

September 2023

# 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. Elliott,  
Ms. Sissney and Mr. Walls, Jr.)*

*All or part of the September 14, 2023, 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, 5<sup>th</sup> Floor, Boardroom.***

*The open portions of the September 14, 2023, 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](http://www.trs.texas.gov). A recording of the meeting will be available at [www.trs.texas.gov](http://www.trs.texas.gov).*

**AGENDA  
September 14, 2023 – 9:00 a.m.**

1. Call roll of Committee members.
2. Consider the approval of the proposed minutes of the July 2023 committee meeting – Committee Chair.
3. CIO Update including Fleet Strategy; Talent Management; Accomplishments; Notices, Key Dates and Upcoming Events, and Market Update – Jase Auby and Mohan Balachandran.
4. Discuss the Second Quarter 2023 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 13, 2023**

The Investment Management Committee of the Board of Trustees of the Teacher Retirement System of Texas met on Thursday, July 13, 2023, 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. John Elliott  
Mr. Jarvis Hollingsworth  
Mrs. Nanette Sissney  
Mr. Robert H. Walls, Jr.

### **Other TRS Board Members present:**

Ms. Brittny Allred  
Mr. Mike Ball  
Mr. James D. Nance  
Mr. Elvis Williams

### **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  
Tim Koek, TRS  
Ryan Zafereo, TRS  
Neil Randall, TRS  
Grant Walker, TRS  
Brad Gilbert, TRS  
Katherine Farrell, TRS  
Suzanne Dugan, Cohen Milstein  
Dr. Keith Brown, Board Advisor  
Mike McCormick, AON  
Tim Pflugrad, AON

Investment Management Committee Chair, Mr. David Corpus, called the meeting to order at 2:20 p.m.

### **1. Call roll of Committee members.**

Ms. Farrell called the roll. A quorum was present.

**2. Consider the approval of the proposed minutes of the April 2023, Investment Management Committee meeting – Chair David Corpus.**

On a motion by Mr. Hollingsworth, seconded by Mr. Elliott, the committee approved the proposed minutes for the April 2023 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 provided a performance update reporting a one-year return of -5.2 percent, with a three year return of 10.3 percent. He said IMD had moved into the new headquarters and turned the keys in on 816. He noted compensation was reviewed biannually at IMD which may result in proposing changes to the incentive policy at the September meeting.

Mr. Auby reported that while the S&P 500 has moved into a bull market, this move has been lopsided. He reported that just five stocks contributed to 9 percent of the return driven by the potential impact of AI on the economy.. He concluded with reporting the equity market being extremely bullish and the Treasury market being extremely bearish, within the year will determine which one was wrong.

**4. Discuss the First Quarter 2023 Performance Review –Mike McCormick, Aon.**

Mr. Mike McCormick began by reporting on the four major components of the Trust. He said stocks and bonds were up 5 percent, risk parity was up about 5.4 percent, but real assets, real estate and energy down -3 percent. He stated the assets were being managed commensurate with the Investment Policy Statement. He noted the net leverage position was higher than the policy target but well within the ranges established. He reported the absolute return portfolio was overweighted and US equities were underweighted. He said the big takeaway though was alpha continued in the first quarter. He said alpha has been consistent from quarter to quarter since the COVID period.

**5. Annual Review of External Private Markets – Eric Lang, Tim Koek, Ryan Zafereo, Neil Randall and Grant Walker.**

Mr. Eric Lang provided an overview of private markets. He said at \$74 billion, this is one of the largest private market portfolios in the world. He noted while the S&P 500 struggled with the -18 percent in 2022 they were positive, with ENRI one year as 15 percent plus returns. He reported real estate held its ground with a little over 6.4 percent. He reported the teams combined approved over 242 separate investments over the year, averaging five a week between the three investment committees, ranging from a couple of million dollars to well over \$100 million. He said these portfolios delivered around \$1.8 billion in net cash to the Trust.

Mr. Tim Koek provided an overview of the private markets data analytics team. He said the group works closely with the three private market investment teams to help enhance effectiveness and deliver returns for the Trust. He stated his team presents information to the investment team in the form of dashboards that were accessed 40,000 times during 2022. This reporting, he said, frees up

the investment team to spend on other valued activities. He said the key role of his team is to be a multiplier to the investment teams.

Mr. Lang provided an update on TRICOT, noting the first local employee was hired. He said the focus for the year was dealing with smaller capital plans.

Mr. Ryan Zafereo provided an overview of the Energy, Natural Resources, and Infrastructure (ENRI) portfolio noting it was started in 2013 marking its 10<sup>th</sup> anniversary. He said last year the portfolio outperformed delivering a 15.6 percent return on a time-weighted basis. He said much of the outperformance came from the energy investments which are highly correlated to inflation. He said the portfolio was currently in line with the target of 60 percent funds and 40 percent principal investments. Mr. Zafereo gave a specific update on the state of the energy markets and discussed the opportunities and challenges. He concluded with a summary of 2022 accomplishments having committed \$2.5 billion of capital. For 2023 he said the plan is to execute on a \$2 billion capital plan and the focus is on the energy market

Mr. Neil Randall provided an overview of the private equity (PE) portfolio. He reported this was the first year since 2009 that the portfolio had a negative return for the year, a negative return of -8.9 percent. He noted when interest rates started to increase the broader equity market goes down and private equity generally follows. He said the team is working in the down cycle to make some key adjustments at the sub-strategy level. Mr. Randall concluded by noting they won the Best LP award from Private Equity Exchange for the second year in a row.

Mr. Grant Walker provided an overview on the real estate portfolio. He reported the portfolio for 2022 was 20 basis points below the benchmark. He commented this is a timing issue and should correct itself going forward. He spotlighted the office environment. He said the pandemic was definitely a strong contributor to what was happening in the office market, less demand. He referenced a report showing on average the U.S. was just under 50 percent of pre-COVID levels, with a large variance by city. He said based upon the under-allocation of office within the portfolio they expect to generate alpha but expected further decline in the office values. Mr. Walker concluded with accomplishments and 2023 priorities.

## **6. Review of proposed modifications to the Investment Policy Statement – Katy Hoffman and Brad Gilbert.**

Ms. Katy Hoffman provided an overview noting there were seven proposed changes to the Investment Policy Statement (IPS) that will be brought back to the Policy committee in September. Mr. Brad Gilbert stated two modifications were implementing changes due to recently passed legislation. He said the statutory limit on hedge funds was raised from 10 percent to a limit to be implemented by the Board of Trustees. He said Staff was recommending for the Board to raise the limit to 15 percent. The second proposed modification due to legislative changes, he said, would be to add language to the IPS to include investments in title-holding entities for the Trust and real estate portfolio. Another proposed modification, he reviewed, was to provide public markets portfolio management authority to the Head of Special Opportunities. Ms. Hoffman reviewed the other proposed changes: requirements in the Board reporting for investments coming to the IIC, authorizing the internal trading of derivatives, changing the credit rating requirement for Securities

Lending Agents, removing a security restriction in 1.8 (e) of the IPS, and expanding the Investment Integrity Questionnaire to add additional due diligence questions.

There being no more business before the Investment Management Committee, the committee adjourned at 4:13 p.m.

Approved by the Investment Management Committee of the Board of Trustees of the Teacher Retirement System of Texas on September\_\_, 2023.

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

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Date





# CIO Update

Jase Auby, Chief Investment Officer  
Mohan Balachandran, Senior Managing Director

September 2023



# CIO Update

## IMD at a Glance



### Priorities

- **Performance.** Trust ended the second quarter of 2023 with a 1-year return of 4.0% and +44 bp of excess return. The 3-year return is 9.0% with +134 bp of excess return.
- **SPN Summit.** Morgan Stanley hosted the Public Strategic Partnership Network (SPN) summit in New York City with a focus on Strategic Asset Allocation (SAA), credit, and inflation
- **Annual Reviews.** Completed Management Committee (MC) Annual Offsite Talent Review
- **Portfolio Reviews.** Held portfolio level reviews across all public markets teams, focused on performance and team accomplishments for the first half of 2023

### Key Dates and Upcoming Events

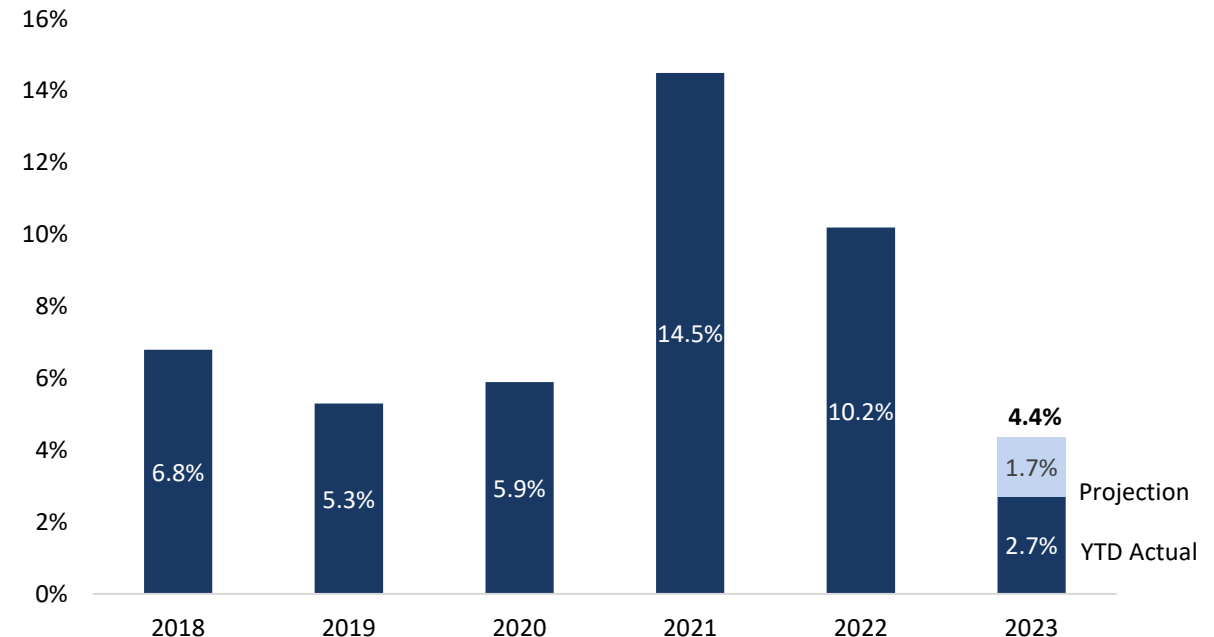
Event	Location	Dates
IMD Legal Summit	Austin, TX	November 7-8, 2023
Public Strategic Partnership Network (SPN) Summit	Austin, TX	November 16, 2023
Aon Wealth Insights Conference	Miami, FL	November 27-29, 2023

### Our People

#### Snapshot as of August 2023

IMD FTEs	233
Shared-Services	20
Contractors	9
Secondes	5

#### Attrition Trend 2018 – 2023 (As of August 2023)



# Market and Performance Update

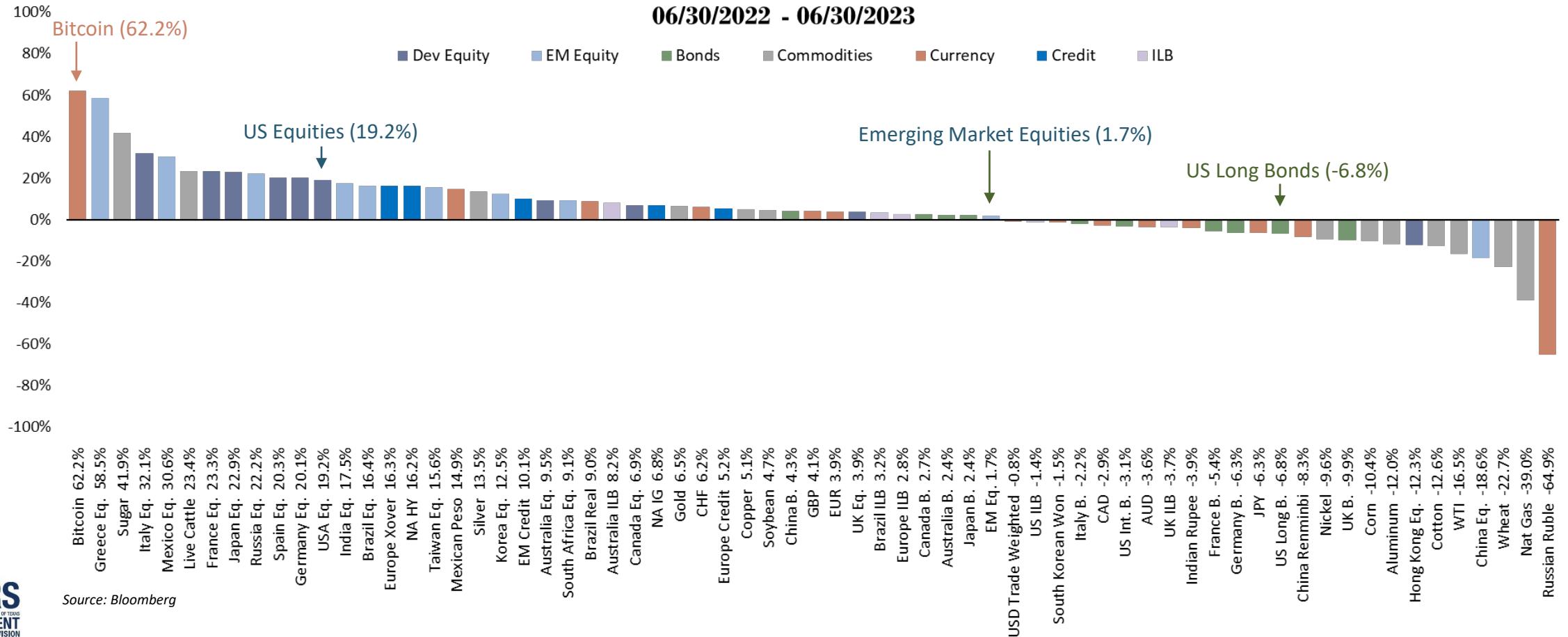
# Last 12 Months in Review

## Market Returns

64% of assets had positive returns throughout the last year

- **Top 5:** Bitcoin 62%, Greece Equities 59%, Sugar 42%, Italy Equities 32%, Mexico Equities 31%
- **Bottom 5:** Russian Ruble -65%, Natural Gas -39%, Wheat -23%, China Equities -19%, WTI -17%

**Asset Class Performance: 1 Year**  
**06/30/2022 - 06/30/2023**

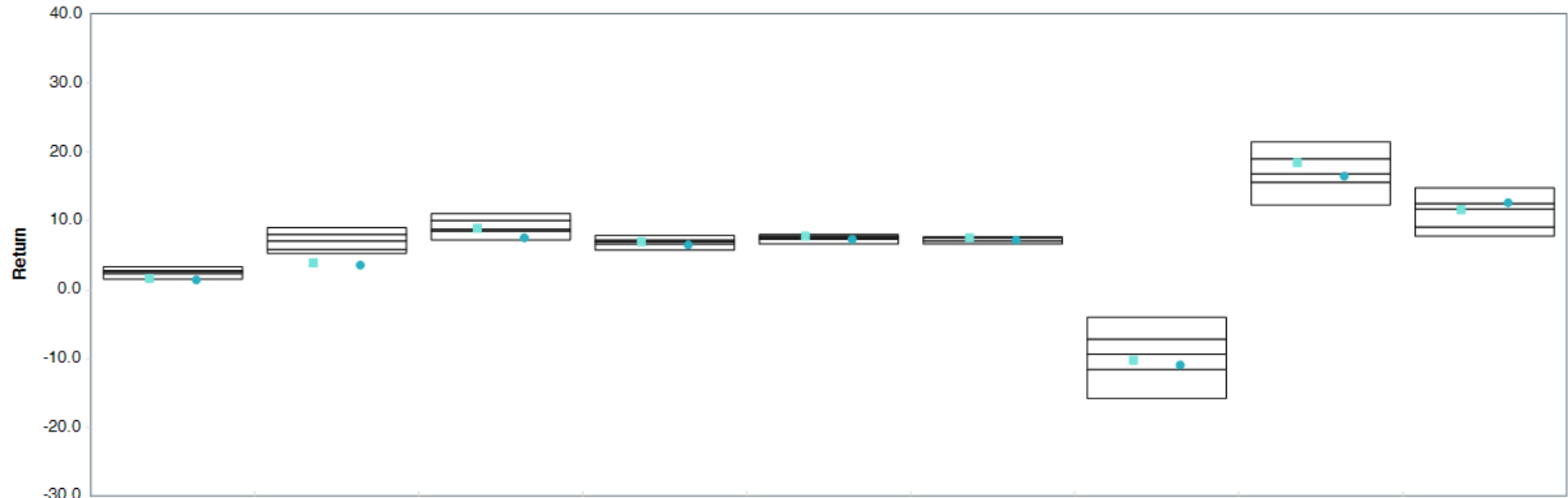


Source: Bloomberg

# Peer Benchmark Performance

*While lagging in the short-term, benchmark performance more in line with peers over longer time horizons (10+ years)*

