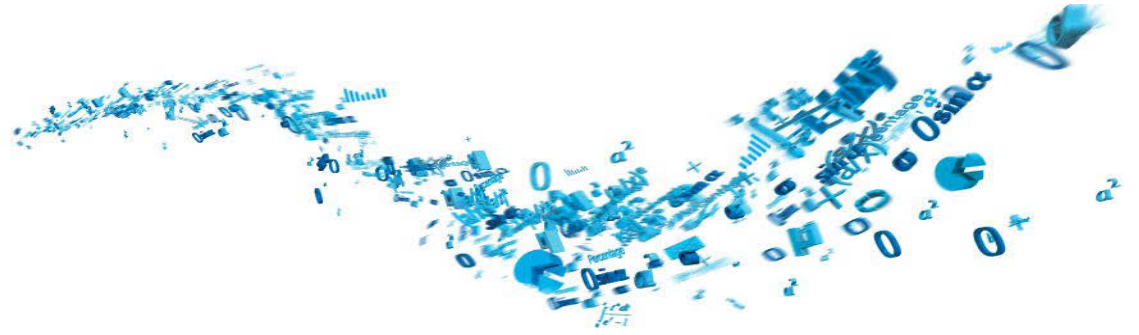
	Second Quarter	YTD	One Year	Three Years	Five Years	Ten Years
Total Risk Parity	-14.5%	-18.1	-14.5%	0.1%	3.6%	4.3%
Risk Parity Benchmark	-15.4	-19.6	-17.3	1.3	4.1	4.3
<i>Difference</i>	<i>+0.9</i>	<i>+1.4</i>	<i>+2.7</i>	<i>-1.2</i>	<i>-0.5</i>	<i>0.0</i>

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

12.Cash Equivalents: Performance Summary Ending 6/30/2022

	Second Quarter	YTD	One Year	Three Years	Five Years	Ten Years
Cash Equivalents	0.8%	0.7%	0.7%	0.8%	1.4%	1.9%
Cash Benchmark	0.1	0.1	0.2	0.6	1.1	0.6
<i>Difference</i>	<i>+0.7</i>	<i>+0.6</i>	<i>+0.5</i>	<i>+0.2</i>	<i>+0.3</i>	<i>+1.3</i>

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

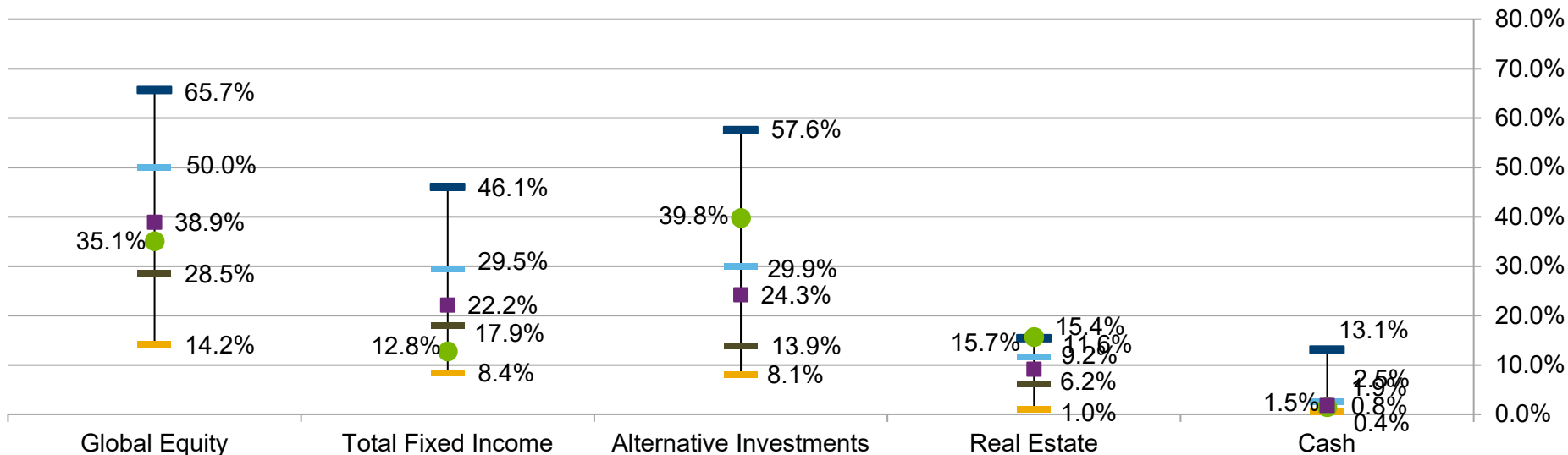


Appendix – Supplemental Reporting

TRS Commitment Levels vs. Peers (>\$10 Billion) as of 6/30/2022

- The chart below depicts the asset allocation of peer public funds with assets greater than \$10 billion.
 - The ends of each line represent the 95th and 5th percentile of exposures, the middle light blue and grey lines represent the 25th and 75th percentile of exposures, the purple square represents the median, and the green dot represents TRS exposure.

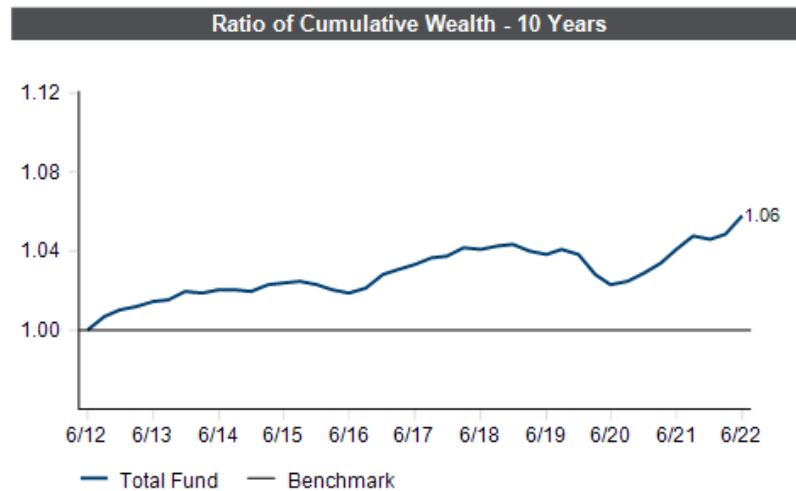
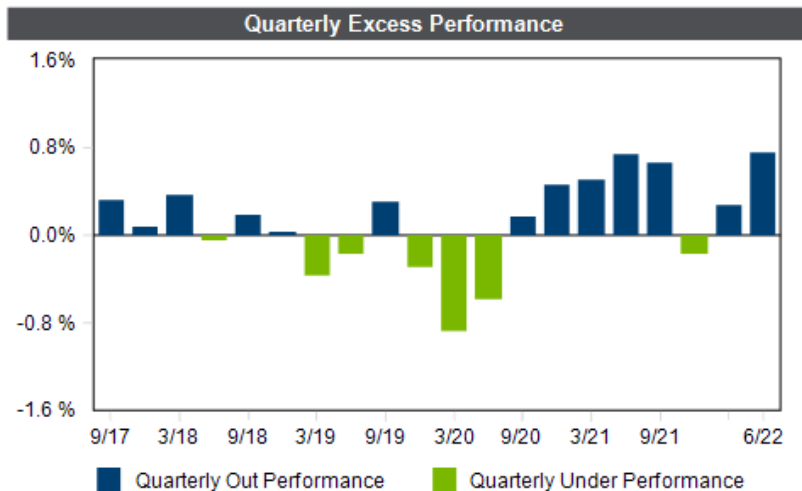
— 95th — 75th — 25th — 5th Percentile ● TRS ■ Median



Note: The Public Plan peer universe had 13 observations for the second quarter 2022. TRS allocations may not sum to 100.0% which is entirely due to the impact of rounding

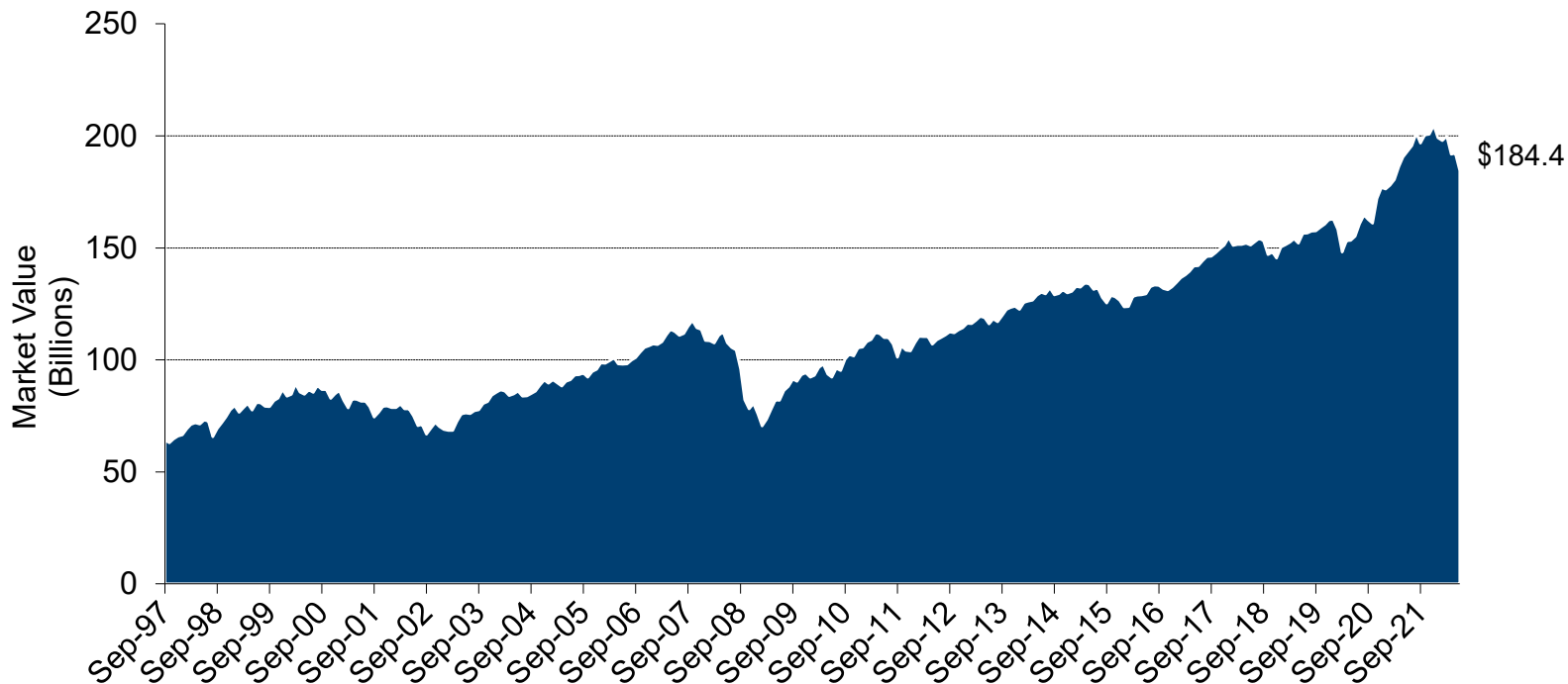
Historical Excess Performance Ending 6/30/2022

Quarterly and Cumulative Excess Performance Total Fund vs. Total Fund Benchmark



TRS Asset Growth

Total Fund Historical Growth (September 1997 - June 2022)



External Manager Program: Public Equity Performance as of 6/30/2022

	Allocation (\$ in billions)	Second Quarter	YTD	One Year	Three Years
EP Total Global Equity	\$26.1	-13.7%	-17.9%	-15.6%	7.6%
EP Global Equity Benchmark	--	-14.8	-19.4	-17.2	5.7
<i>Difference</i>	--	+1.1	+1.5	+1.6	+1.9
EP U.S.A.	\$9.7	-15.4	-17.3	-10.5	11.2
EP U.S.A. Benchmark	--	-16.8	-21.1	-13.7	10.0
<i>Difference</i>	--	+1.4	+3.8	+3.2	+0.2
EP Non-U.S. Developed	\$5.0	-14.1	-21.2	-21.7	3.9
MSCI EAFE + Canada Policy Index	--	-14.8	-18.8	-16.8	1.7
<i>Difference</i>	--	+0.7	-2.4	-4.9	+2.2
EP Emerging Markets	\$5.6	-10.0	-15.8	-21.7	4.8
MSCI Emerging Markets Policy Index	--	-11.5	-17.6	-25.3	0.6
<i>Difference</i>	--	+1.5	+1.8	+3.6	+4.2
EP World Equity	\$5.8	-14.0	-17.9	-11.4	9.1
EP World Equity Benchmark	--	-15.6	-20.1	-16.1	6.6
<i>Difference</i>	--	+1.6	+2.2	+4.7	+2.5

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

External Manager Program: Stable Value/Total Program Performance as of 6/30/2022

	Allocation (\$ in billions)	Second Quarter	YTD	One Year	Three Years
EP Total Stable Value	\$9.7	2.7%	4.8%	9.4%	8.3%
EP Stable Value Benchmark	--	-1.5	-1.3	0.3	4.7
<i>Difference</i>	--	+4.2	+6.1	+9.1	+3.6
EP Stable Value Hedge Funds	\$9.7	2.7%	4.8%	9.4%	8.3%
EP Stable Value Hedge Funds Benchmark	--	-1.5	-1.3	0.3	4.7
<i>Difference</i>	--	+4.2	+6.1	+9.1	+3.6
Total External Public Program	\$42.6	-10.1	-13.6	-10.9	7.1
EP External Public Benchmark	--	-11.8	-15.8	-13.6	4.9
<i>Difference</i>	--	+1.7	+2.2	+2.7	+2.2

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

Public Strategic Partnership Program (SPN): Performance Summary as of 6/30/2022

The Public SPNs in aggregate outperformed the benchmark during the second quarter, as well as over the trailing one-, three-, and five-year trailing periods.

	Allocation (\$ in billions)	Second Quarter	YTD	One Year	Three Years	Five Years
Public Strategic Partnership	\$6.7	-13.4%	-19.2%	-17.2%	4.3%	5.6%
Public SPN Benchmark	--	-13.9%	-19.8%	-17.3%	3.3%	4.9%
<i>Difference</i>	--	+0.5	+0.6	+0.1	+1.0	+0.7
Blackrock	\$2.3	-12.6%	-18.5%	-16.2%	4.5%	6.2%
J.P. Morgan	\$2.4	-13.4%	-20.1%	-17.5%	5.0%	5.6%
Morgan Stanley	\$2.1	-14.3%	-19.0%	-17.9%	2.9%	4.8%

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

Benchmarks

- Total Fund Performance Benchmark – 17.6% MSCI U.S.A. IMI, 12.7% MSCI EAFE plus Canada Index, 8.8% MSCI Emerging Markets Index, 17.7% State Street Private Equity Index (1 quarter lagged), 15.6% Blmb. Barc. Long Term Treasury Index, 4.9% HFRI FoF Conservative Index, 2.0% Citigroup 3 Mo. T-Bill Index, 13.8% NCREIF ODCE Index (1 quarter lagged), 5.3% Energy and Natural Resources Benchmark, 7.8% Risk Parity Benchmark, and -6.0% Asset Allocation Leverage Benchmark.
- Global Equity Benchmark – 31.0% MSCI U.S.A. IMI, 22.4% MSCI EAFE plus Canada Index, 15.5% MSCI Emerging Markets Index, and 31.2% State Street Private Equity Index (1 quarter lagged)
 - TF U.S. Equity Benchmark - MSCI U.S.A. Investable Markets Index (IMI)
 - Emerging Markets Equity Benchmark – MSCI Emerging Markets Index
 - Non-US Developed Equity Benchmark– MSCI EAFE + Canada Index
 - Private Equity Benchmark - State Street Private Equity Index (1 quarter lagged)

Note: Returns and market values (based on account level) reported are provided by State Street. Net additions/withdrawals are reported on a gross (adjusted for expenses) total fund level as provided by State Street. All rates of return for time periods greater than one year are annualized. The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

Benchmarks (cont'd)

- Stable Value Benchmark – 76.2% Blmb. Barc. Long Term Treasury Index and 23.8% HFRI FoF Conservative Index
 - US Treasuries Benchmark – Bloomberg Barclays Long Term Treasury Index
 - Stable Value Hedge Funds – HFRI Fund of Funds (FoF) Conservative Index
 - Absolute Return Benchmark - SOFR + 4%
- Real Return Benchmark – 72.2% NCREIF ODCE Index and 27.8% Energy & Natural Resources Benchmark
 - Real Estate Benchmark – NCREIF ODCE Index (1 quarter lagged)
 - Energy and Natural Resources Benchmark – 75% Cambridge Associates Natural Resources Index (reweighted) and 25% quarterly Seasonally-Adjusted Consumer Price Index (1 quarter lagged)
 - Commodities Benchmark – Goldman Sachs Commodity Index
- Risk Parity Benchmark – 100% HFR Risk Parity Vol 12 Institutional Index

Note: Returns and market values (based on account level) reported are provided by State Street. Net additions/withdrawals are reported on a gross (adjusted for expenses) total fund level as provided by State Street. All rates of return for time periods greater than one year are annualized. The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

Description of Performance Attribution

- A measure of the source of the deviation of a fund's performance from that of its policy benchmark. Each bar on the attribution graph represents the contribution made by the asset class to the total difference in performance. A positive value for a component indicates a positive contribution to the aggregate relative performance. A negative value indicates a detrimental impact. The magnitude of each component's contribution is a function of (1) the performance of the component relative to its benchmark, and (2) the weight (beginning of period) of the component in the aggregate.
- The individual Asset Class effect, also called **Selection Effect**, is calculated as
Actual Weight of Asset Class x (Actual Asset Class Return – Asset Class Benchmark Return)
- The bar labeled **Allocation Effect** illustrates the effect that a Total Fund's asset allocation has on its relative performance.
Allocation Effect calculation = (Asset Class Benchmark Return – Total Benchmark Return) x (Actual Weight of Asset Class – Target Policy Weight of Asset Class).
- The bar labeled **Other** is a combination of Cash Flow Effect and Benchmark Effect:
 - **Cash Flow Effect** describes the impact of asset movements on the Total Fund results. Cash Flow Effect calculation = (Total Fund Actual Return – Total Fund Policy Return) – Current Selection Effect – Current Allocation Effect
 - **Benchmark Effect** results from the weighted average return of the asset classes' benchmarks being different from the Total Funds' policy benchmark return. Benchmark Effect calculation = Total Fund Policy Return – (Asset Class Benchmark Return x Target Policy Weight of Asset Class)
- **Cumulative Effect**
Cumulative Effect calculation = Current Effect t *(1+Cumulative Total Fund Actual Return t-1) + Cumulative Effect t-1*(1+Total Fund Benchmark Return t)



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Disclaimers and Notes

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Notes:

- The rates of return contained in this report are shown on an after-fees basis unless otherwise noted. They are geometric and time weighted. Returns for periods longer than one year are annualized.
- Universe percentiles are based upon an ordering system in which 1 is the best ranking and 100 is the worst ranking.
- Due to rounding throughout the report, percentage totals displayed may not sum up to 100.0%. Additionally, individual fund totals in dollar terms may not sum up to the plan totals.

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Chicago, IL 60601
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Investment Risk Report

James Nield, Chief Risk Officer

Stephen Kim, Director

September 2022



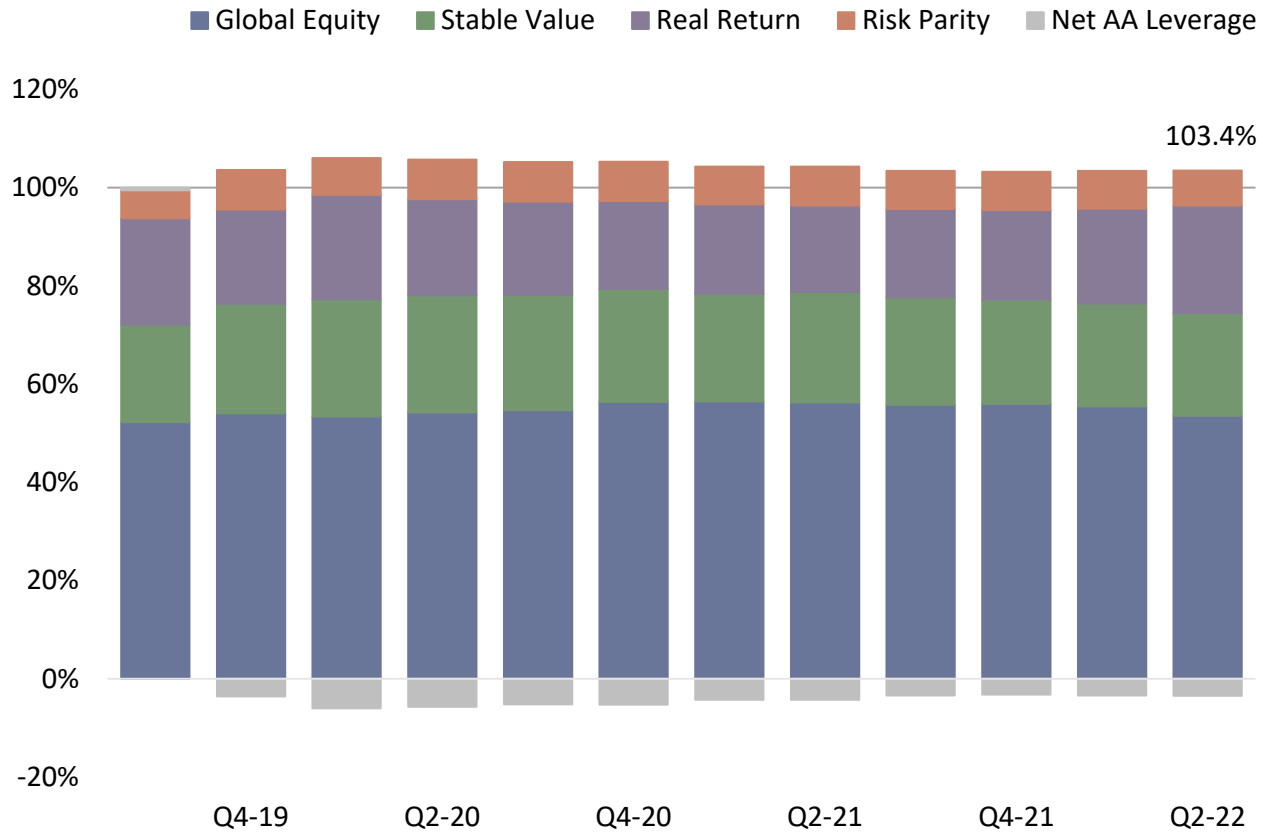
All metrics in compliance

<u>Risk Metric</u>	<u>Value</u>	<u>In Compliance?</u>	<u>Page(s)</u>
1. Asset Allocation (AA): Underweight Global Equity	Underweight -3.1%	✓	3 - 5
2. Drawdown Risk: VaR estimate moderately increased	6.2% VaR	✓	6 - 8
3. Tracking Error: Total Trust TE range bound	150 bp	✓	9 - 10
4. Leverage: Trust levered by 3.4%	120.1% Gross, -3.4% Net	✓	11 - 13
5. Liquidity: Remained strong	4.7x Coverage Ratio	✓	14
6. Counterparty Risk: Within Policy limit	Lowest Rating: A-	✓	15
7. Derivatives: Gross exposure declined	20.5% Gross	✓	16 - 17
8. Securities Lending: Earnings stable	14.5% Utilization	✓	18