**TRS Performance vs. Peers (>\$10 Billion) as of 6/30/2023**



	1 Quarter	1 Year	3 Years	5 Years	10 Years	20 Years	2022	2021	2020
■ Total Fund	1.7 (88)	4.0 (100)	9.0 (45)	7.0 (49)	7.8 (25)	7.5 (63)	-10.3 (58)	18.5 (31)	11.6 (52)
● Total Fund Benchmark	1.4 (97)	3.5 (100)	7.6 (93)	6.6 (83)	7.3 (76)	7.2 (73)	-10.9 (67)	16.5 (67)	12.6 (22)
5th Percentile	3.3	9.0	11.1	7.9	8.0	7.7	-4.0	21.5	14.8
1st Quartile	2.8	8.0	10.1	7.3	7.8	7.6	-7.2	19.0	12.6
Median	2.6	7.1	8.8	7.0	7.5	7.6	-9.4	16.8	11.7
3rd Quartile	2.3	5.9	8.6	6.7	7.3	7.1	-11.7	15.6	9.1
95th Percentile	1.5	5.3	7.2	5.8	6.6	6.6	-15.9	12.3	7.8
Population	23	19	14	13	12	9	26	39	38

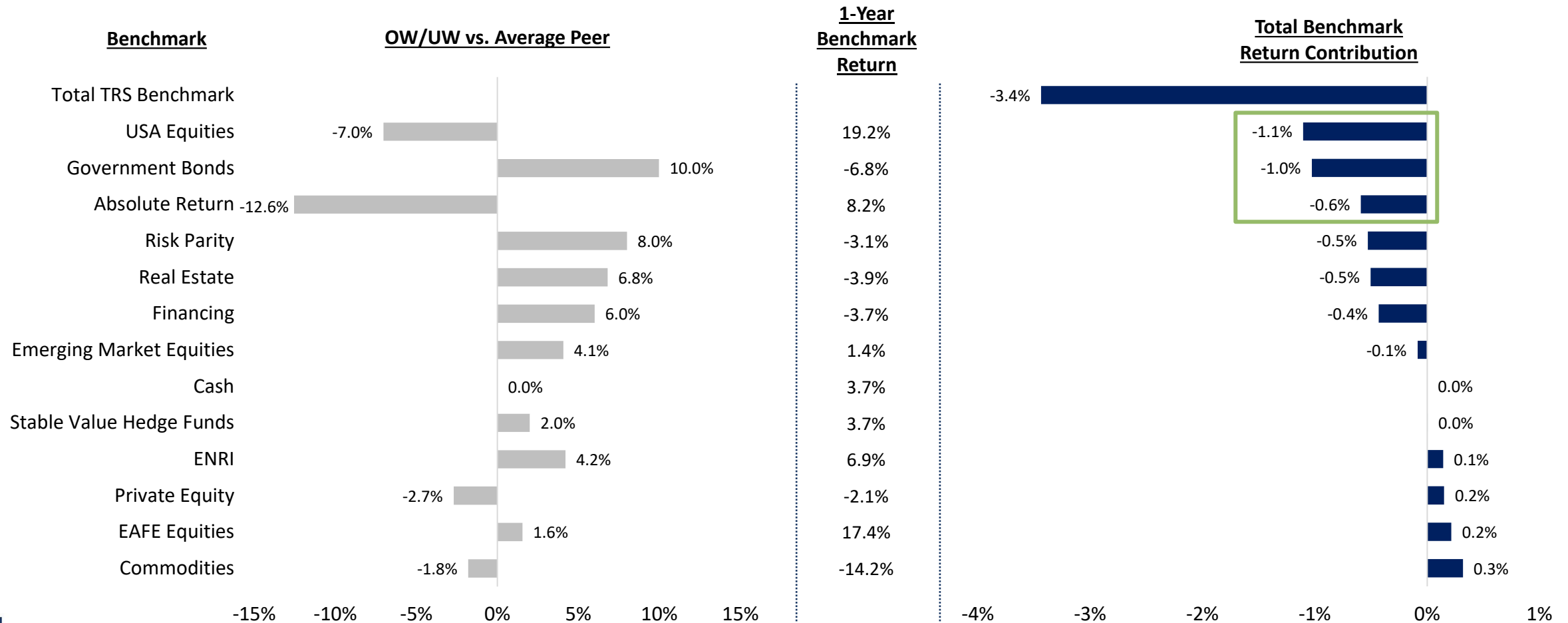
Parentheses contain percentile rankings.

Source: Aon

# Peer Benchmark Performance

Over the past year, benchmark returns lagged due to Trust's strategic positioning

## Estimated TRS Benchmark vs. Peer Benchmark 1-Year Return Attribution (As of June 30, 2023)



# Peer Benchmark Performance

*Diversification in general has not been rewarded over past three years due to higher correlations than expected*

## Asset Class Forecast vs. Actual – Returns and Volatility

	2019 SAA Study Forecast	TRS 3-Year Actual	2023 Updated Forecast
<b>Asset Class Returns</b>			
USA	6.4%	14.1%	6.1%
Non-US Developed	6.3%	9.2%	7.2%
Emerging Markets	7.3%	2.2%	8.2%
Private Equity	8.4%	22.7%	8.5%
Government Bonds	3.1%	-12.1%	3.7%
Absolute Return	5.1%	4.7%	5.8%
Stable Value Hedge Funds	4.5%	6.1%	4.9%
Real Estate	8.5%	7.5%	5.9%
ENRI	7.3%	14.8%	7.1%
Commodities	4.2%	25.1%	5.0%
Risk Parity	5.9%	0.1%	6.8%
Cash	2.5%	1.3%	3.2%
TRS Return	7.2%	9.0%	7.2%
Peer Return	6.6%	8.8%	6.7%
TRS Vol	10.9%	9.3%	12.0%
Peer Vol	10.5%	9.2%	11.6%

- In 2019, the SAA Study forecast outperformance versus peers of +0.6%
  - Actual outperformance versus peers for the past three years is +0.2%
  - An estimated 2023 update of the 2019 forecast process continues to show outperformance versus peers
- In 2024, the Board is expected to conduct its next SAA Study
- In preparation for the 2024 Study, the IMD has begun a review of all of the asset classes in the allocation. Particularly relevant topics include:
  - The allocation of US Treasuries in the portfolio and their role
  - The allocation to US versus non-US equity within the public equity portfolio
- Absolute Return remains an opportunistic asset class for TRS

## Special Topic: Artificial Intelligence



# Special Topic: Artificial Intelligence

## Overview

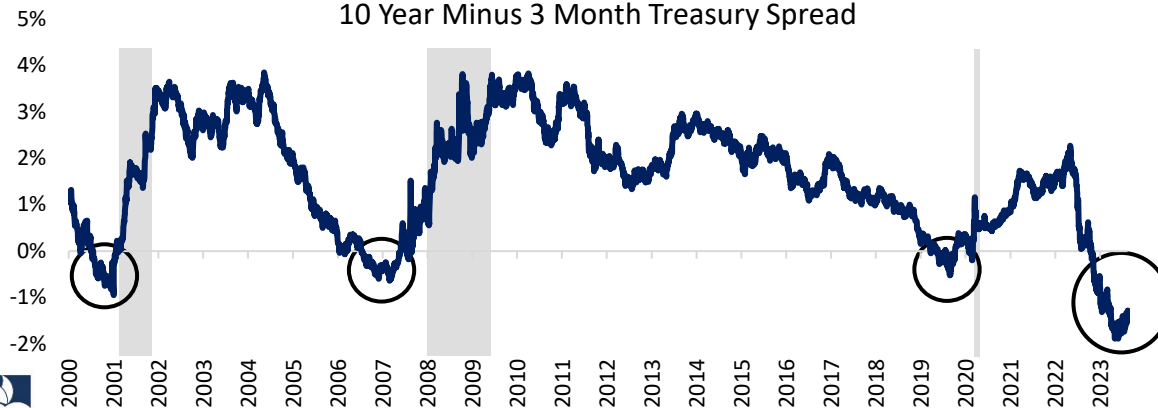
### Special Topics

Topic	Date	Topic	Date
1 Recession	September 2017	8 Long-Term Investing	February 2021
2 Growth	February 2018	9 Commodities	September 2021
3 Inflation	September 2018	10 China	February 2022
4 Strategic Asset Allocation	February 2019	11 Sentiment	September 2022
5 Value	September 2019	12 Foreign Currency	February 2023
6 Diversification	February 2020	13 Artificial Intelligence	September 2023
7 Interest Rates	September 2020		

### Update on Recession Special Topic

As of 8/17

10 Year Minus 3 Month Treasury Spread

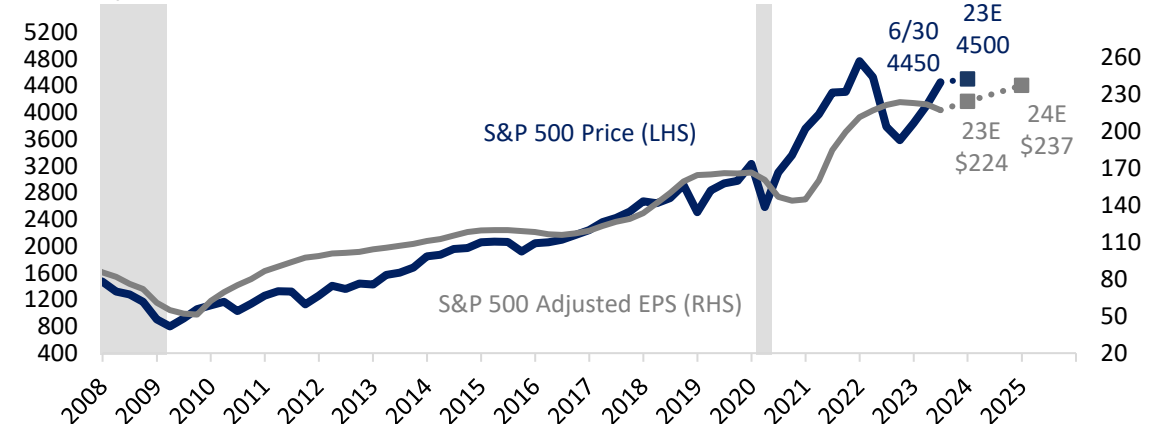


Source: Goldman Sachs, Bloomberg, Fred

Note: Adjusted S&P 500 EPS calculated as twelve trailing months on a quarterly basis

### Update on Growth Special Topic

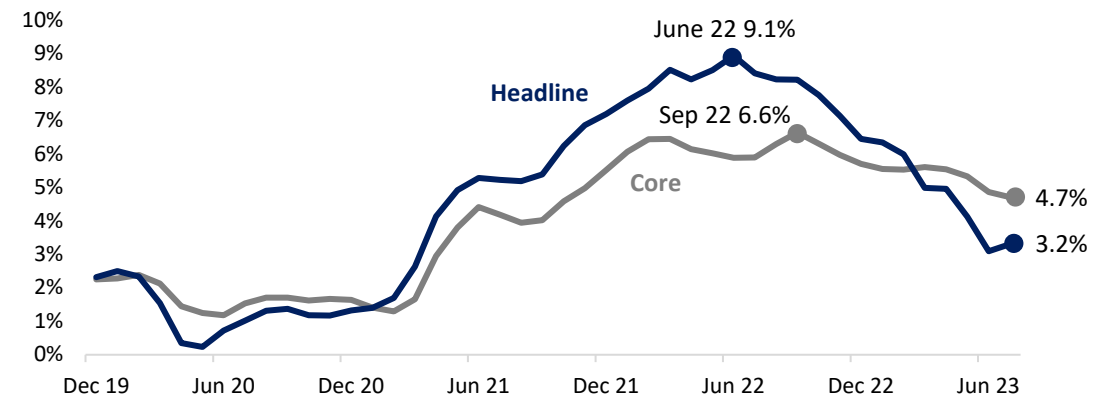
As of 6/30



### Update on Inflation Special Topic

As of 8/10

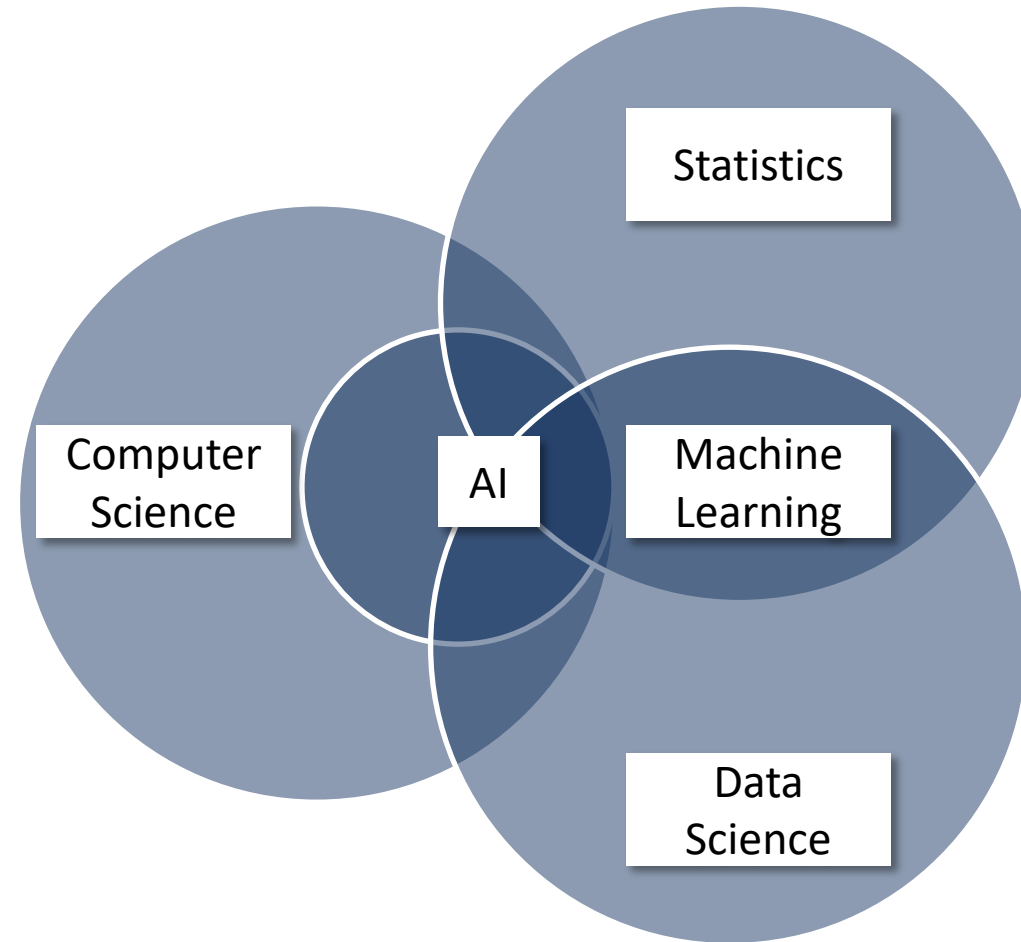
Headline vs. Core CPI (Year over year change in %)



# Special Topic: Artificial Intelligence

## *What is artificial intelligence (AI)?*

- **Artificial intelligence (AI)** is the theory and development of computer systems able to perform tasks normally requiring human intelligence. Examples:
  - Visual perception
  - Speech recognition
  - Decision-making
  - Translation between languages
- AI combines aspects of four other types of research:
  - Computer science
  - Statistics
  - Data science
  - Machine learning



# Special Topic: Artificial Intelligence

*Enthusiasm around AI has driven the market higher in 2023*

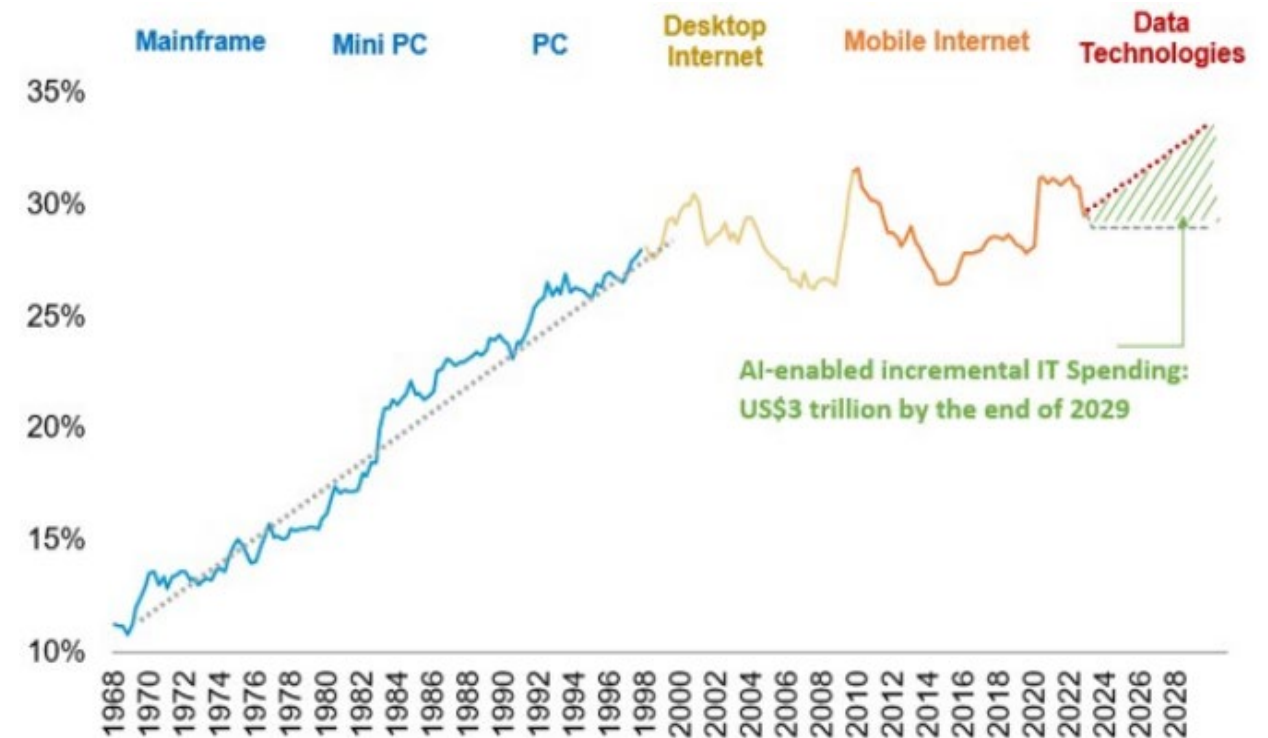
Year to date, the “Magnificent Seven” stocks in the S&P 500 index accounted for almost two thirds of its total return...

...as a major catalyst driving these stocks has been the potential impact of AI technology growth

## Contribution to Year To Date S&P 500 Total Return

Company	Stock Return	Contribution to S&P 500
NVIDIA	199.5%	2.3%
Meta	154.4%	1.3%
Tesla	94.6%	1.0%
Amazon.com	67.4%	1.6%
Alphabet	48.9%	0.8%
Apple	38.7%	2.4%
Microsoft	35.8%	2.1%
<b>“Magnificent Seven”</b>		<b>11.5%</b>
<b>Rest of S&amp;P 500</b>		<b>6.7%</b>
<b>S&amp;P 500 Total Return</b>		<b>18.2%</b>

## IT Infrastructure Spend as % of Total US Capex



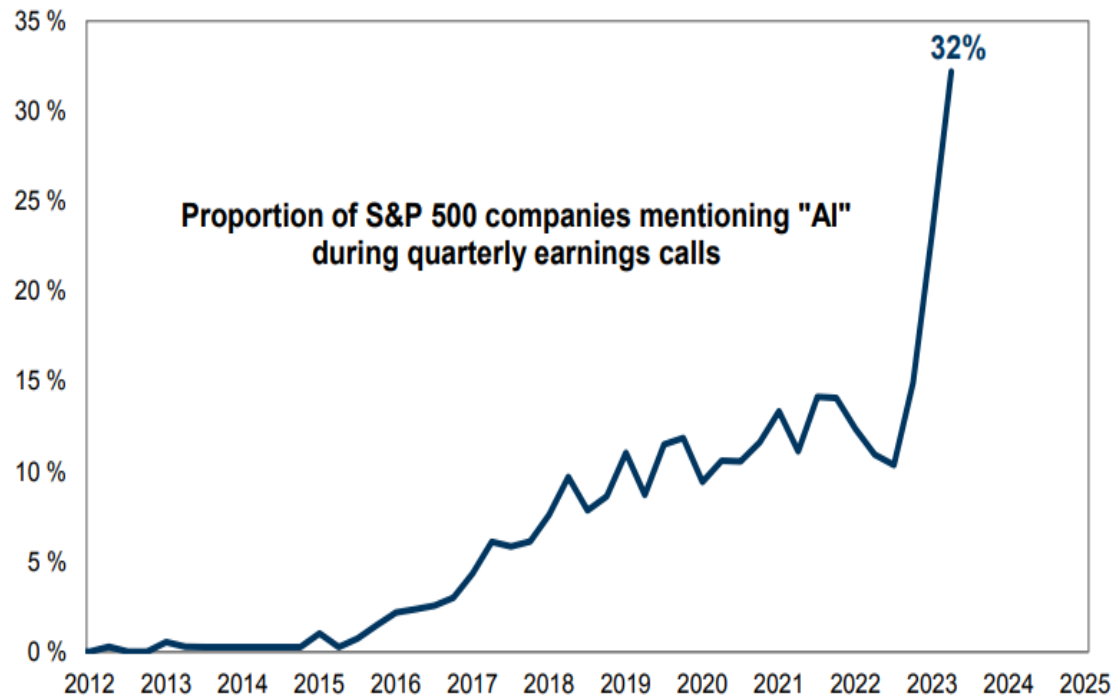
# Special Topic: Artificial Intelligence

*Heightened company interest suggests AI investment is already starting to grow*

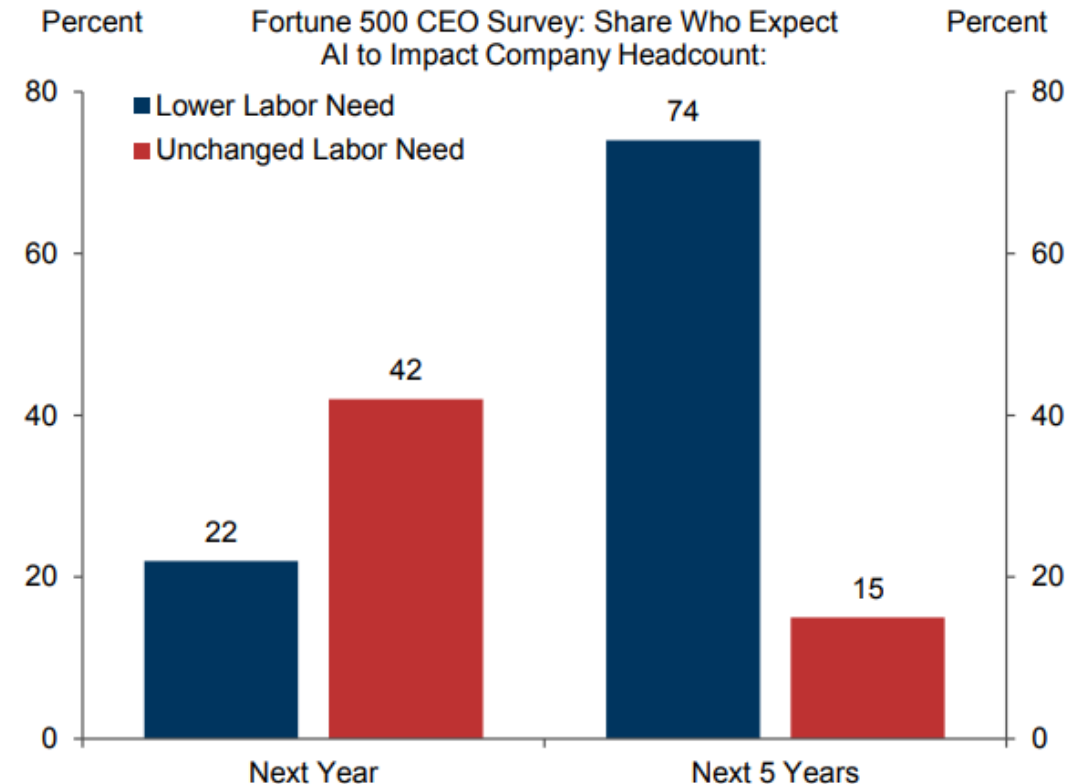
The share of large companies discussing current uses of AI within their businesses has sharply increased...

...with corporate leaders expecting AI to impact labor needs within the next five years

**S&P 500 Companies Mentioning "AI"**



**CEO Survey of AI's Impact to Company Labor**

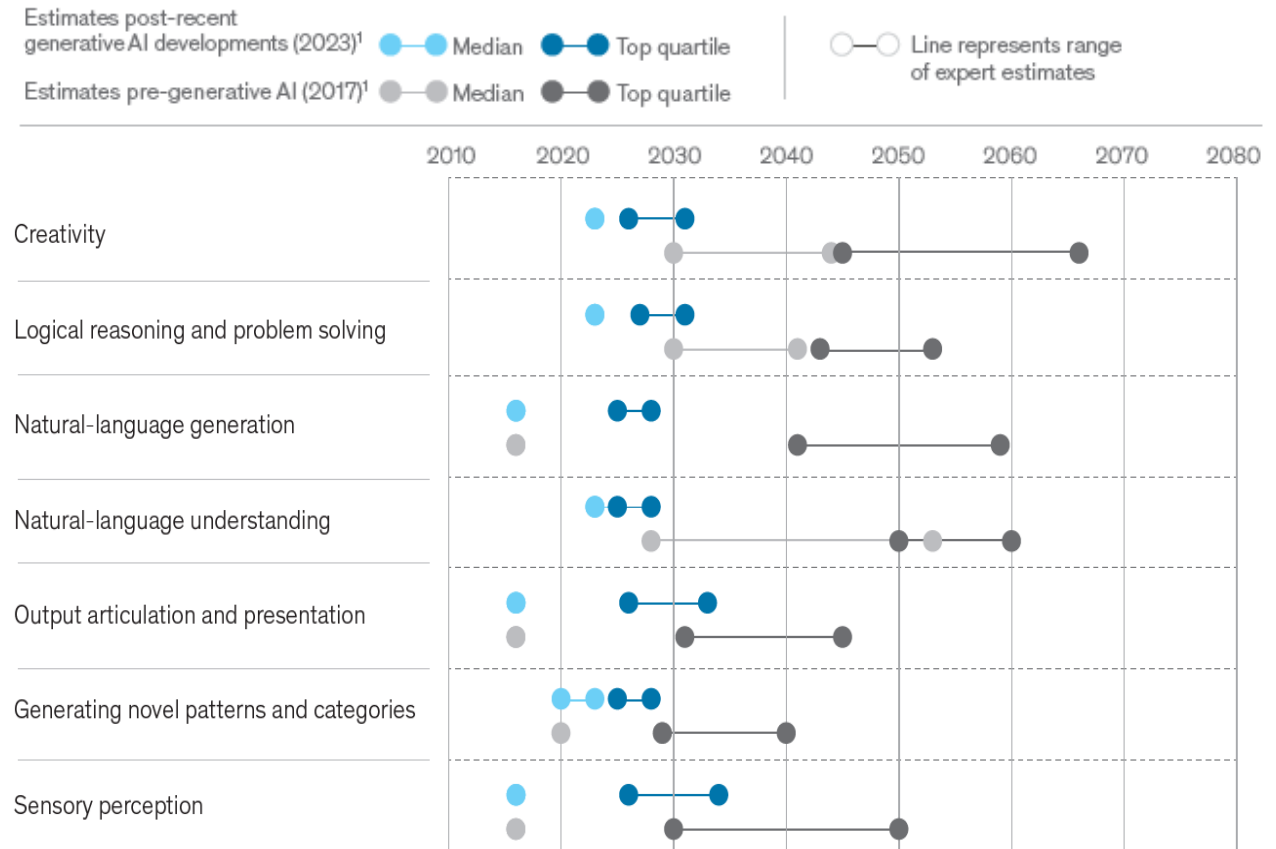


# Special Topic: Artificial Intelligence

*AI has two distinct classifications that are at different stages of development*

- There are two broad classifications of AI:
- **Artificial Narrow Intelligence (ANI)**
  - Generally better than humans in specific tasks like playing chess, web search, smart speaker, etc
- **Artificial General Intelligence (AGI)**
  - Capabilities similar to humans in every area
- Generative AI models such as OpenAI's ChatGPT is the first large-scale commercial example that looks very close to AGI

**Technical capabilities, level of human performance achievable by technology**



<sup>1</sup>Comparison made on the business-related tasks required from human workers. Please refer to technical appendix for detailed view of performance rating methodology.

Source: McKinsey Global Institute occupation database; McKinsey analysis

# Special Topic: Artificial Intelligence

## *AI-driven investing at TRS*

### Public Markets

- TRS currently uses AI to understand the markets better:
  - Identify patterns
    - Example: Characterize how important company profitability is on future stock returns
- Predict stock returns based on patterns in data
  - Reduce textual information into numbers
    - Example: Infer a number that represents the sentiment of executives during companies' quarterly conference calls
  - Reduce datasets into core factors
  - Understand and predict portfolio risk

### Private Markets

- Real Assets
  - Hyperscale data centers
  - Edge computing infrastructure
  - Alternative power generation, transmission infrastructure, and water access
  - Advanced manufacturing facilities
- Venture Capital
  - Early-stage AI venture investing
  - Gaming and entertainment specialist funds
- Digital Assets
  - Software and infrastructure that will power an intelligent and increasingly automated global internet
  - NFT and web3 infrastructure that will provide ownership, content creation, identity and consumer apps

# Special Topic: Artificial Intelligence

*Applications in finance are challenging and still developing*

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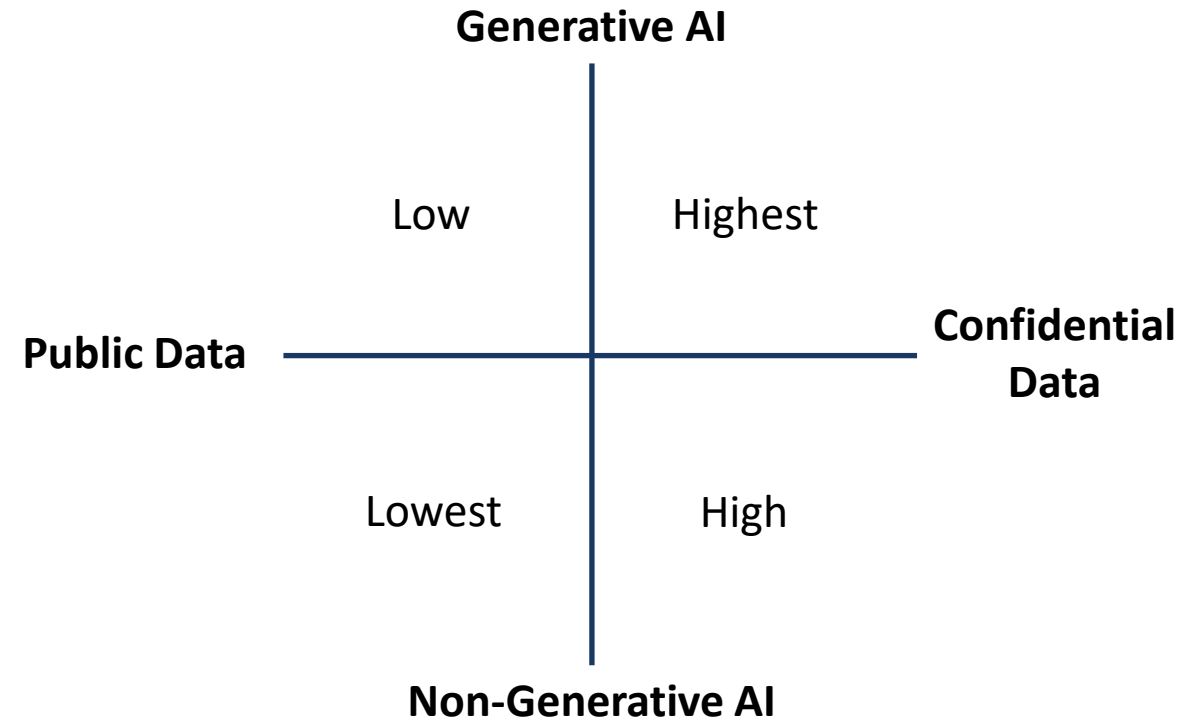
- AI and Machine Learning in finance is challenging
  - Financial time series data is relatively small
  - This challenge is fundamental and does not have a clear solution
- Noise
  - The market is generally efficient resulting in poor signal to noise
  - Innovative use of new datasets could help investors find an advantage
- Capacity
  - Areas that have higher signal-to-noise have much lower capacity

# Special Topic: Artificial Intelligence

*AI presents both opportunities and risks to TRS*

- Generative AI, such as ChatGPT, use existing information to create new information
- Potential risks:
  - Member/health information
  - Proprietary data
  - Cybersecurity
  - Regulatory
  - Intellectual property
  - Statutory
- TRS is working on an agency-wide policy to address these potential risks and opportunities