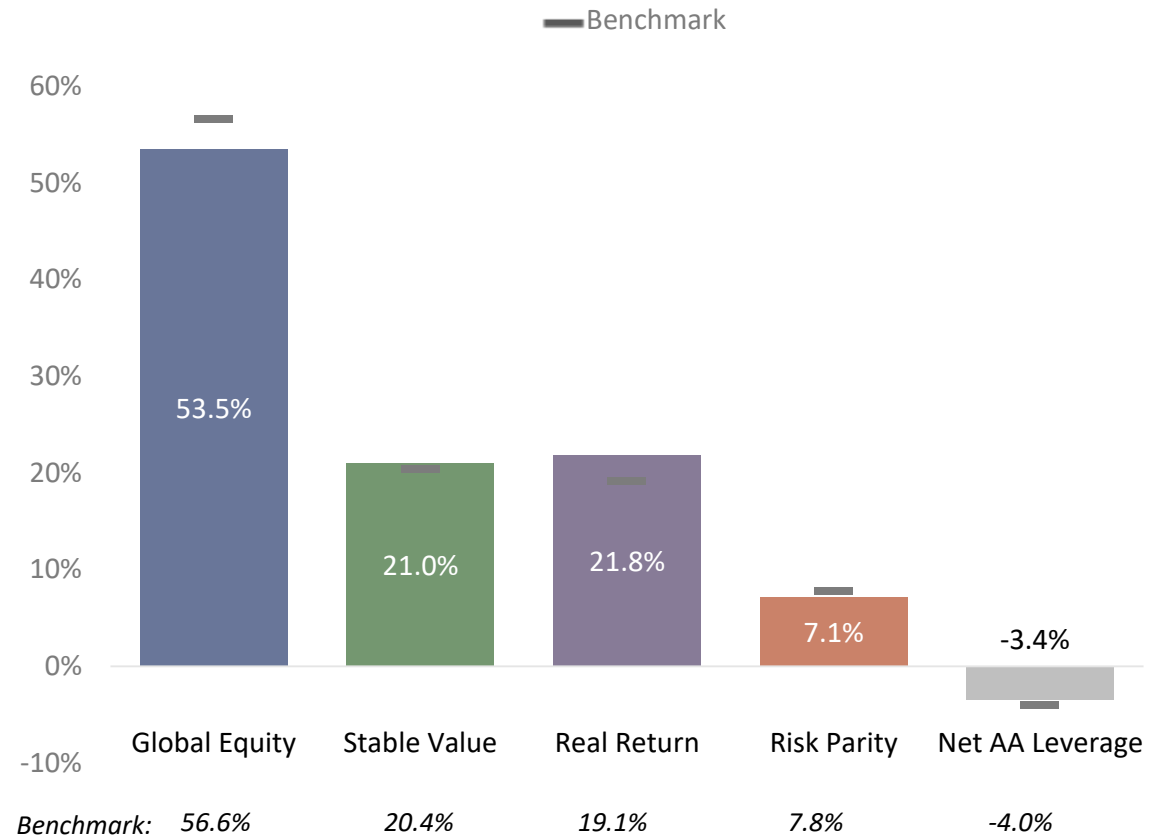
Unless otherwise noted, data presented as of June 30, 2022

Trust underweight investment exposure primarily due to Global Equity

Asset Class Weights Trend

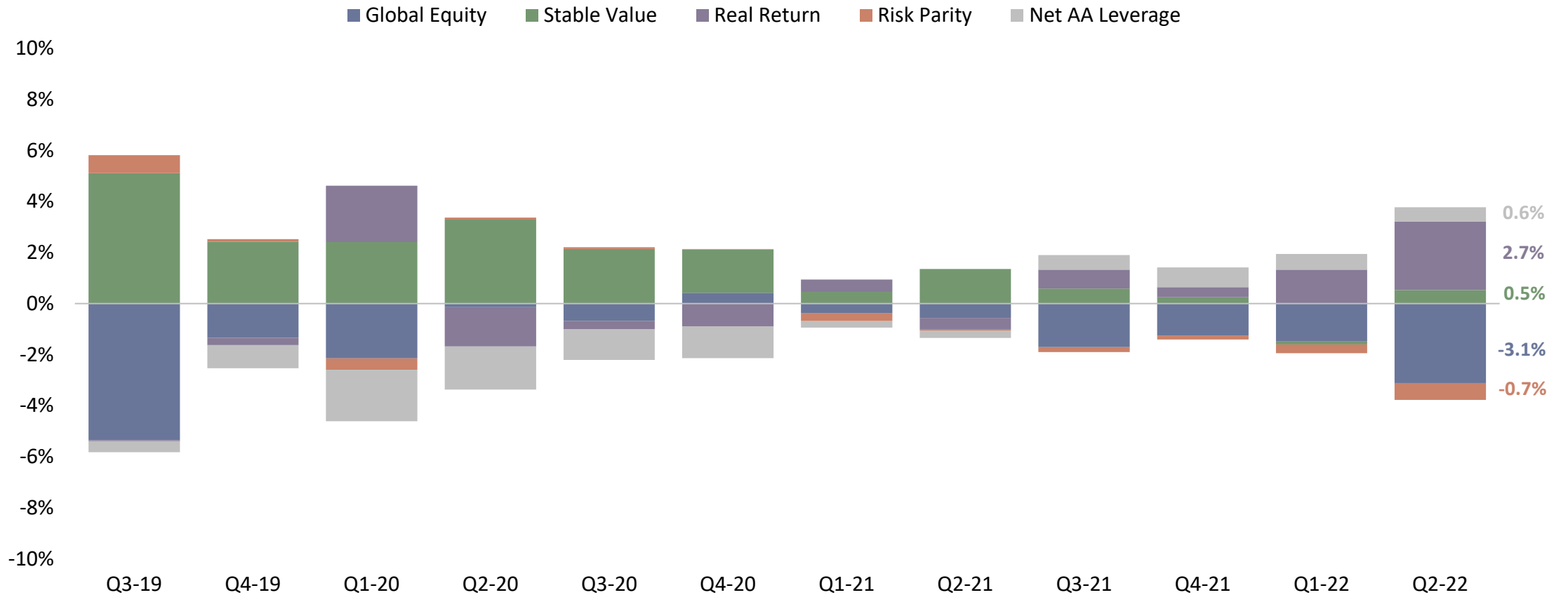


Asset Class Weights



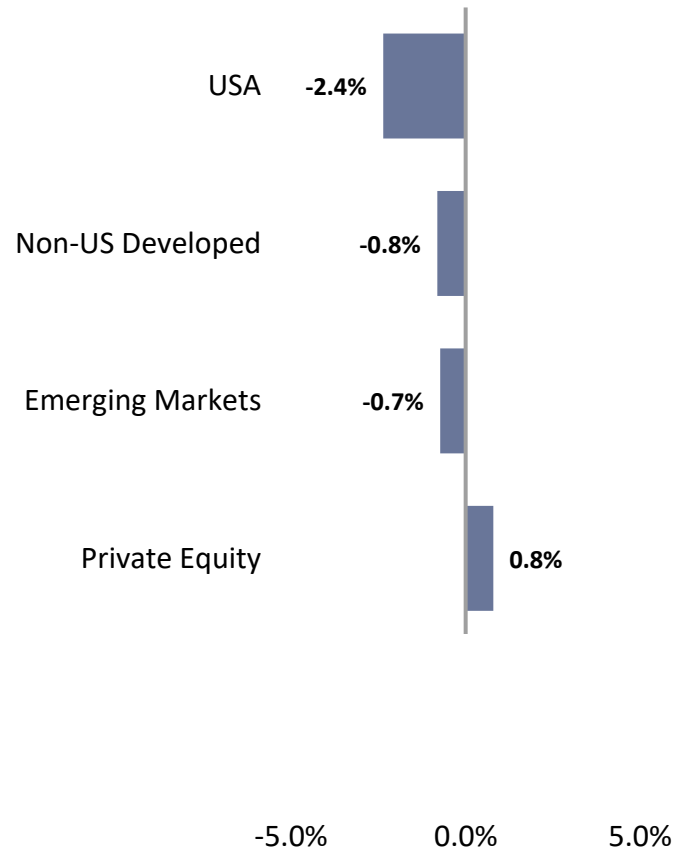
Global Equity underweight offset by Real Return overweight