## AI Data Security Risks



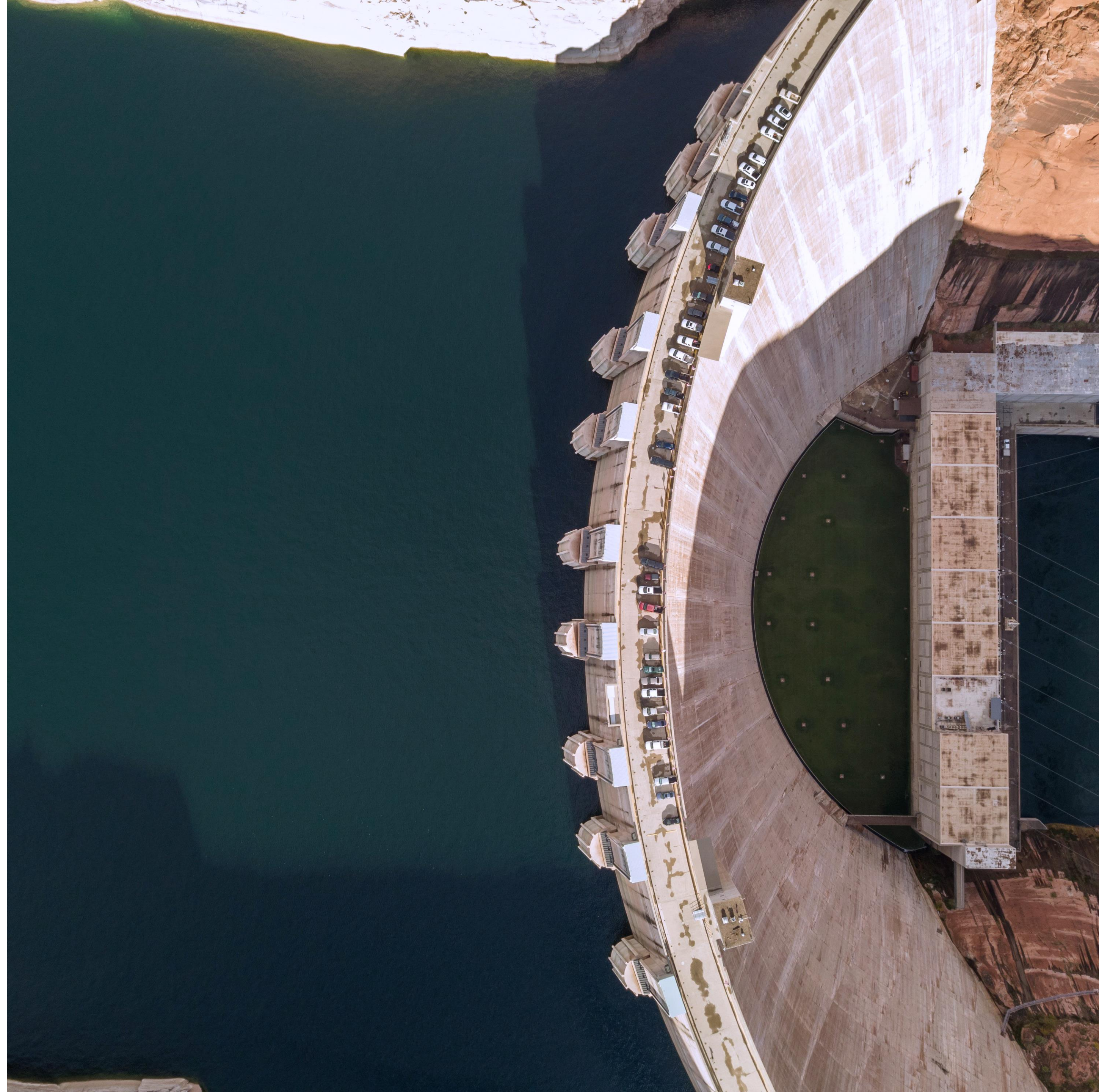




# Teacher Retirement System of Texas

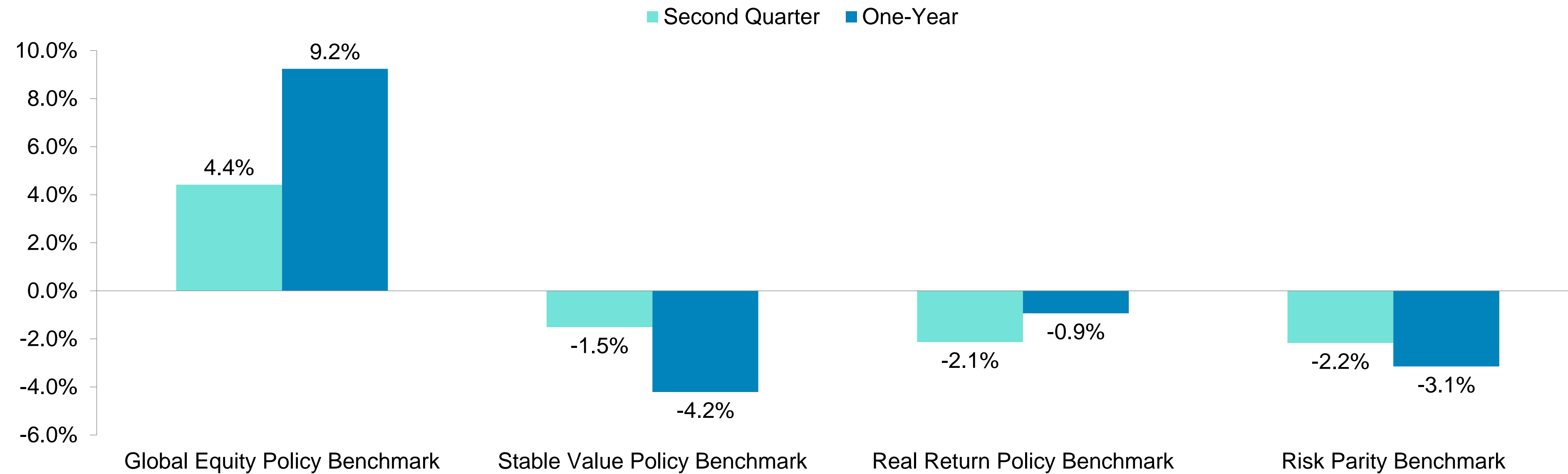
Performance Review:  
Second Quarter 2023

Investment advice and consulting services provided by Aon Investments USA, Inc.  
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# Summary



**In Q2 2023, equity markets continued to rise as high-interest rate concerns abated, with inflation also cooling down in major economies**

**Global equities rose 4.4% for the quarter and returned 9.2% over a trailing 1-year period**

**The U.S. Federal Reserve (Fed) increased its benchmark interest rate by 25bps to a range of 5.00%-5.25% over the quarter. Fed Chair Jerome Powell indicated that the central bank intends to carry out further monetary tightening to bring persistently high inflation under control but defended the current pause citing "potential headwinds" from the banking crisis.**

**TRS returned 1.7% for the quarter which was 0.3 percentage points above its benchmark**

–Outperformance at the asset class level for Risk Parity, Stable Value, and Real Return were the primary drivers for relative results.

**For the trailing twelve months, TRS returned 4.0% versus the benchmark return of 3.5%**

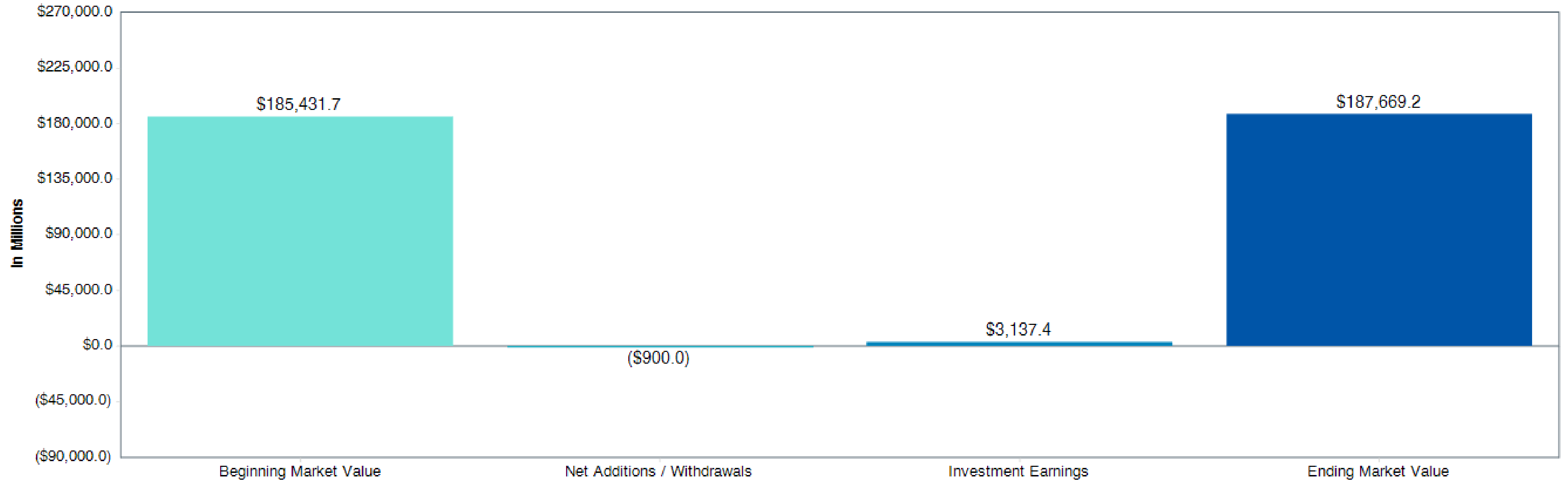
–Outperformance from the Stable Value, Real Return and Risk Parity asset classes were the primary drivers of relative performance

# 1. Market Summary – Second Quarter 2023

	Second Quarter	YTD	One Year	Three Years	Five Years	Ten Years
<b>Global Equity:</b>						
TF USA Benchmark	8.4%	16.4%	19.2%	14.1%	11.5%	12.5%
TRS Non-US Developed Benchmark	3.0	11.4	17.4	9.2	4.6	5.4
TRS Emerging Markets Benchmark	3.5	7.4	1.4	2.2	0.9	2.9
HFRI Fund of Funds Composite Index	1.5	2.3	3.7	5.0	3.3	3.4
State Street Private Equity Index (quarter lagged)	2.1	3.3	-2.9	22.6	14.9	13.4
Global Equity Policy Benchmark	4.4	9.4	9.2	13.9	9.3	9.3
<b>Stable Value:</b>						
Bloomberg Barclays Long Treasury Index	-2.3%	3.7%	-6.8%	-12.1%	-0.9%	1.8%
HFRI Fund of Funds Conservative Index	1.0	2.0	3.7	6.1	3.9	3.5
Absolute Return Benchmark	2.3	4.5	8.2	4.7	4.5	3.6
90 Day U.S. Treasury Bill	1.3	2.4	3.7	1.3	1.6	1.0
Stable Value Policy Benchmark	-1.5	3.4	-4.2	-7.9	0.4	2.2
<b>Real Return:</b>						
Bloomberg Barclays U.S. TIPS Index	-1.4%	1.9%	-1.4%	-0.1%	2.5%	2.1%
NCREIF ODCE (quarter lagged)	-3.4	-8.4	-3.9	7.5	6.6	8.5
Energy, Natural Resources & Infrastructure Benchmark	1.0	4.1	6.9	14.8	7.0	--
Goldman Sachs Commodities Index	-2.7	-7.5	-14.2	25.1	2.8	-3.5
Real Return Policy Benchmark	-2.1	-5.0	-0.9	9.5	6.7	7.1
<b>Risk Parity:</b>						
Risk Parity Benchmark	-2.2%	3.1%	-3.1%	0.1%	1.8%	3.2%
TRS Policy Benchmark	1.4%	4.6%	3.5%	7.6%	6.6%	7.3%

## 2. Market Value Change

From April 1, 2023 to June 30, 2023



Summary of Cash Flows					
	1 Quarter	Year to Date	1 Year	3 Years	5 Years
<b>Total Fund</b>					
Beginning Market Value	185,431,716,576	179,746,129,720	184,398,784,440	155,202,490,183	151,181,579,806
+ Additions / Withdrawals	-899,999,999	-1,917,196,510	-3,915,749,984	-12,421,019,633	-20,711,019,795
+ Investment Earnings	3,137,444,489	9,840,227,857	7,186,126,611	44,887,690,516	57,198,601,054
<b>= Ending Market Value</b>	<b>187,669,161,066</b>	<b>187,669,161,066</b>	<b>187,669,161,066</b>	<b>187,669,161,066</b>	<b>187,669,161,066</b>

### 3. Asset Allocation Detail

	Market Value \$ in millions) as of 6/30/2023		Interim Policy Target	Relative to Interim Policy Target	Long Term Policy Target	Long Term Policy Ranges
	(\$)	(%)				
<b>Investment Exposure</b>	--	105.2%	104.0%	+1.2%	104.0%	99-115%
Total U.S.A.	\$29,869	15.9%	16.7%	-0.8%	18.0	13-23%
Non-U.S. Developed	\$22,578	12.0%	12.1%	-0.1%	13.0	8-18%
Emerging Markets	\$15,458	8.2%	8.3%	-0.1%	9.0	4-14%
Private Equity	\$32,276	17.2%	17.2%	0.0%	14.0	9-24%*
<b>Global Equity</b>	<b>\$100,180</b>	<b>53.4%</b>	<b>54.2%</b>	<b>-0.8%</b>	<b>54.0</b>	<b>47-61%</b>
Government Bonds	\$26,219	14.0%	14.8%	-0.8%	16.0	0-21%
Stable Value Hedge Funds	\$9,108	4.9%	4.6%	+0.3%	5.0	0-10%
Absolute Return	\$5,601	3.0%	0.0%	+3.0%	0.0	0-20%
<b>Stable Value</b>	<b>\$40,928</b>	<b>21.8%</b>	<b>19.4%</b>	<b>+2.4%</b>	<b>21.0</b>	<b>14-28%</b>
Real Estate	\$30,366	16.2%	16.5%	-0.3%	15.0	10-20%
Energy, Natural Resource and Inf.	\$12,424	6.6%	6.5%	+0.1%	6.0	1-11%
Commodities	\$767	0.4%	0.0%	+0.4%	0.0	0-5%
<b>Real Return</b>	<b>\$43,557</b>	<b>23.2%</b>	<b>23.0%</b>	<b>+0.2%</b>	<b>21.0</b>	<b>14-28%</b>
Risk Parity	<b>\$12,710</b>	<b>6.8%</b>	<b>7.4%</b>	-0.6%	8.0	0-13%
<b>Risk Parity</b>	<b>\$12,710</b>	<b>6.8%</b>	<b>7.4%</b>	<b>-0.6%</b>	<b>8.0</b>	<b>0-13%</b>
Cash	<b>\$3,760</b>	<b>2.0%</b>	<b>2.0%</b>	0.0%	2.0	0-7%
Asset Allocation Leverage	<b>-\$13,466</b>	<b>-7.2%</b>	<b>-6.0%</b>	-1.2%	-6.0	--
<b>Net Asset Allocation</b>	<b>-\$9,706</b>	<b>-5.2%</b>	<b>-4.0%</b>	<b>-1.2%</b>	<b>-4.0</b>	<b>--</b>
<b>Total Fund</b>	<b>\$187,669</b>	<b>100.0%</b>		---	<b>100.0%</b>	<b>--</b>

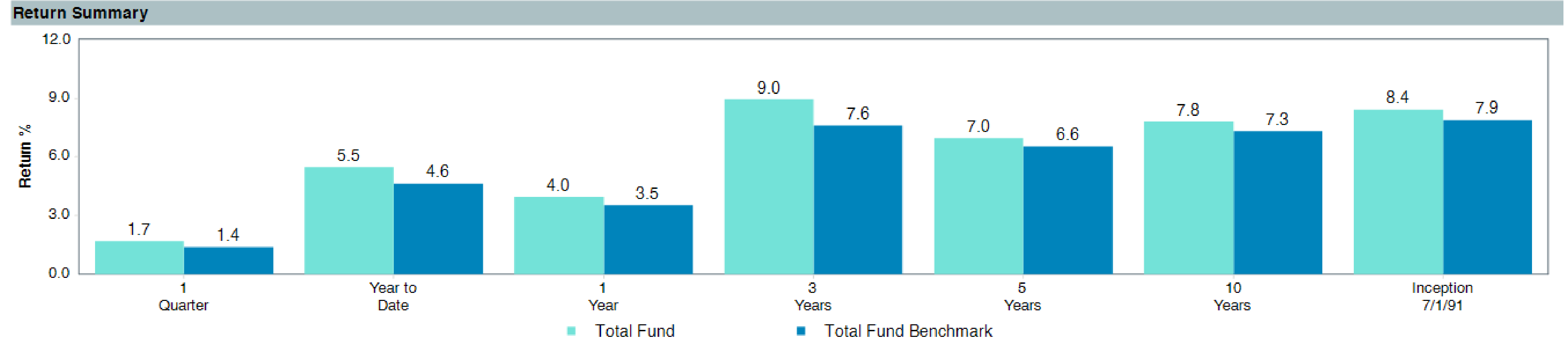


Note: Asset allocation information shown above is based upon MOPAR reporting. The excess returns shown above may not be a perfect difference between the actual and benchmark returns due entirely to rounding.