Relative Asset Class Positions Through Time

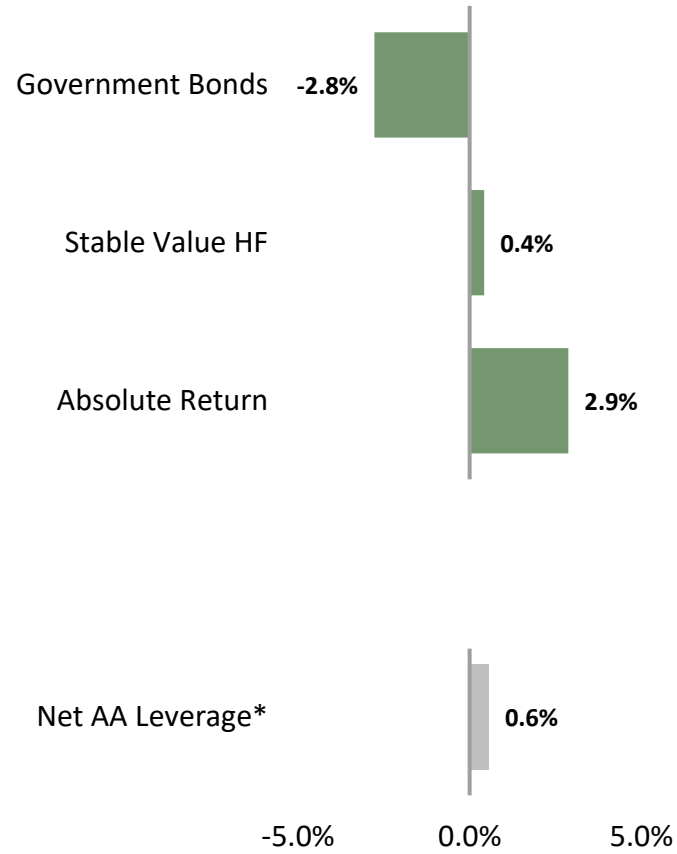


Global Equity underweight primarily due to Public Equity allocation

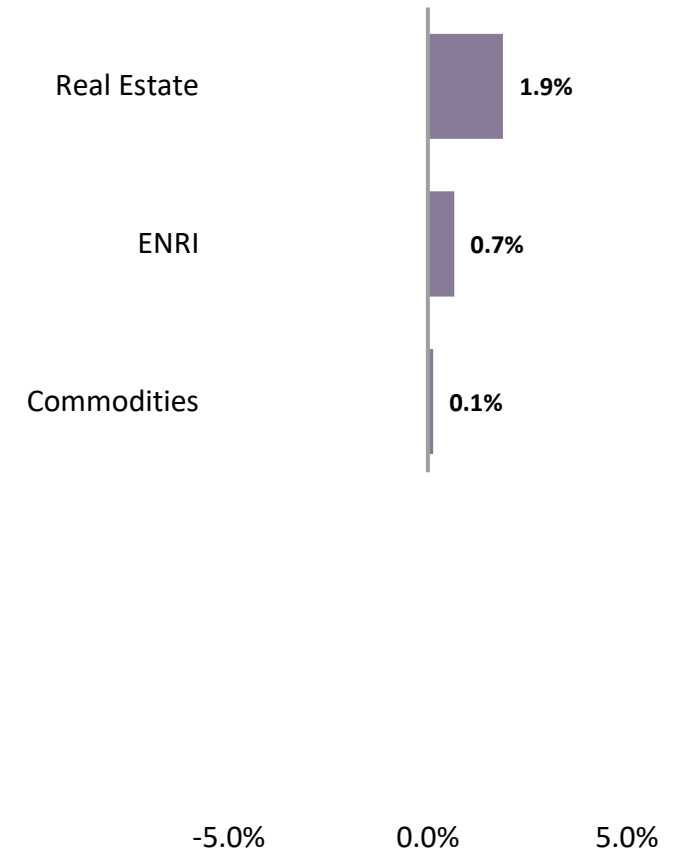
Global Equity UW -3.1%



Stable Value OW 0.5%

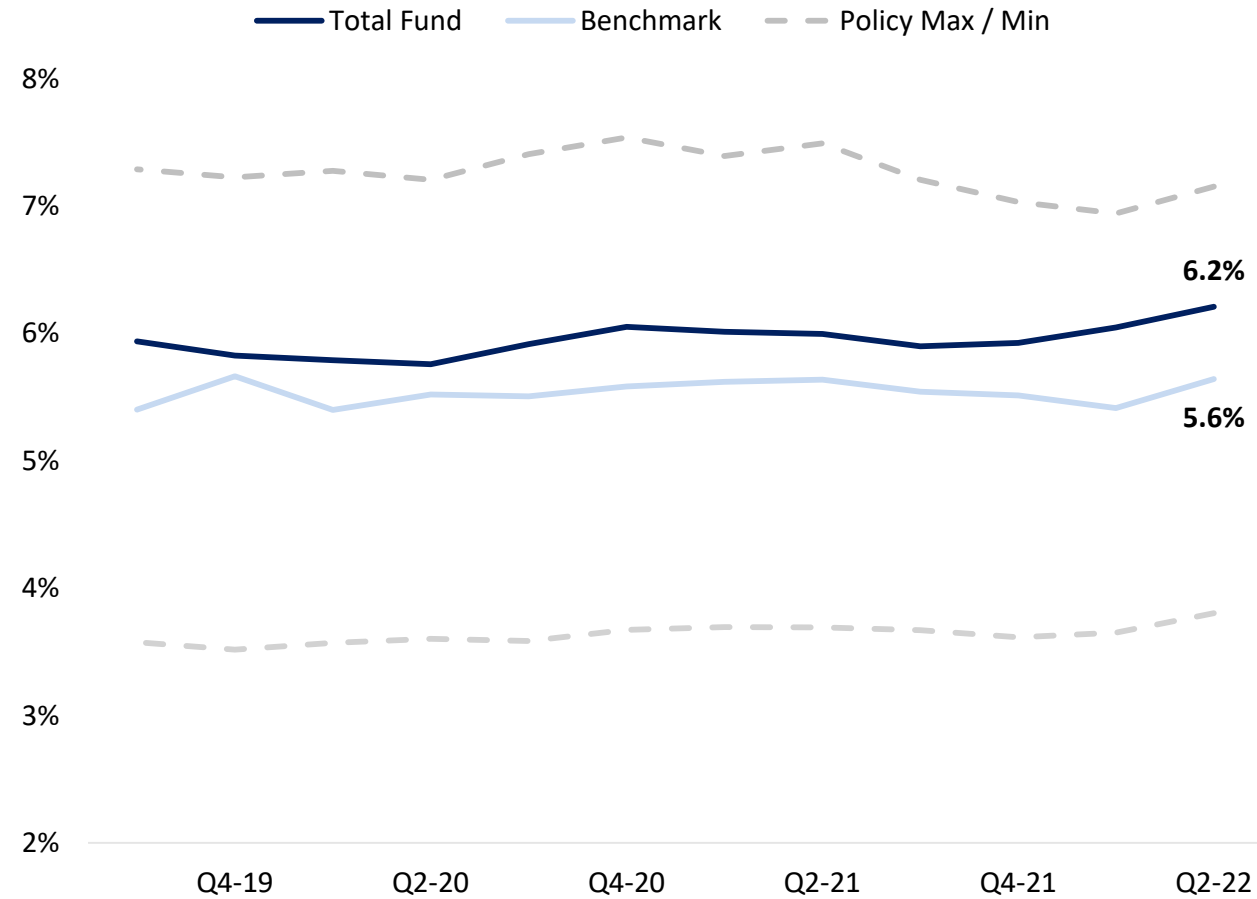


Real Return OW 2.7%

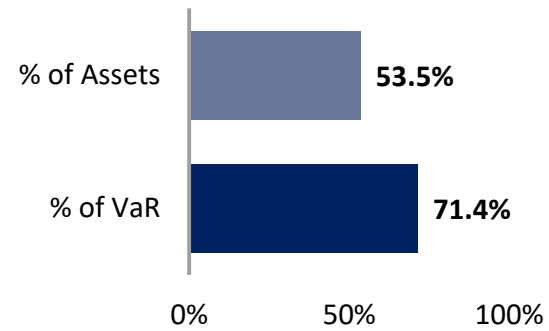


VaR estimate increased to 6.2% given Q2 volatility

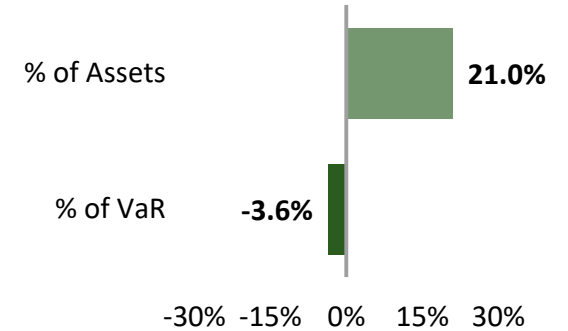
VaR History



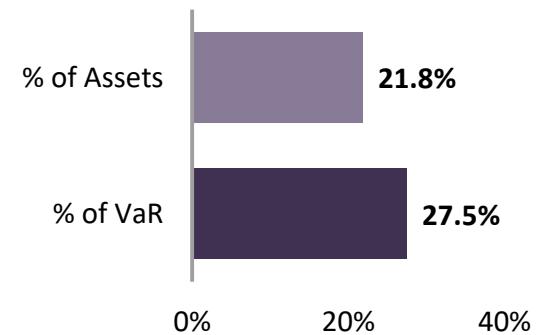
Global Equity



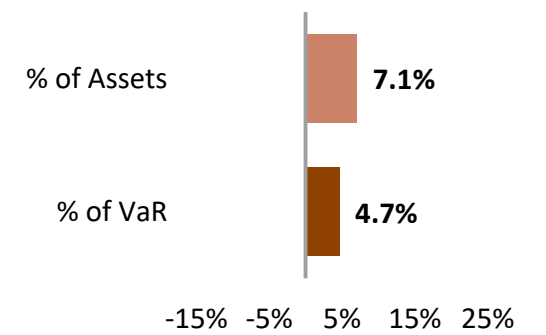
Stable Value



Real Return

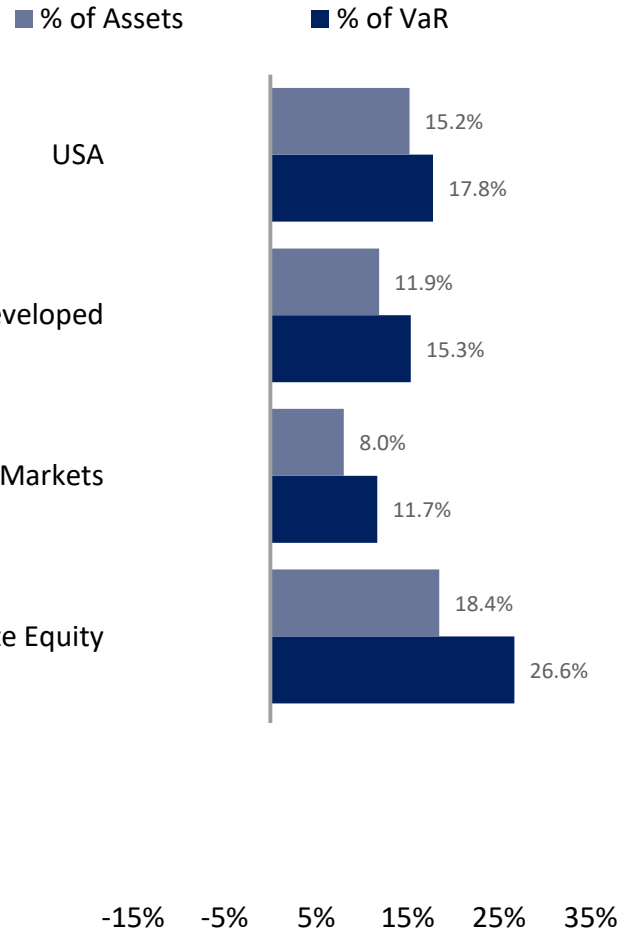


Risk Parity

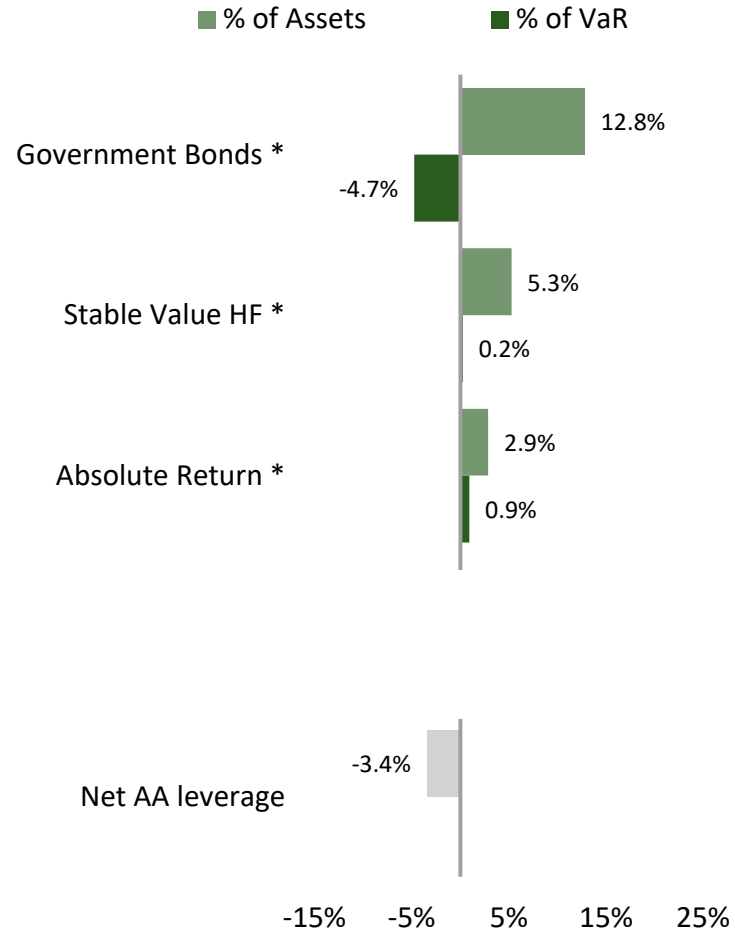


Stable Value assets remain a key source of diversification

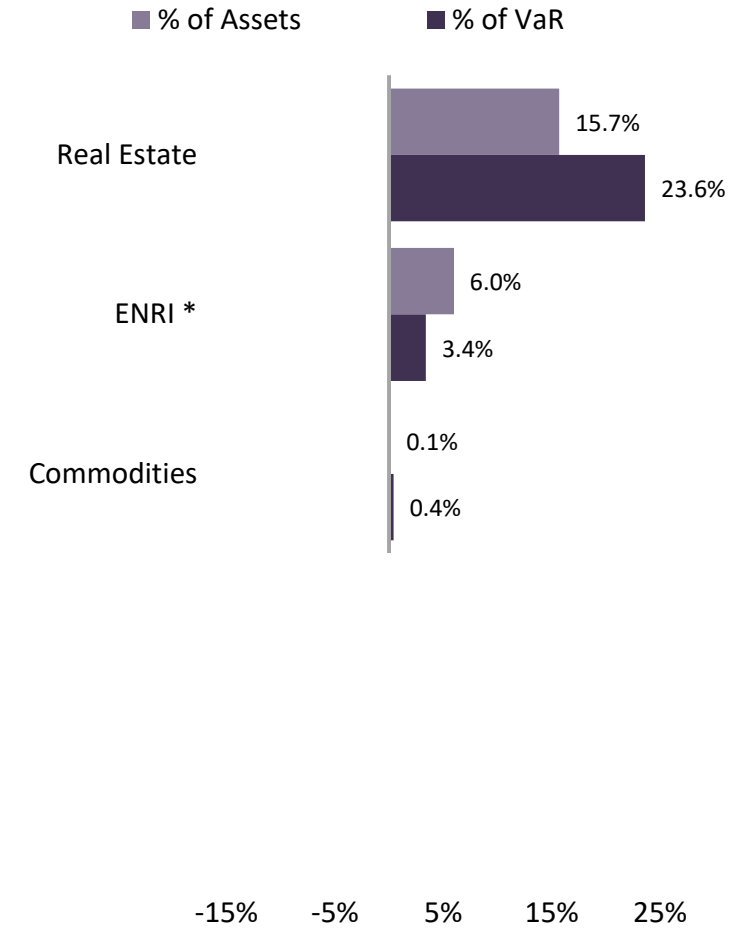
Global Equity



Stable Value



Real Return



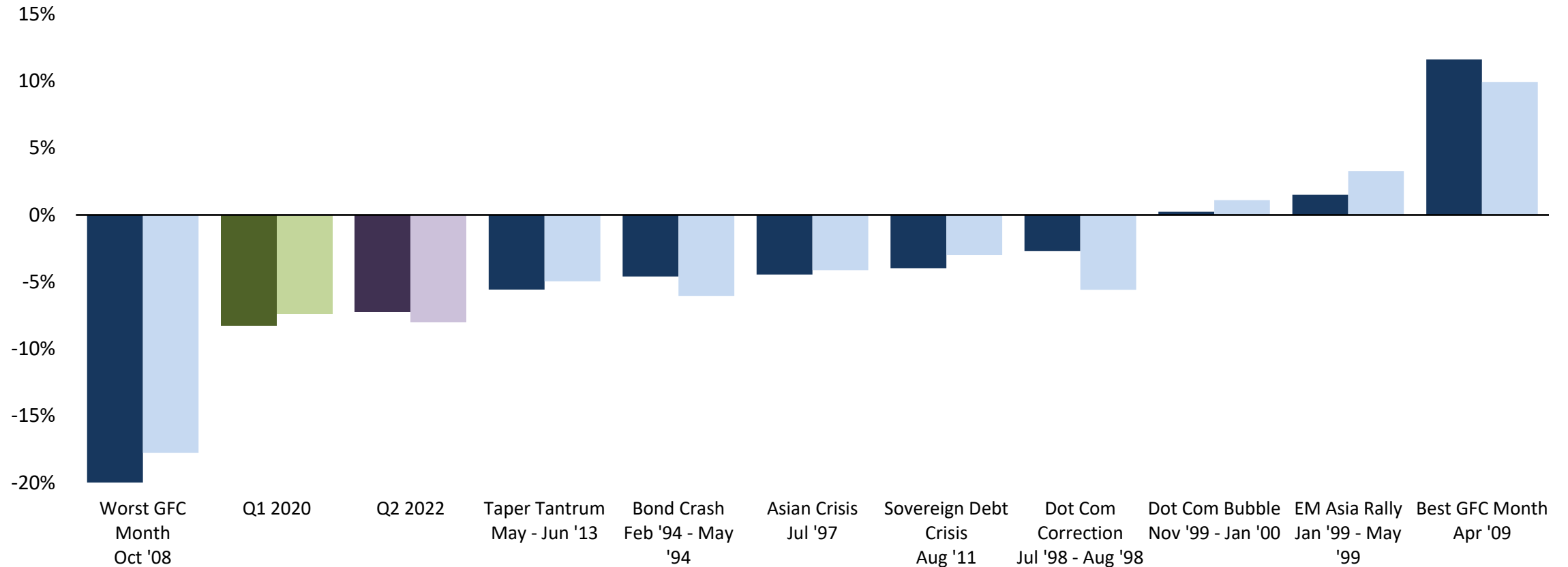
* These assets contribute less risk than their dollar allocation

Source: State Street Bank; note: Net AA leverage is -3.4%, which indicates the Trust is levered by 3.4%

Material drawdown in Q2 2022 as stocks and bonds both declined

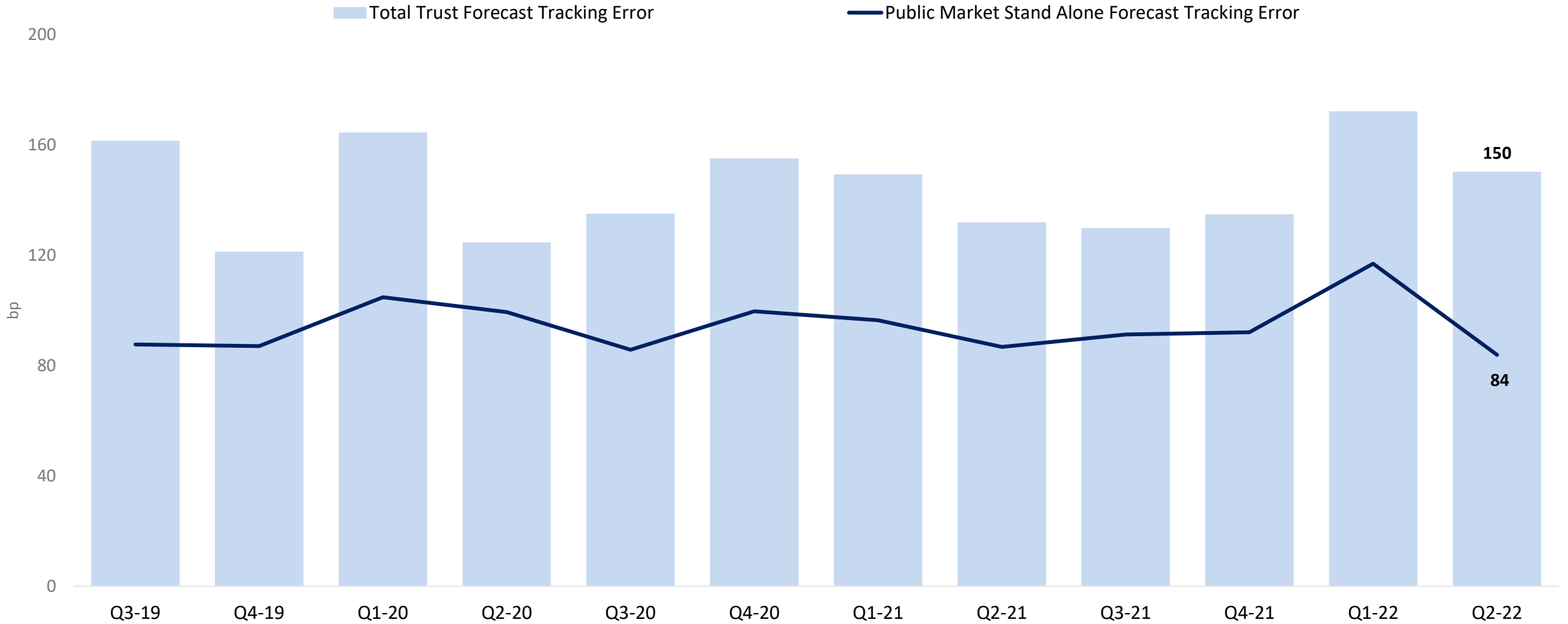
Scenario Analysis

■ Total Fund ■ Benchmark

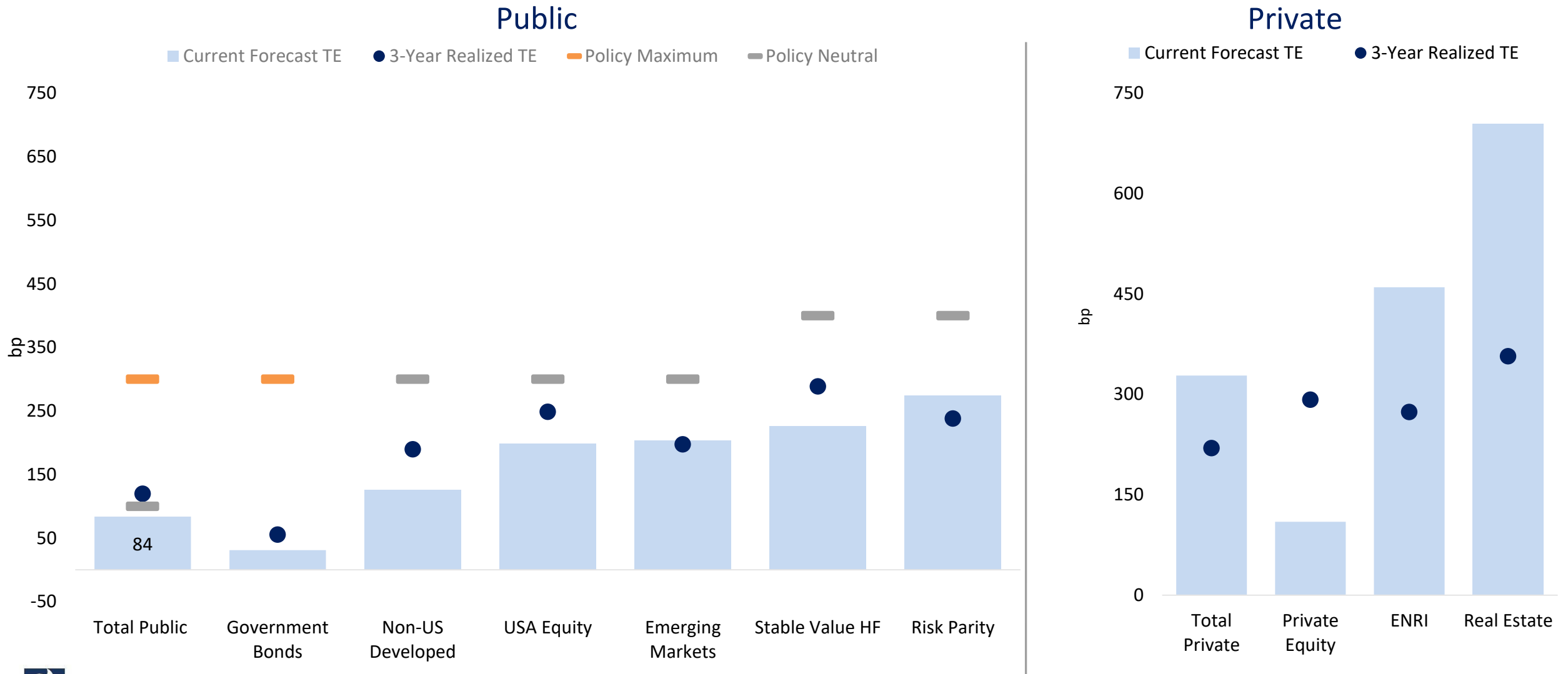


Source: State Street Bank; note: data shown are predicted drawdowns given current allocation, except for Q1 2020 and Q2 2022, which reflect realized performance