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

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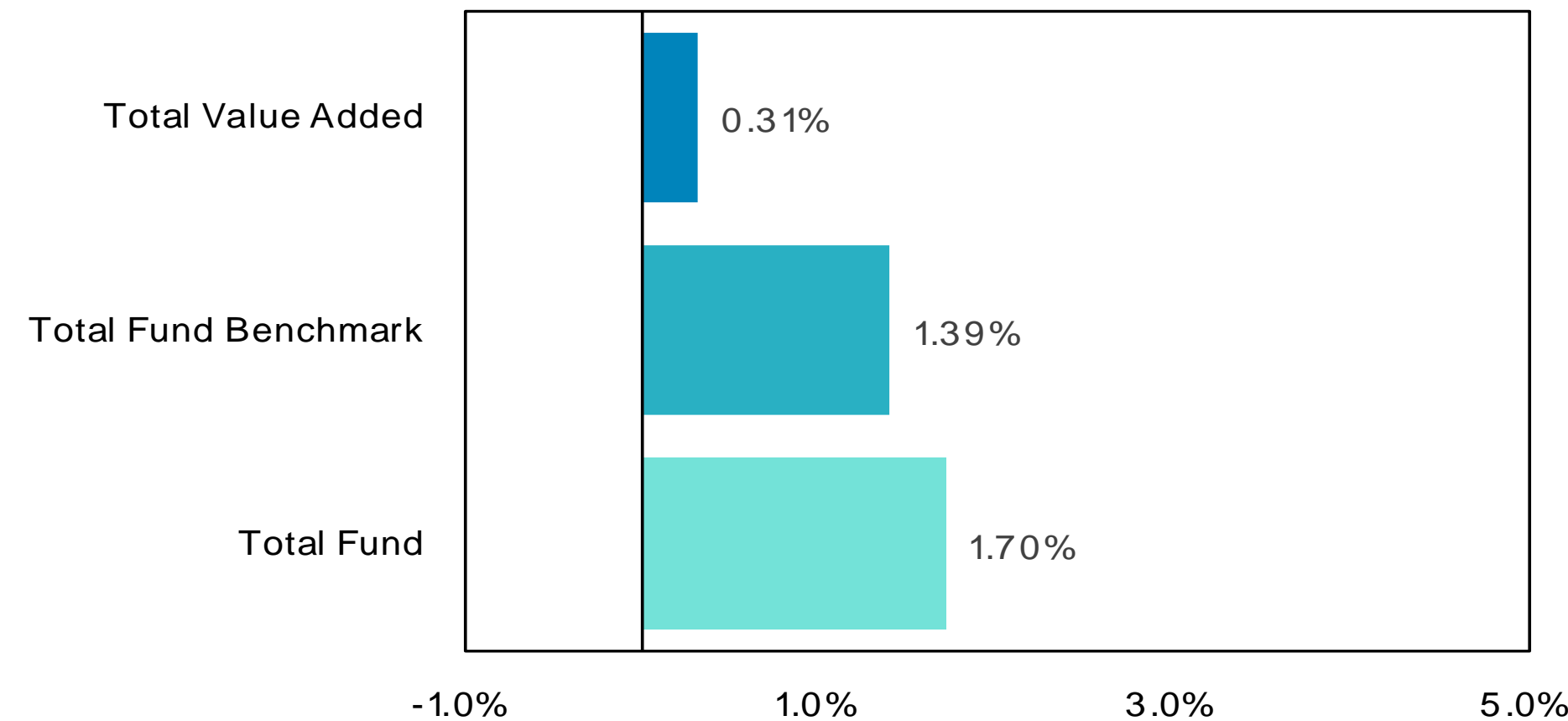
## 4. Total TRS Performance Ending 6/30/2023



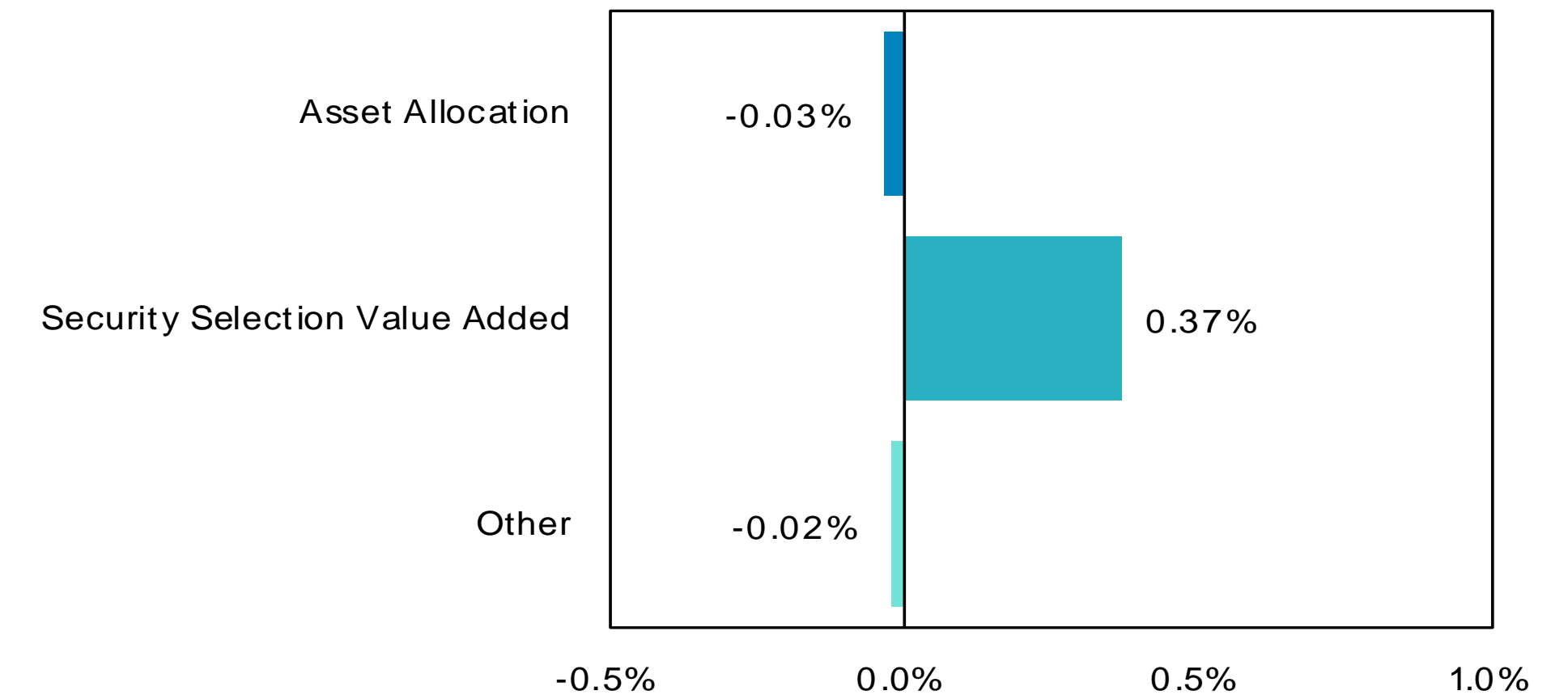
# 5. Total Fund Attribution – One Quarter Ending 6/30/2023

## Total Fund vs. Total Fund Benchmark

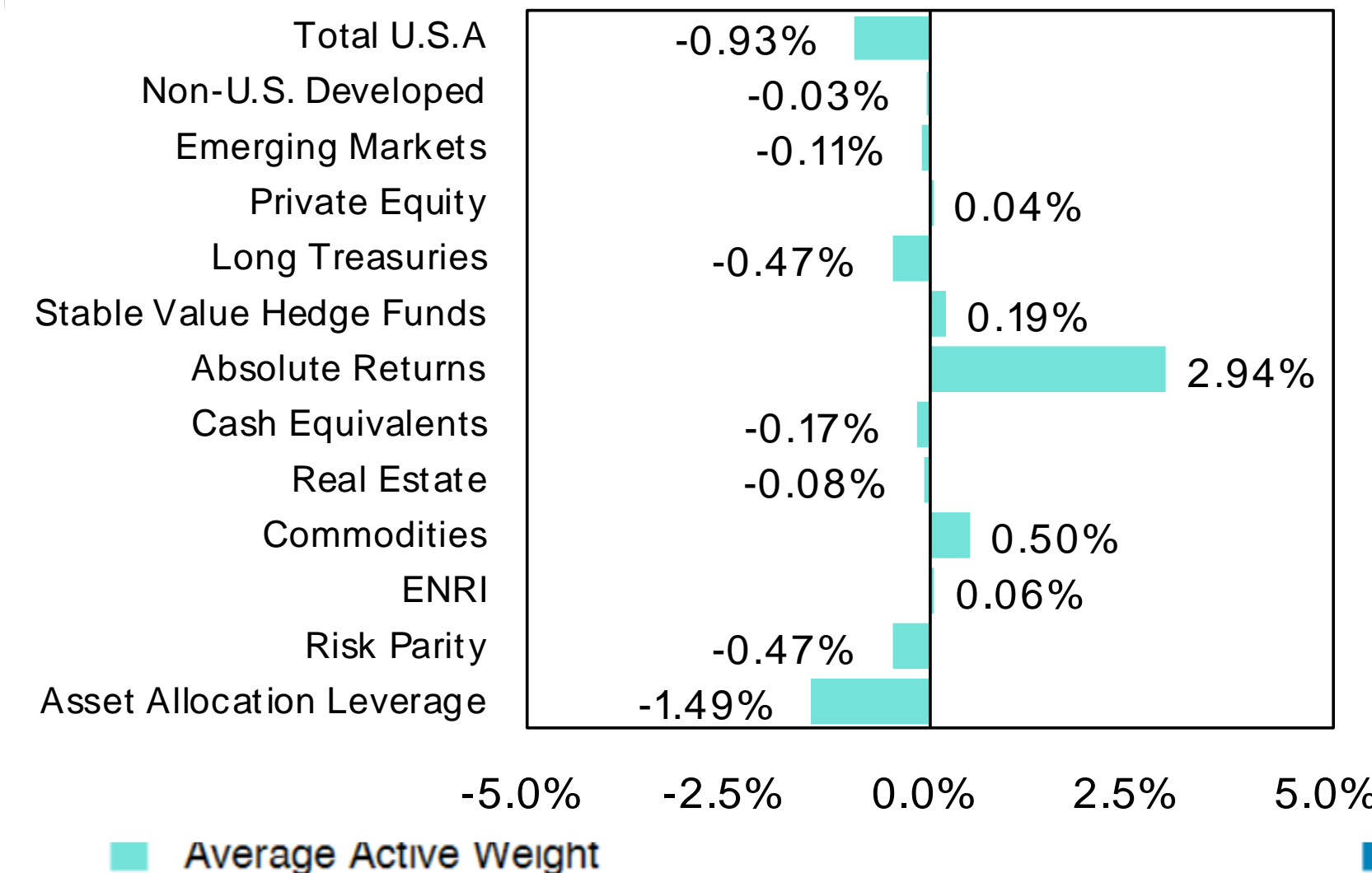
### Total Fund Performance



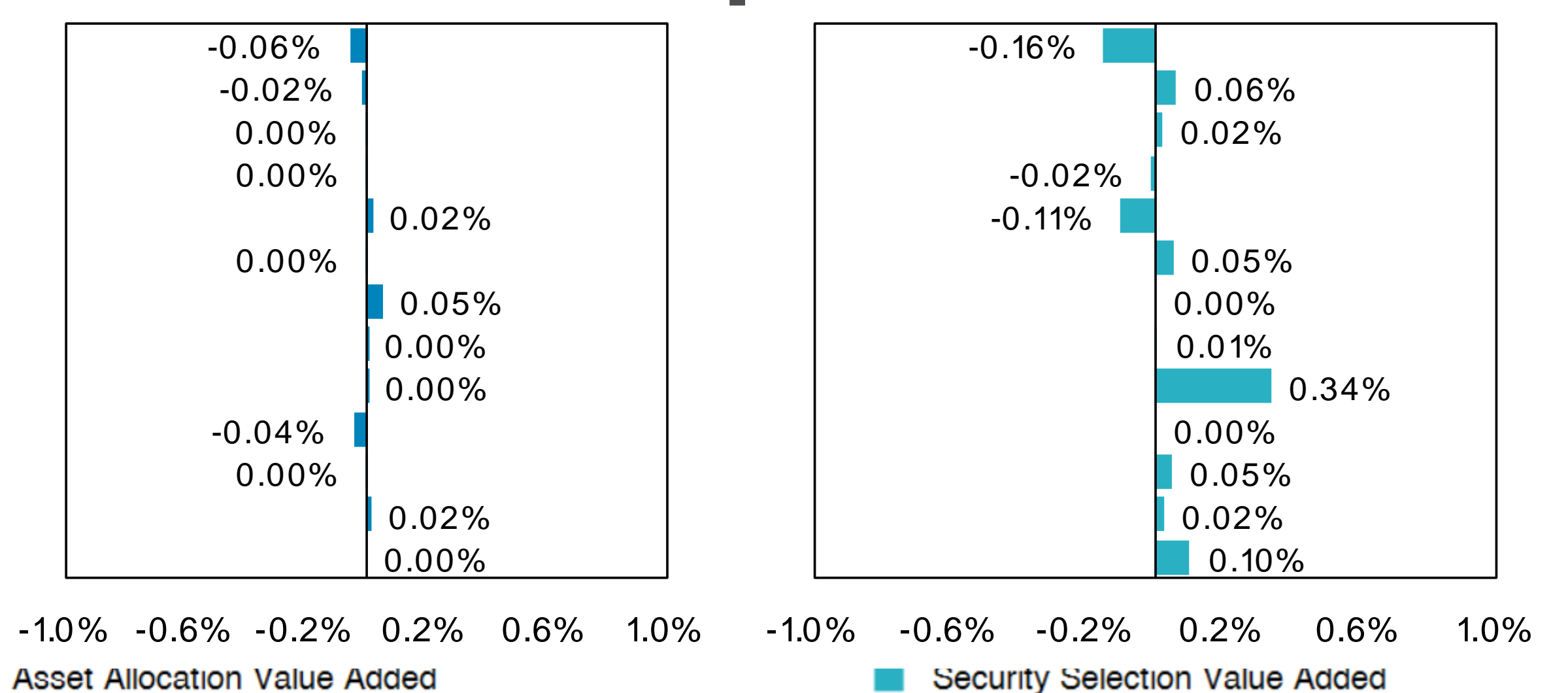
### Total Value Added: 0.31%



### Total Asset Allocation: -0.03%



### Total Security Selection Value Added: 0.37%



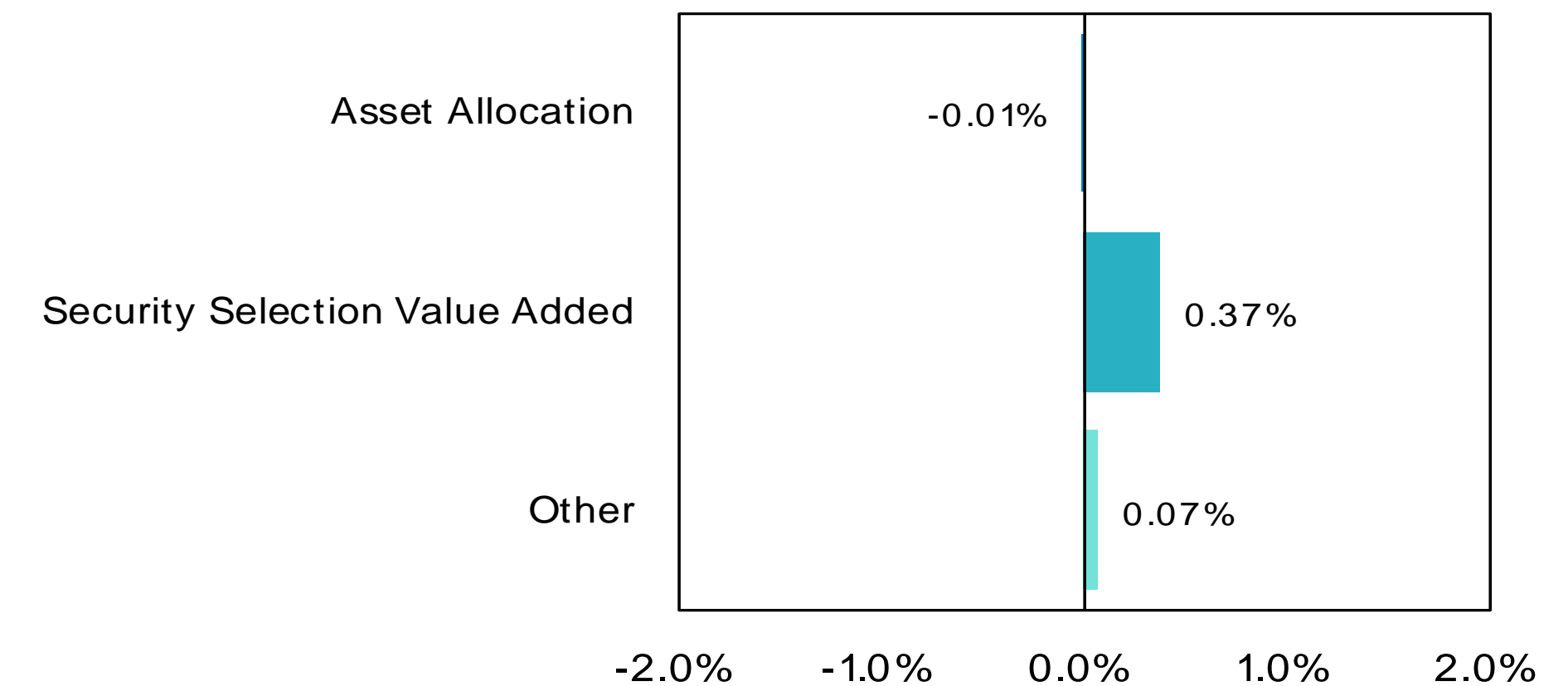
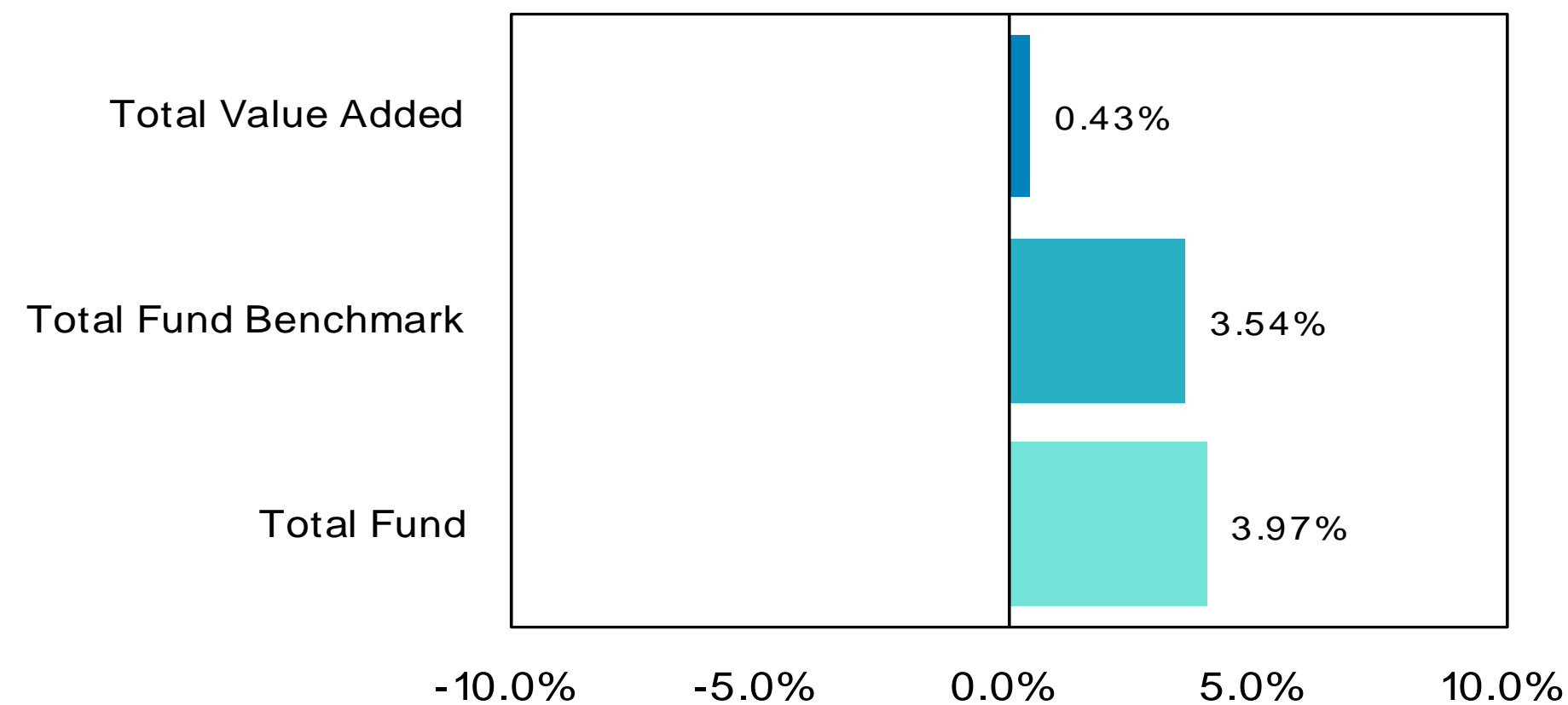


# 5. Total Fund Attribution – One Year Ending 6/30/2023

Total Fund vs. Total Fund Benchmark

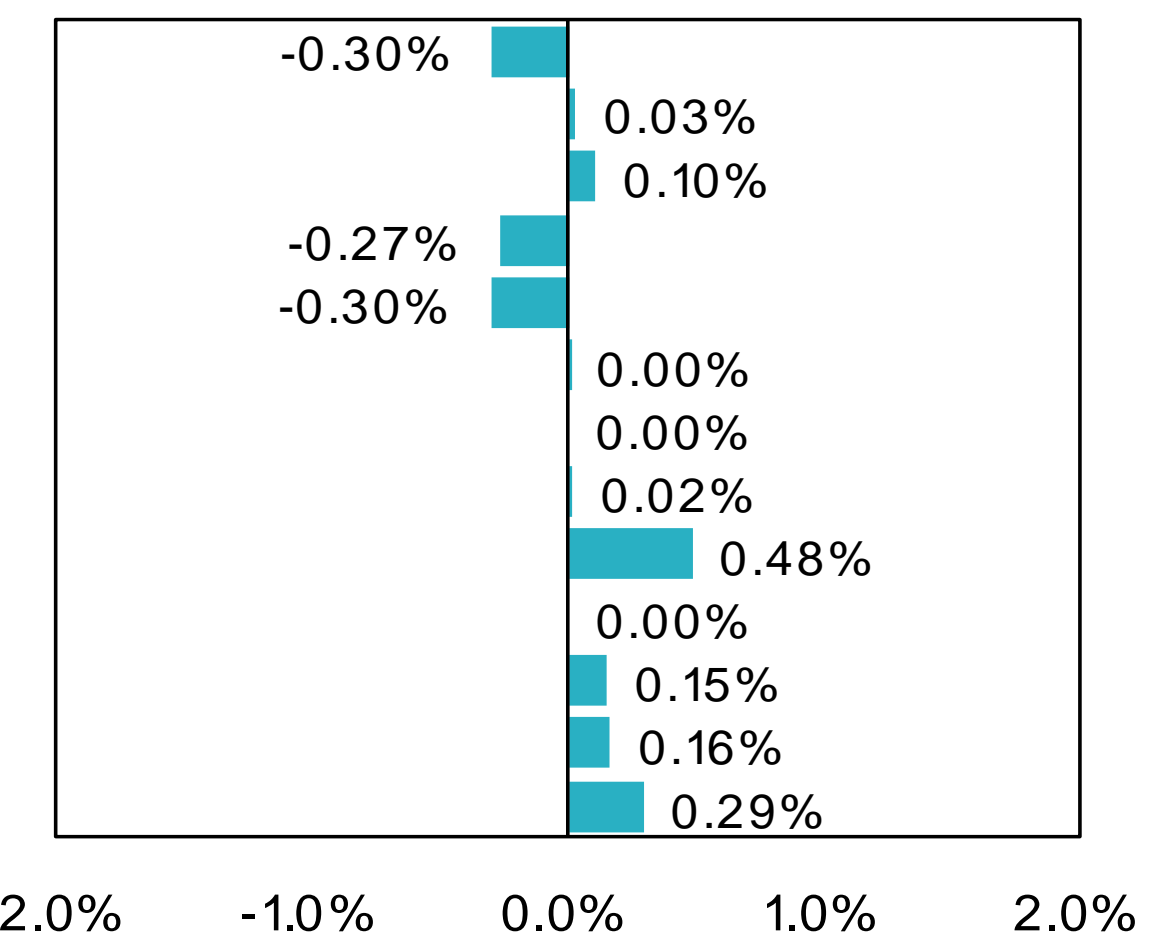
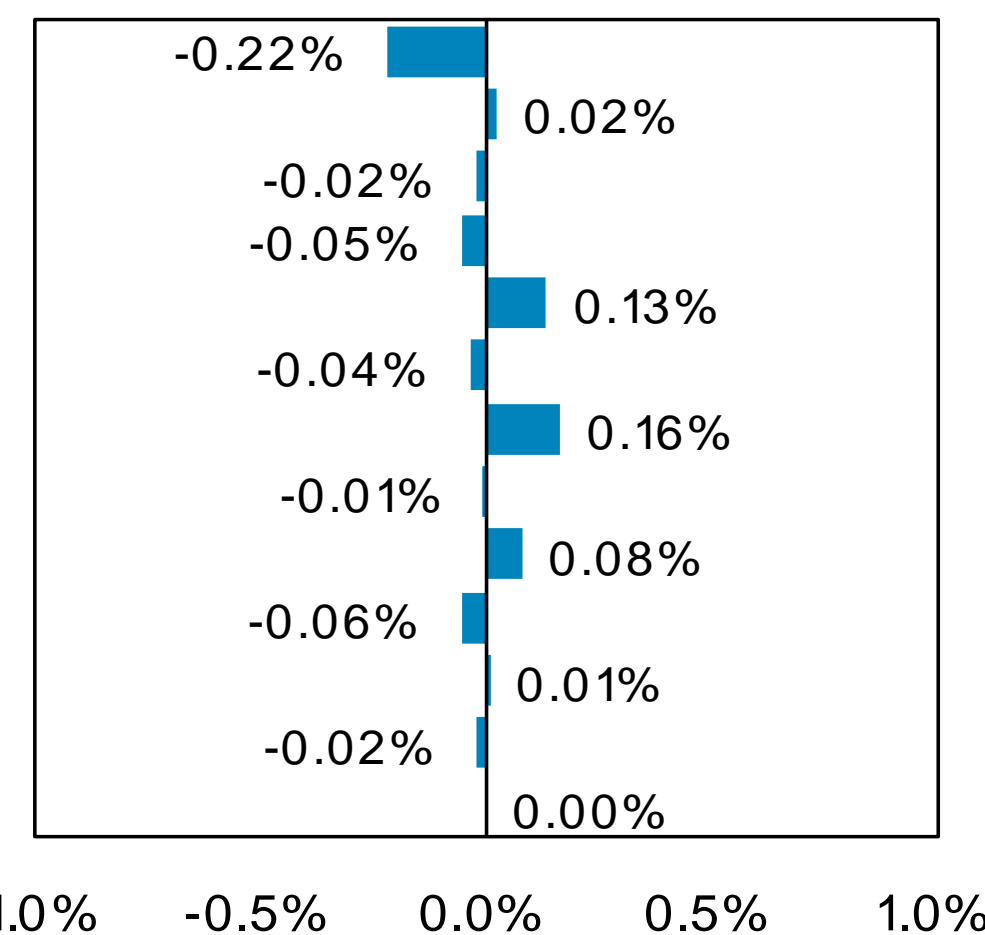
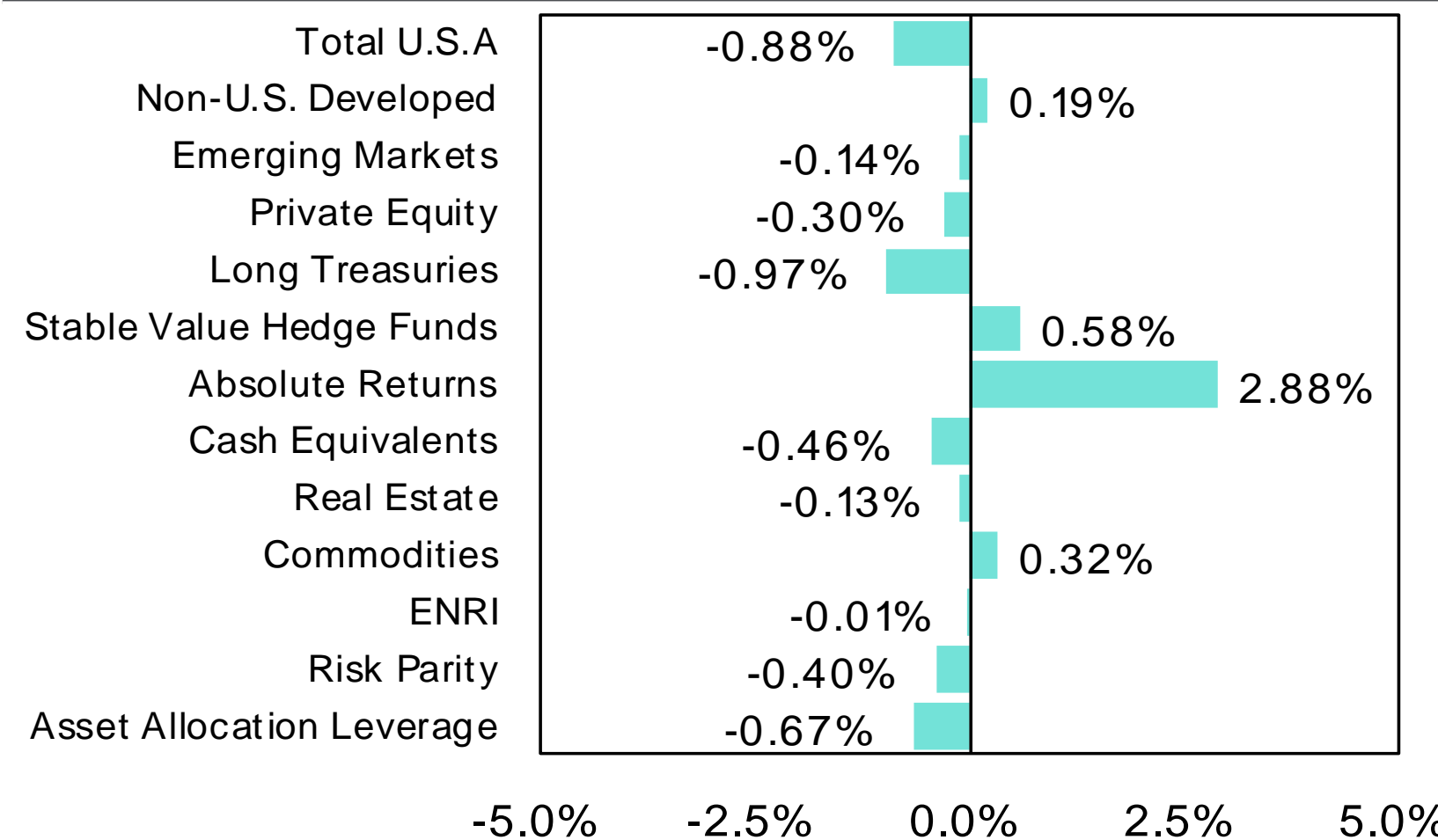
Total Fund Performance