Forecasted Trust tracking error remains range bound

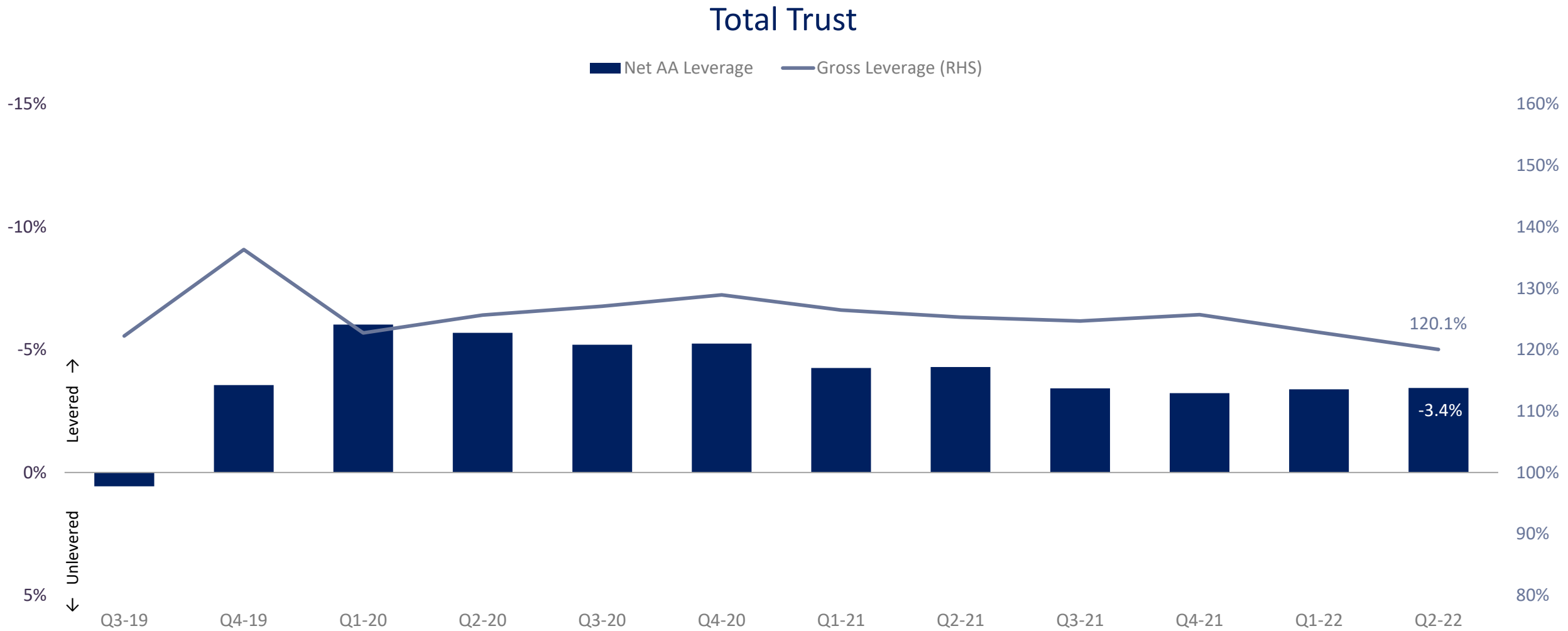


Public portfolio tracking error forecast at 84 bp, in line with policy neutral



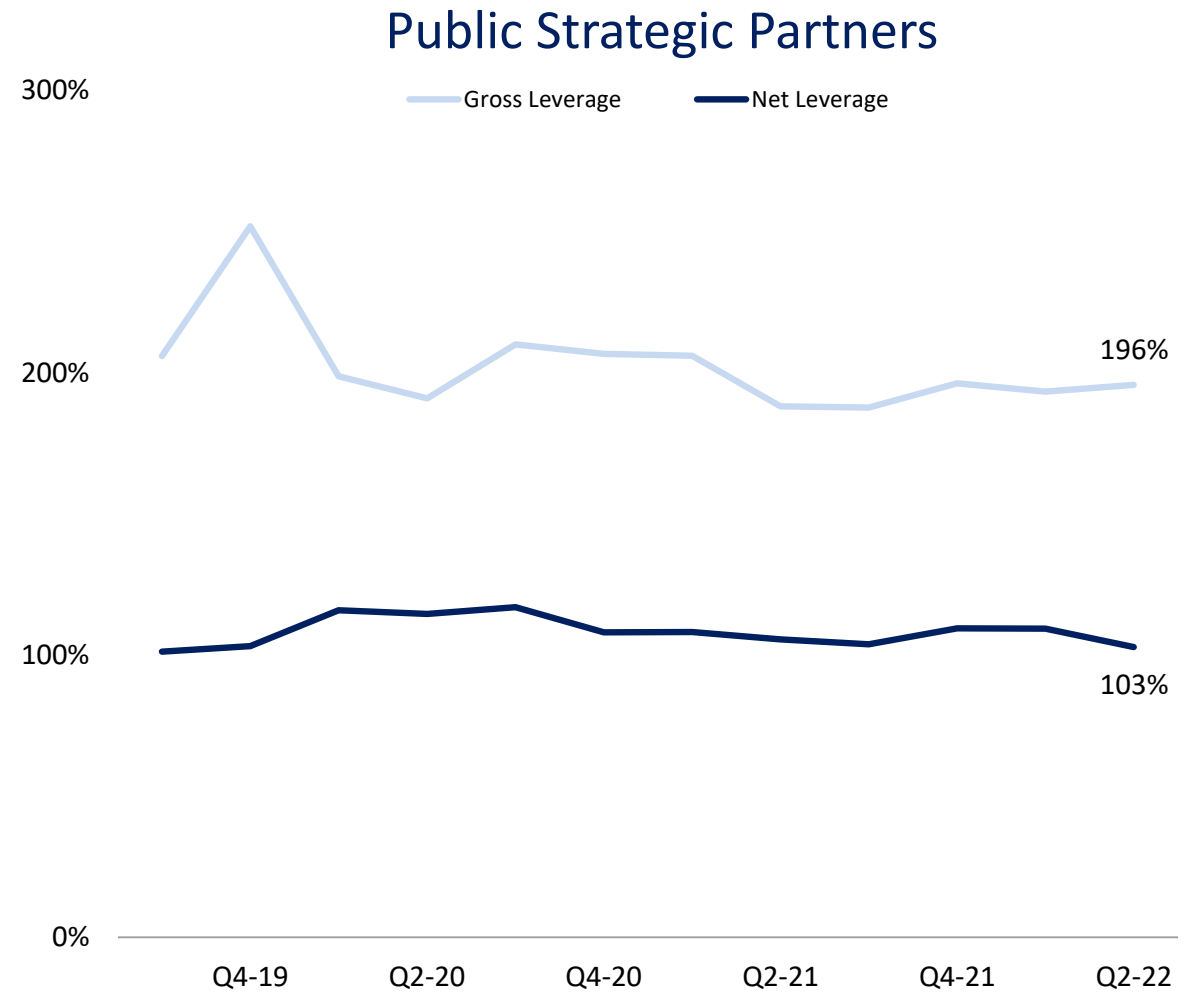
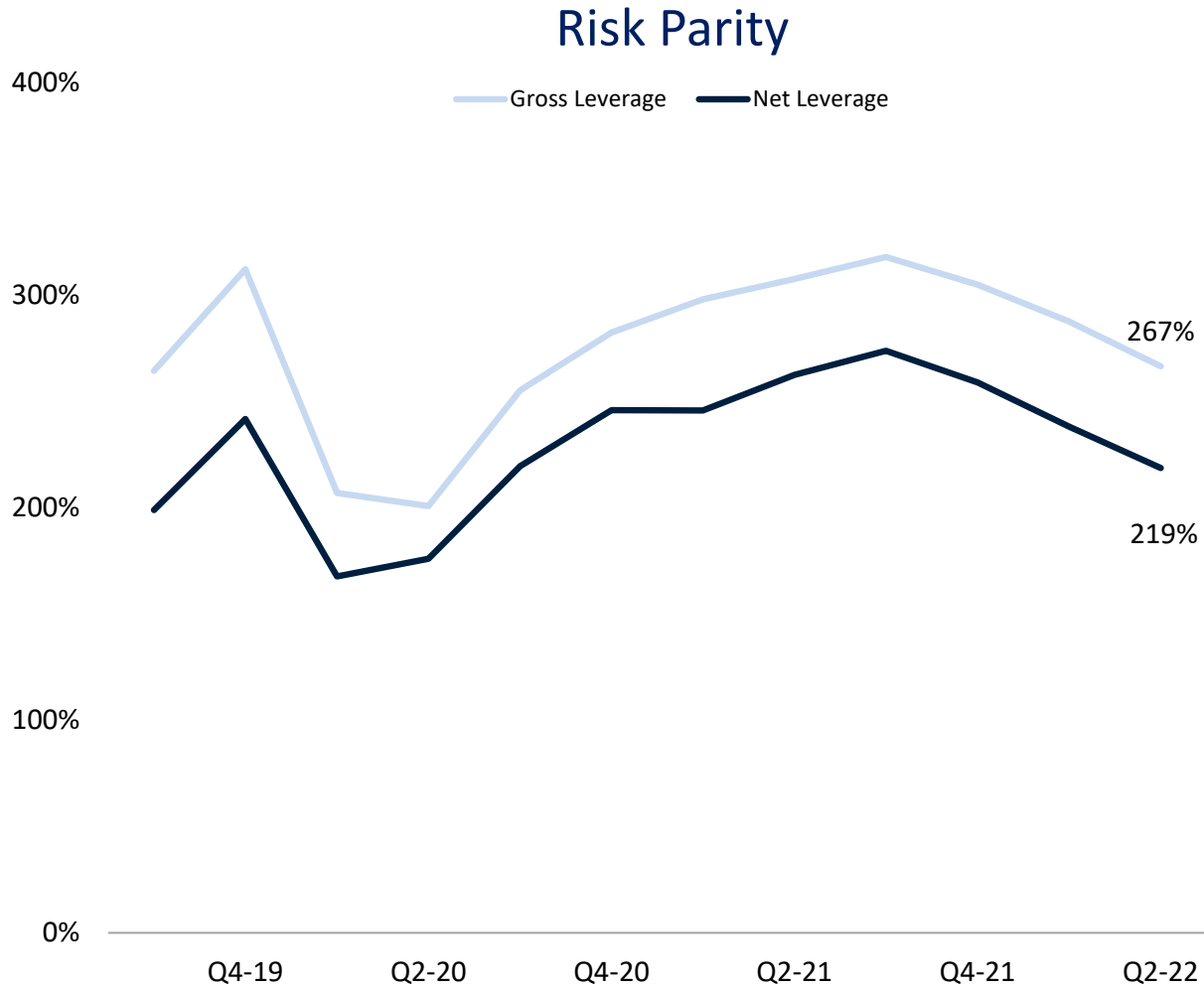
Source: State Street Bank; note: current forecast tracking error uses past experiences from January 1, 2008 to June 30, 2022 and therefore includes the effects of the Global Financial Crisis; External World Equity had tracking error of 326 bp realized, 255 bp forecasted with a policy neutral of 300