Total Value Added: 0.43%



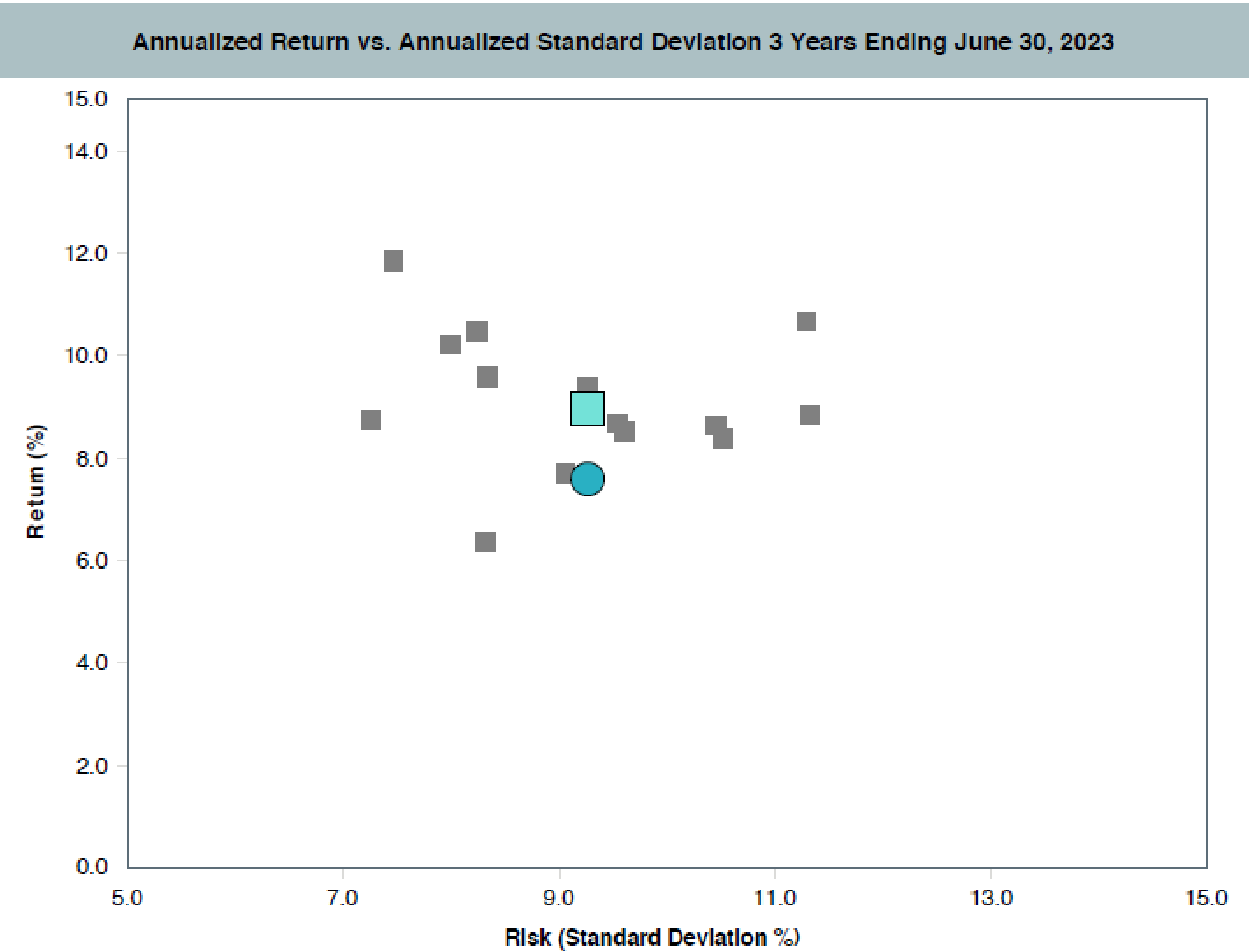
Total Asset Allocation: -0.01%

Total Security Selection Value Added: 0.37%

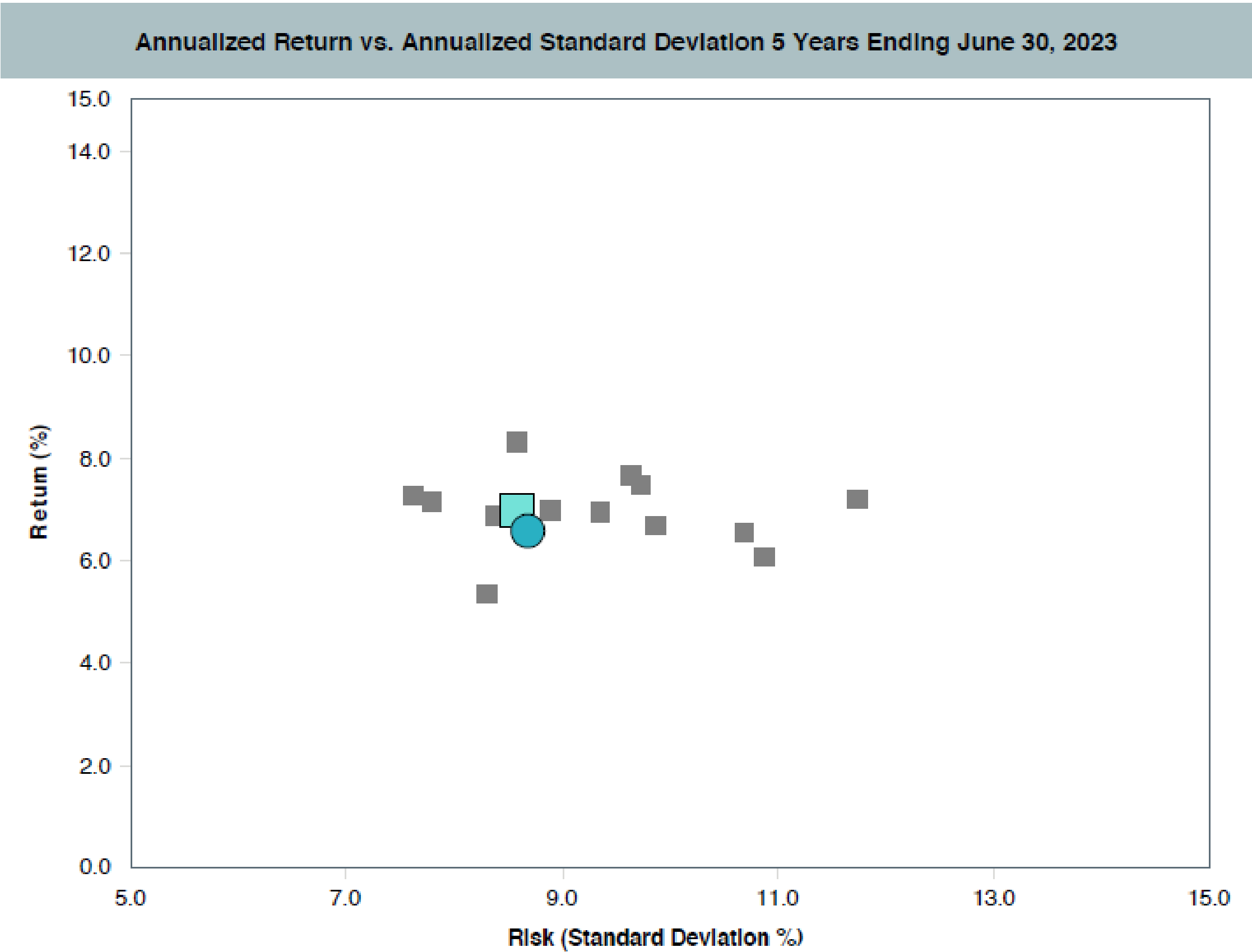




# 6. Risk Profile: Total Fund Risk-Return vs. Peers



	Return	Standard Deviation
■ Total Fund	9.0	9.3
● Total Fund Benchmark	7.6	9.3
— Median	8.8	9.2

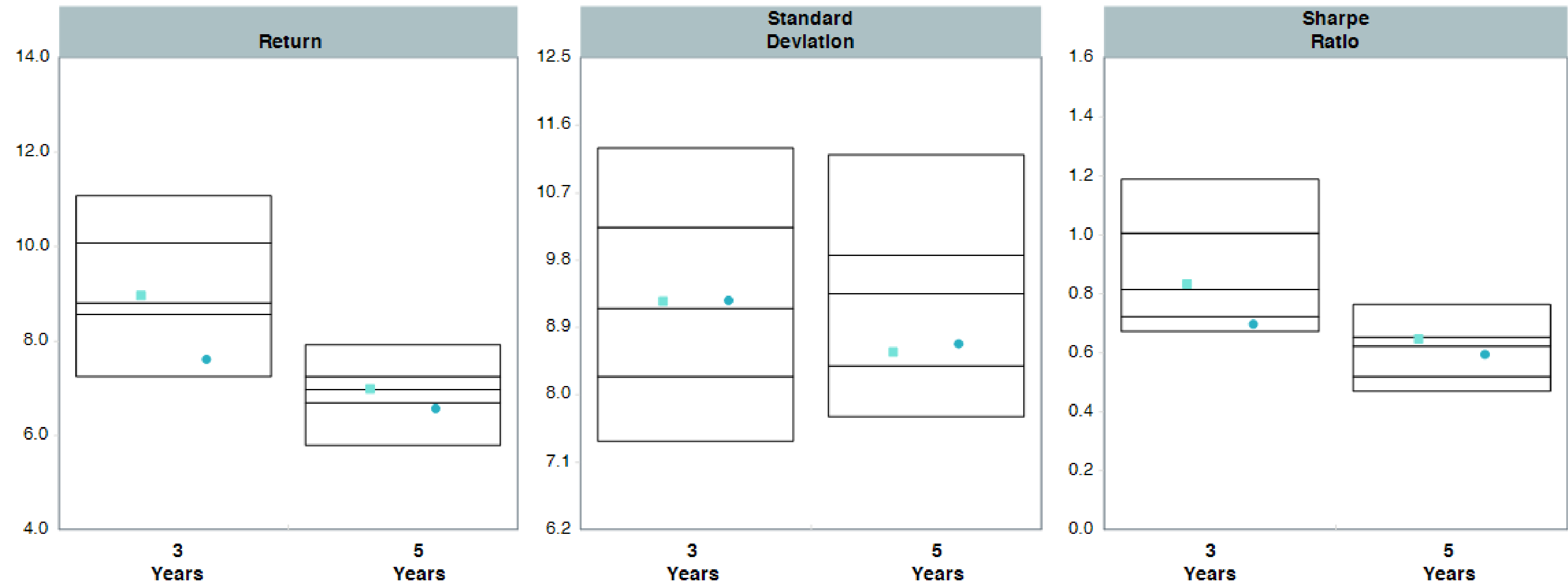


	Return	Standard Deviation
■ Total Fund	7.0	8.6
● Total Fund Benchmark	6.6	8.7
— Median	7.0	9.4

Note: Public Plan peer group composed of 14 and 13 public funds, respectively, with total assets in excess of \$10B as of 6/30/2023. 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

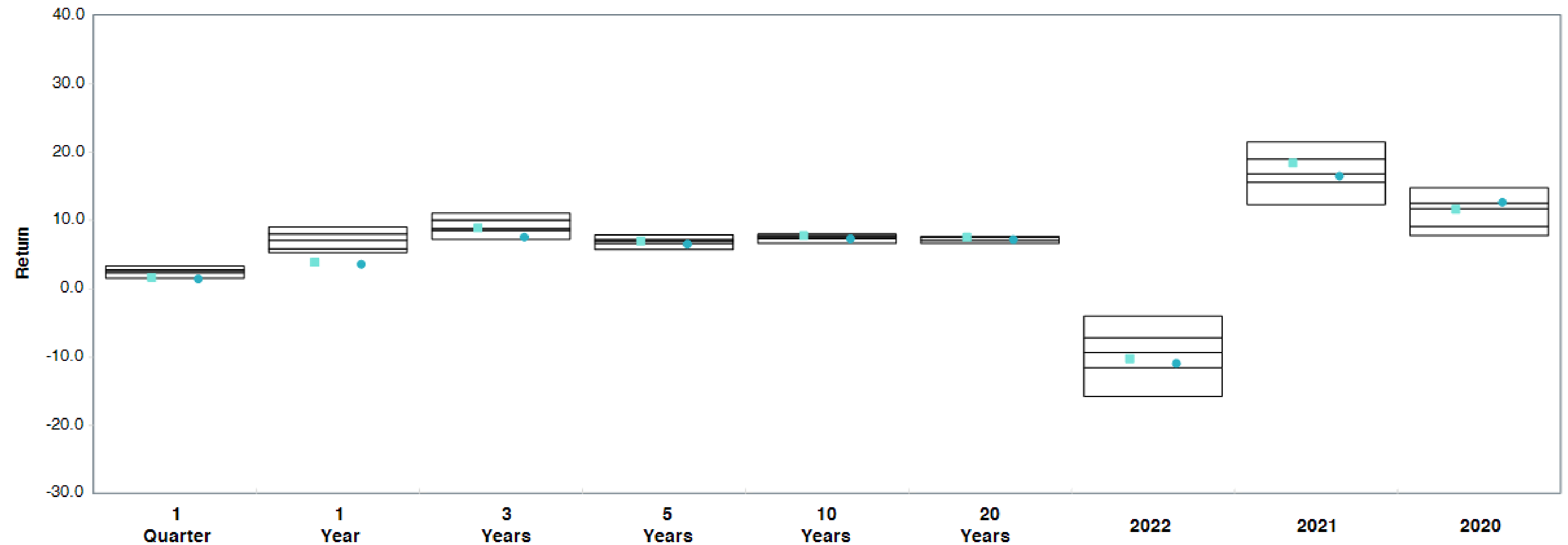
Total Fund vs. All Public Plans > \$10B



	3 Years		5 Years		3 Years		5 Years		3 Years		5 Years	
Total Fund	9.0 (45)		7.0 (49)		9.3 (47)		8.6 (68)		0.8 (48)		0.6 (34)	
Total Fund Benchmark	7.6 (93)		6.6 (83)		9.3 (46)		8.7 (64)		0.7 (87)		0.6 (59)	
5th Percentile	11.1		7.9		11.3		11.2		1.2		0.8	
1st Quartile	10.1		7.3		10.2		9.9		1.0		0.7	
Median	8.8		7.0		9.2		9.4		0.8		0.6	
3rd Quartile	8.6		6.7		8.2		8.4		0.7		0.5	
95th Percentile	7.2		5.8		7.4		7.7		0.7		0.5	
Population	14		13		14		13		14		13	

Parentheses contain percentile rankings.

## 6. TRS Performance vs. Peers (>\$10 Billion) as of 6/30/2023



	1 Quarter	1 Year	3 Years	5 Years	10 Years	20 Years	2022	2021	2020
■ Total Fund	1.7 (88)	4.0 (100)	9.0 (45)	7.0 (49)	7.8 (25)	7.5 (63)	-10.3 (58)	18.5 (31)	11.6 (52)
● Total Fund Benchmark	1.4 (97)	3.5 (100)	7.6 (93)	6.6 (83)	7.3 (76)	7.2 (73)	-10.9 (67)	16.5 (67)	12.6 (22)
5th Percentile	3.3	9.0	11.1	7.9	8.0	7.7	-4.0	21.5	14.8
1st Quartile	2.8	8.0	10.1	7.3	7.8	7.6	-7.2	19.0	12.6
Median	2.6	7.1	8.8	7.0	7.5	7.6	-9.4	16.8	11.7
3rd Quartile	2.3	5.9	8.6	6.7	7.3	7.1	-11.7	15.6	9.1
95th Percentile	1.5	5.3	7.2	5.8	6.6	6.6	-15.9	12.3	7.8
Population	23	19	14	13	12	9	26	39	38

Parentheses contain percentile rankings.

## 7. IPS Stated Trust Return Objectives ending 6/30/2023

	Five Year	Seven Year	Ten Year	Twenty Year
Total Fund	<b>7.0</b>	<b>8.1</b>	<b>7.8</b>	<b>7.5</b>
Total Fund Benchmark	6.6	7.5	7.3	7.2
<b>Difference</b>	<i>+0.4</i>	<i>+0.6</i>	<i>+0.5</i>	<i>+0.3</i>
Total Fund	<b>7.0</b>	<b>8.1</b>	<b>7.8</b>	<b>7.5</b>
Assumed Rate of Return	7.2	7.4	7.6	7.8
<b>Difference</b>	<i>-0.2</i>	<i>+0.7</i>	<i>+0.2</i>	<i>-0.3</i>
Total Fund	<b>7.0</b>	<b>8.1</b>	<b>7.8</b>	<b>7.5</b>
CPI + 5%	8.9	8.4	7.7	7.5
<b>Difference</b>	<i>-1.9</i>	<i>-0.3</i>	<i>+0.1</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.*

## 8. Global Equity: Performance Summary Ending 6/30/2023

	Second Quarter	YTD	One Year	Three Year	Five Year	Ten Year
<b>Total Global Equity</b>	<b>4.1</b>	<b>9.2</b>	<b>8.0</b>	<b>13.5</b>	<b>8.6</b>	<b>9.0</b>
Total Global Equity Benchmark	4.4	9.4	9.2	13.9	9.3	9.3
<i>Difference</i>	<i>-0.3</i>	<i>-0.2</i>	<i>-1.2</i>	<i>-0.4</i>	<i>-0.7</i>	<i>-0.3</i>
<b>Total U.S. Equity</b>	<b>7.4</b>	<b>13.9</b>	<b>17.2</b>	<b>15.0</b>	<b>10.3</b>	<b>11.1</b>
Total U.S. Equity Benchmark	8.4	16.4	19.2	14.1	11.5	12.5
<i>Difference</i>	<i>-1.0</i>	<i>-2.5</i>	<i>-2.0</i>	<i>+0.9</i>	<i>-1.2</i>	<i>-1.4</i>
<b>Non-U.S. Equity</b>	<b>3.6</b>	<b>10.8</b>	<b>11.5</b>	<b>6.9</b>	<b>3.7</b>	<b>5.0</b>
Non-U.S. Equity Benchmark	3.2	9.8	10.8	6.5	3.2	4.5
<i>Difference</i>	<i>+0.4</i>	<i>+1.0</i>	<i>+0.7</i>	<i>+0.4</i>	<i>+0.5</i>	<i>+0.5</i>
<b>Non-U.S. Developed</b>	<b>3.5</b>	<b>12.2</b>	<b>17.6</b>	<b>8.9</b>	<b>4.4</b>	<b>5.8</b>
TRS Non-U.S. Developed Benchmark	3.0	11.4	17.4	9.2	4.6	5.4
<i>Difference</i>	<i>+0.5</i>	<i>+0.8</i>	<i>+0.2</i>	<i>-0.3</i>	<i>-0.2</i>	<i>+0.4</i>
<b>Emerging Markets</b>	<b>3.7</b>	<b>8.7</b>	<b>2.8</b>	<b>3.8</b>	<b>2.3</b>	<b>3.9</b>
TRS Emerging Market Benchmark	3.5	7.4	1.4	2.2	0.9	2.9
<i>Difference</i>	<i>+0.2</i>	<i>+1.3</i>	<i>+1.4</i>	<i>+1.6</i>	<i>+1.4</i>	<i>+1.0</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.

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## 8. Global Equity: Performance Summary Ending 6/30/2023 (cont'd)

	Second Quarter	YTD	One Year	Three Year	Five Year	Ten Year
<b>Total Public Equity</b>	<b>5.2</b>	<b>12.2</b>	<b>14.1</b>	<b>10.5</b>	<b>6.5</b>	<b>7.5</b>
Public Equity Benchmark	5.5	12.8	14.7	10.0	6.9	7.8
<i>Difference</i>	<i>-0.3</i>	<i>-0.6</i>	<i>-0.6</i>	<i>+0.5</i>	<i>-0.4</i>	<i>-0.3</i>
<b>Total Private Equity</b>	<b>1.9</b>	<b>3.2</b>	<b>-3.5</b>	<b>20.9</b>	<b>13.9</b>	<b>13.9</b>
Private Equity Benchmark	2.0	2.4	-2.1	22.7	15.2	13.5
<i>Difference</i>	<i>-0.1</i>	<i>+0.8</i>	<i>-1.4</i>	<i>-1.8</i>	<i>-1.3</i>	<i>+0.4</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 6/30/2023

	Second Quarter	YTD	One Year	Three Year	Five Year	Ten Year
<b>Total Stable Value</b>	<b>-1.1</b>	<b>2.6</b>	<b>-3.5</b>	<b>-5.1</b>	<b>1.6</b>	<b>3.6</b>
Total Stable Value Benchmark	-1.5	3.4	-4.2	-7.9	0.4	2.2
<i>Difference</i>	<i>+0.4</i>	<i>-0.8</i>	<i>+0.7</i>	<i>+2.8</i>	<i>+1.2</i>	<i>+1.4</i>
<b>Total Government Bonds</b>	<b>-3.0</b>	<b>2.4</b>	<b>-8.8</b>	<b>-13.0</b>	<b>-1.3</b>	<b>1.9</b>
Treasury Benchmark	-2.3	3.7	-6.8	-12.1	-0.9	1.8
<i>Difference</i>	<i>-0.7</i>	<i>-1.3</i>	<i>-2.0</i>	<i>-0.9</i>	<i>-0.4</i>	<i>+0.1</i>
<b>Stable Value Hedge Funds</b>	<b>2.1</b>	<b>1.3</b>	<b>3.7</b>	<b>8.7</b>	<b>6.1</b>	<b>5.7</b>
Hedge Funds Benchmark	1.0	2.0	3.7	6.1	3.9	3.5
<i>Difference</i>	<i>+1.1</i>	<i>-0.7</i>	<i>0.0</i>	<i>+2.6</i>	<i>+2.2</i>	<i>+2.2</i>
<b>Absolute Return</b>	<b>3.3</b>	<b>6.4</b>	<b>9.3</b>	<b>10.3</b>	<b>7.2</b>	<b>8.0</b>
Absolute Return Benchmark	2.3	4.5	8.2	4.7	4.5	3.6
<i>Difference</i>	<i>+1.0</i>	<i>+1.9</i>	<i>+1.1</i>	<i>+5.6</i>	<i>+2.7</i>	<i>+4.4</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.*

## 10. Real Return: Performance Summary Ending 6/30/2023

	Second Quarter	YTD	One Year	Three Year	Five Year	Ten Year
<b>Total Real Return</b>	<b>-0.6</b>	<b>-1.2</b>	<b>2.2</b>	<b>13.2</b>	<b>9.1</b>	<b>9.0</b>
Real Return Benchmark	-2.1	-5.0	-0.9	9.5	6.7	7.1
<i>Difference</i>	<i>+1.5</i>	<i>+3.8</i>	<i>+3.1</i>	<i>+3.7</i>	<i>+2.4</i>	<i>+1.9</i>
<b>Real Estate</b>	<b>-1.3</b>	<b>-3.1</b>	<b>-0.4</b>	<b>12.5</b>	<b>9.9</b>	<b>11.2</b>
Real Estate Benchmark	-3.4	-8.4	-3.9	7.5	6.6	8.5
<i>Difference</i>	<i>+2.1</i>	<i>+5.3</i>	<i>3.5</i>	<i>+5.0</i>	<i>+3.3</i>	<i>+2.7</i>
<b>Energy, Natural Resources, and Infrastructure</b>	<b>1.8</b>	<b>4.7</b>	<b>9.7</b>	<b>15.4</b>	<b>7.6</b>	<b>--</b>
Energy and Natural Res. Benchmark	1.0	4.1	6.9	14.8	7.0	--
<i>Difference</i>	<i>+0.8</i>	<i>+0.6</i>	<i>+2.8</i>	<i>+0.6</i>	<i>+0.6</i>	
<b>Commodities</b>	<b>-6.4</b>	<b>-10.4</b>	<b>-5.3</b>	<b>8.0</b>	<b>-0.9</b>	<b>-3.3</b>
Commodities Benchmark	-2.7	-7.5	-14.2	25.1	2.8	-3.5
<i>Difference</i>	<i>-3.7</i>	<i>-2.9</i>	<i>+8.9</i>	<i>-17.1</i>	<i>-3.7</i>	<i>+0.2</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 6/30/2023

	Second Quarter	YTD	One Year	Three Year	Five Year	Ten Year
Total Risk Parity	-1.8	4.7	-0.9	1.7	1.5	4.1
Risk Parity Benchmark	-2.2	3.1	-3.1	0.1	1.8	3.2
<i>Difference</i>	+0.4	+1.6	+2.2	+1.6	-0.3	+0.9

*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 6/30/2023

---

	Second Quarter	YTD	One Year	Three Year	Five Year	Ten Year
Cash Equivalents	1.5	3.1	5.0	2.1	1.8	2.3
Cash Benchmark	1.3	2.4	3.7	1.3	1.6	1.0
<i>Difference</i>	+0.2	+0.7	+1.3	+0.8	+0.2	+1.3

*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.*



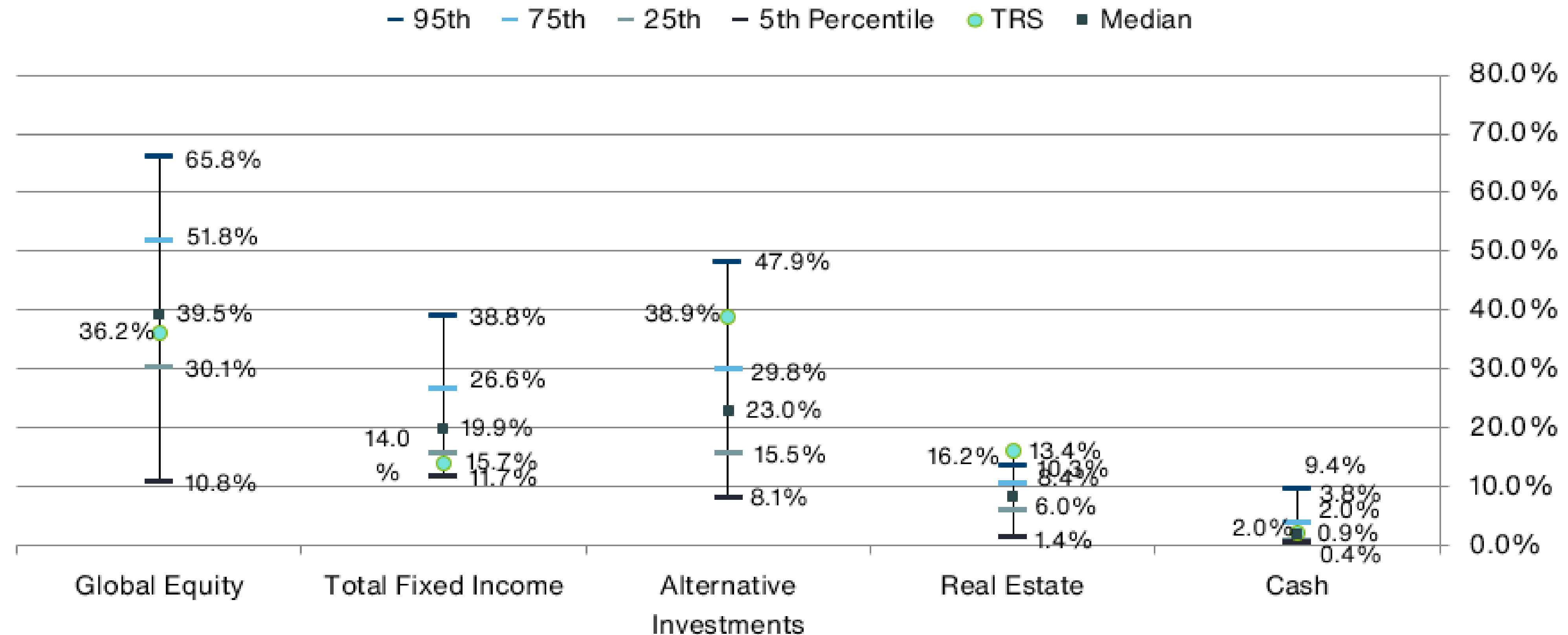
# Appendix – Supplemental Reporting





# TRS Commitment Levels vs. Peers (>\$10 Billion) as of 6/30/2023

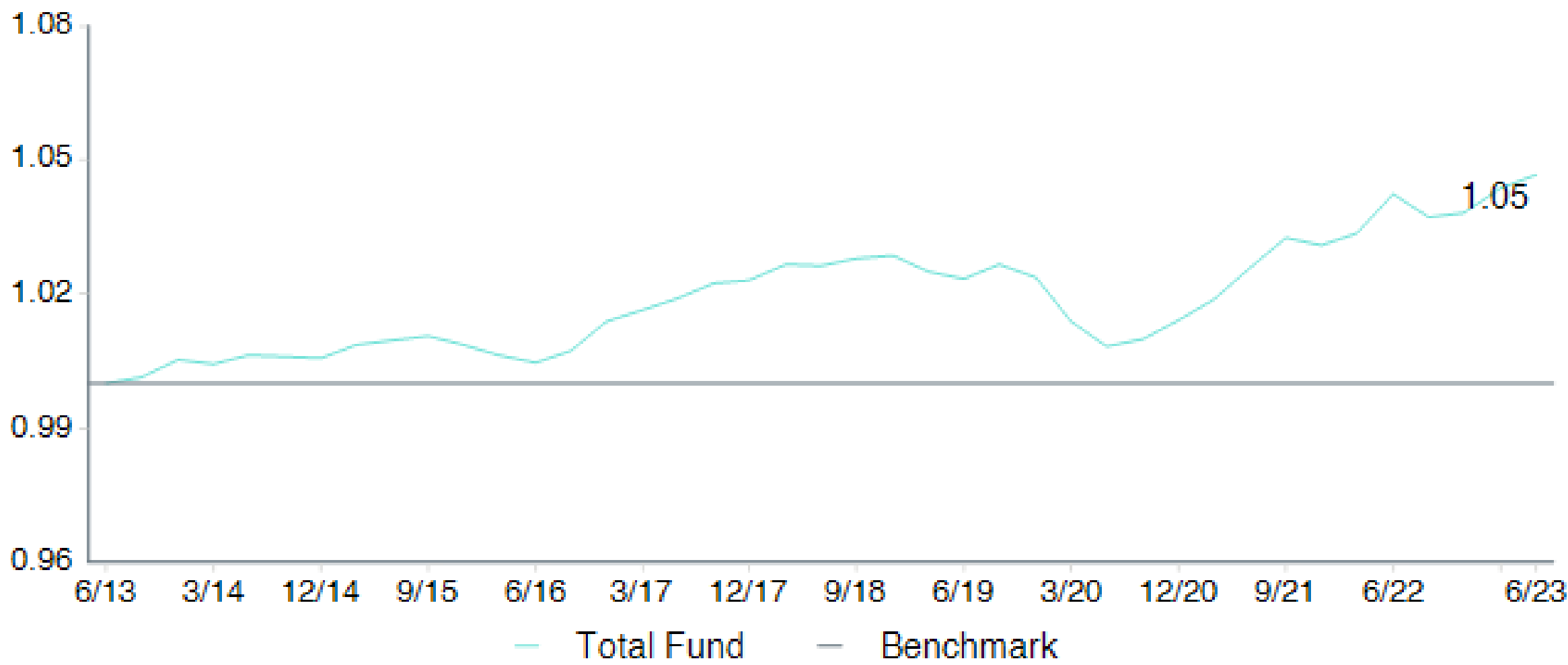
- The chart below depicts the asset allocation of peer public funds with assets greater than \$10 billion.
  - The ends of each line represent the 95<sup>th</sup> and 5<sup>th</sup> percentile of exposures, the middle light blue and grey lines represent the 25<sup>th</sup> and 75<sup>th</sup> percentile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



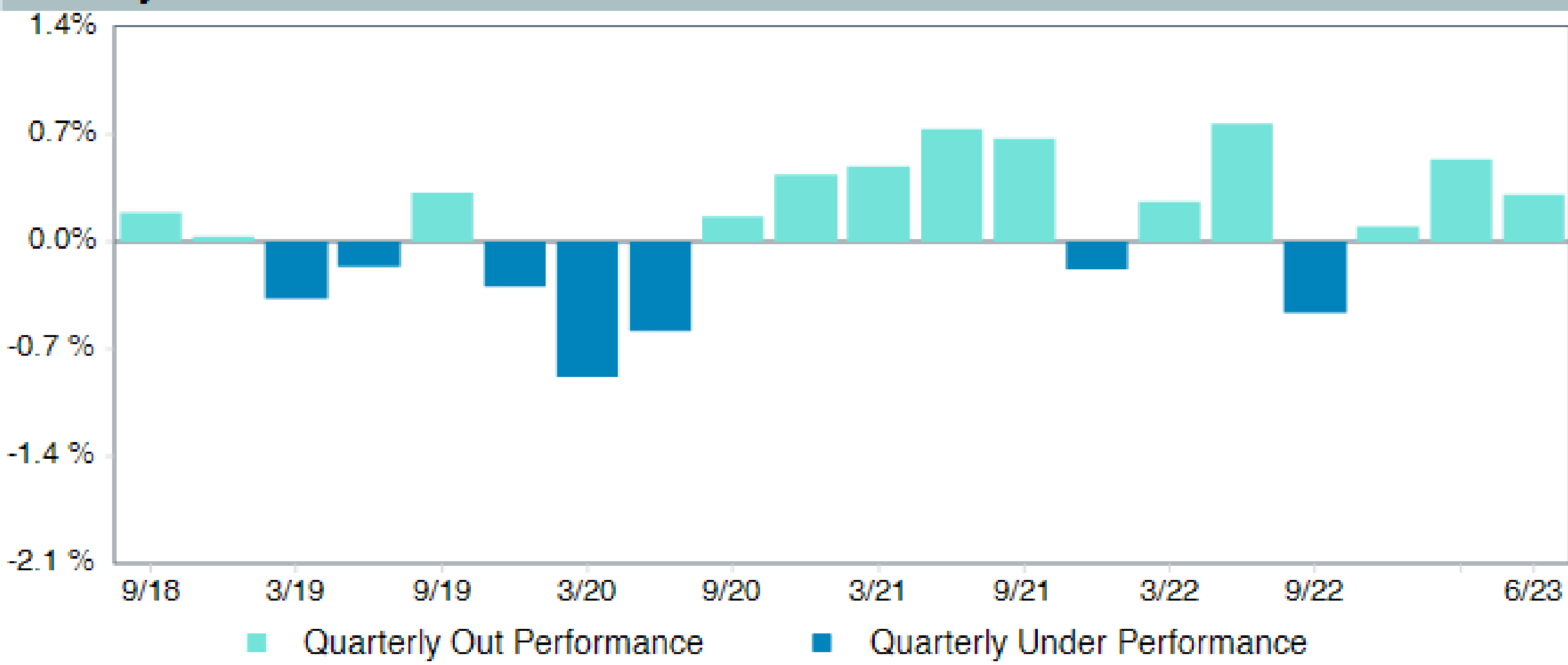
# Historical Excess