Trust Gross Leverage declined while Net AA Leverage remained stable



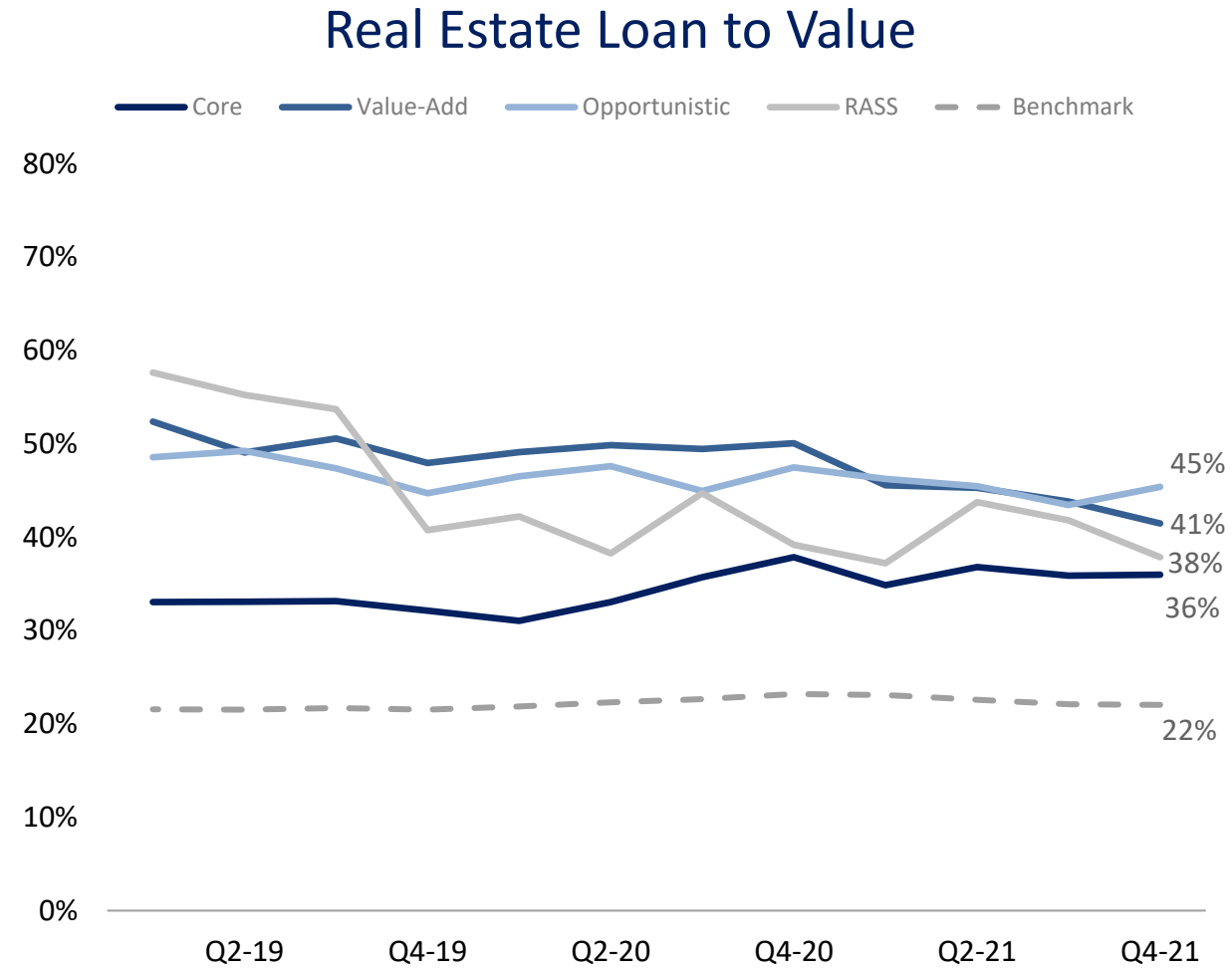
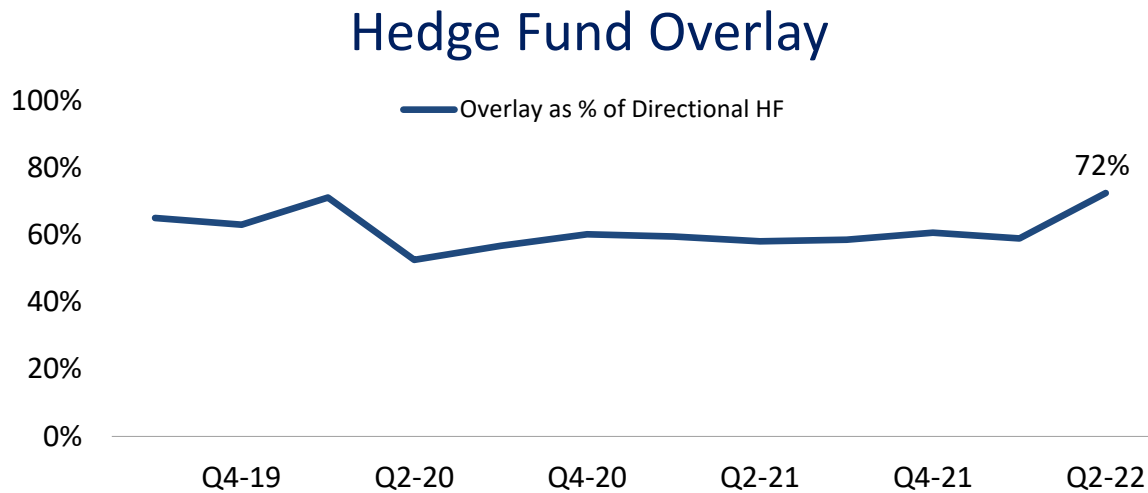
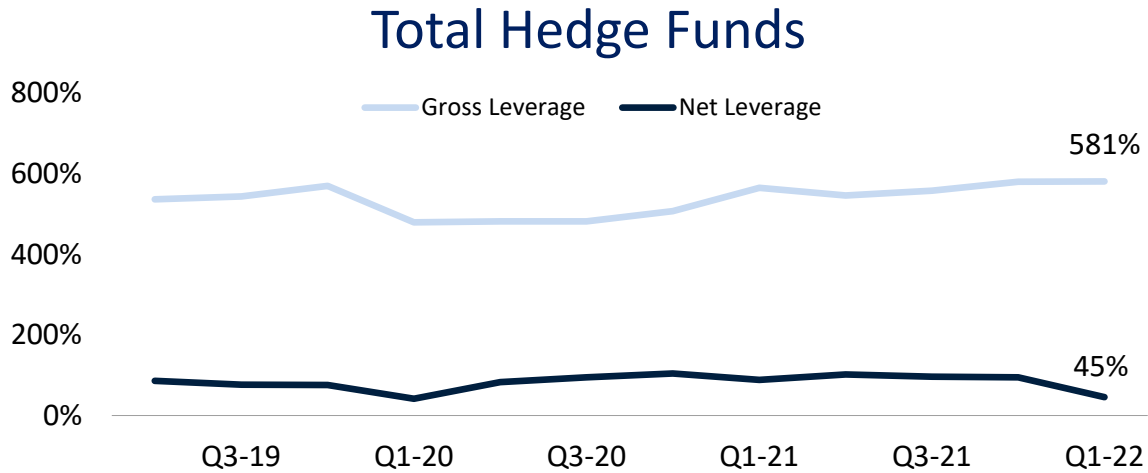
Source: State Street Bank; note: total Trust leverage excludes securities lending which is reported separately; Net AA Leverage includes adjustments for delta-notionalization of options and exclusion of spot forwards of 30 days or less

Risk Parity and SPN leverage remained range bound



Source: State Street Bank; note: Risk Parity changed from a 10% to 12% volatility target at the start of Q4 2019

Hedge Fund and Real Estate strategy leverage range bound



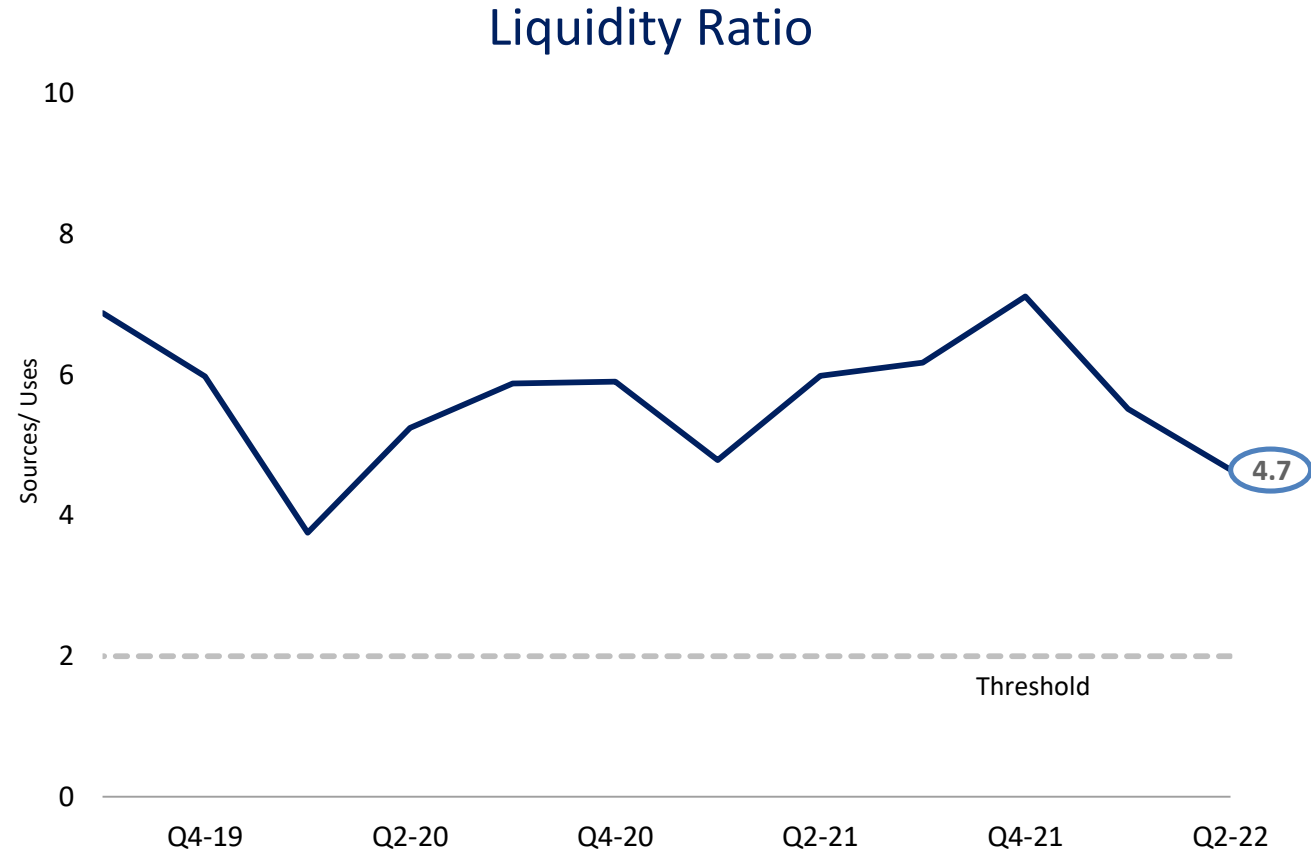
Source: MSCI RiskMetrics, State Street Bank, TRS RE manager data, NCREIF; note: Directional Hedge Fund overlay program began on September 2019 and includes one non-Hedge Fund; Total Real Estate Loan to Value was 41% as of December 31, 2021 ; Real Estate Loan-to-Values are estimates based on self-reported manager data

Trust liquidity remained strong

Sources of Liquidity (\$, billions)	Market Value	Stressed Value
Internal Cash	\$ 2.1	\$ 2.1
Government Bonds	14.8	12.3
Risk Parity	13.2	7.6
Other Liquid Assets (Equity, Commodities)	52.8	26.9
Total Sources of Liquidity	\$ 82.9	\$ 49.0
<i>Note: Excluded Illiquid Private Assets and Hedge Funds</i>	\$ 101.5	NA

Uses of Liquidity (\$, billions)	Market Value	Stressed Value
Operational Uses of Liquidity		\$ (0.4)
Stressed Securities Lending		(1.2)
Stressed Derivatives		(5.4)
Stressed Repo		(1.4)
Stressed Private Markets		(2.3)
Total Uses of Liquidity	\$ (0.1)	\$ (10.5)

Liquidity Ratio	
Ratio (Sources/Uses)	4.7
Alert Threshold	2.0
Test Result	Pass
<i>Note: Net Stressed Liquidity (Sources less Uses)</i>	\$ 38.4
<i>Note: Past 12 Months of Benefit Payments</i>	\$ 4.2



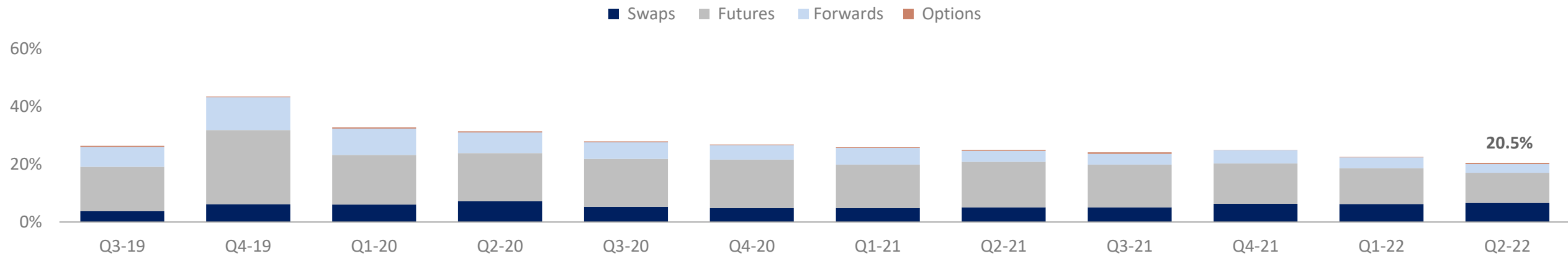
Source: State Street Bank, TRS IMD

Assumptions: The stress case assumes liquid assets experience 1.5x the worst rolling monthly return since 2008 plus an additional liquidity stress. Operational uses of liquidity reflects the lesser of forecasted cash flows or monthly benefit payments. Stressed securities lending reflects potential costs associated with termination including a liquidity stress. Stressed non-collateralized assets and derivatives reflect margin calls based on the same market stress applied to Liquid Assets. Private Market investments are assumed to return half as much capital as currently planned and experience capital calls equivalent to total unfunded commitments in equal installments over the course of 12 months.

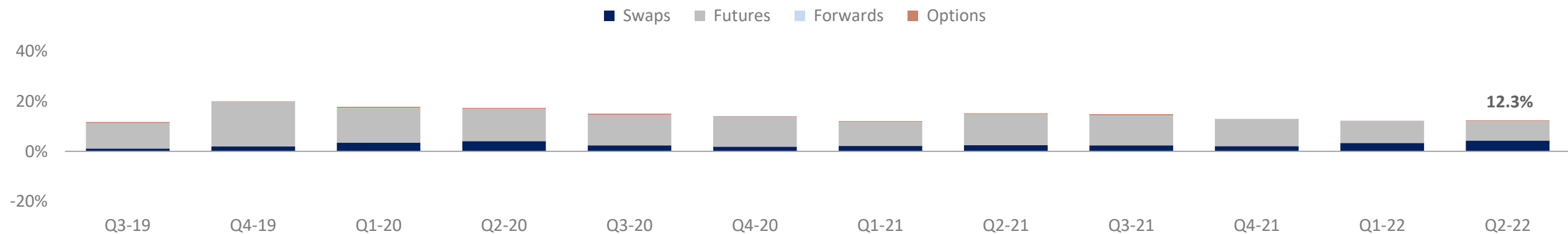
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Derivative notional remained steady

Gross Notional by Instrument (% of Total Trust)



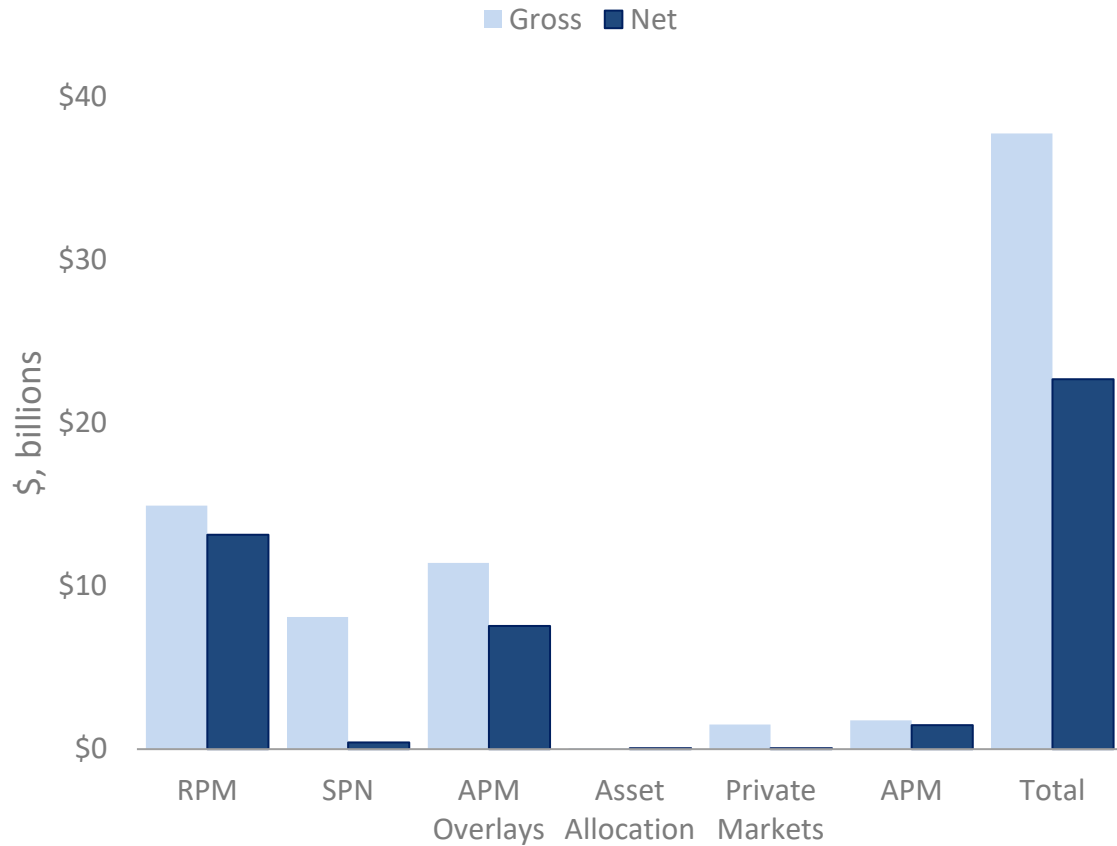
Net Notional by Instrument (% of Total Trust)



Source: State Street Bank; note: derivative positions represent transactions in which TRS is a counterparty; net leverage includes adjustments for delta-notionalization for options and exclusion of spot forwards of 30 days or less

Derivatives contributed small portion of drawdown risk

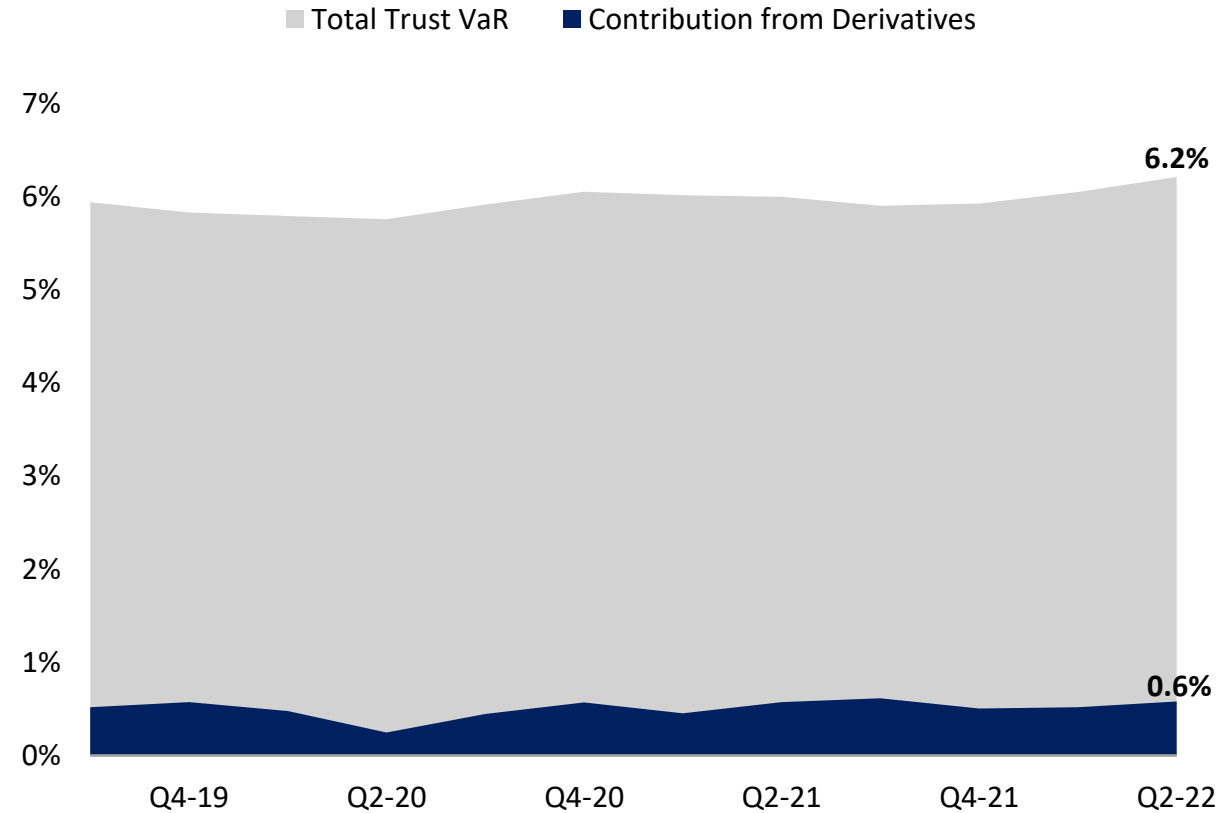
Gross vs Net Derivatives Notional by Portfolio



● Total Gross = \$37.7b

● Total Net = \$22.7b

VaR Contribution from Derivatives



Source: State Street Bank; derivative positions represent transactions in which TRS is a counterparty. Note: net leverage includes adjustments for delta-notionalization of options and exclusion of spot forwards of 30 days or less

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In conclusion, key points are the following:

- Underweight investment exposure, particularly Global Equities
- Overweight in Private Markets offset by underweight in Public Markets
- Drawdown and liquidity risk models updated
- Risk metrics remain in compliance

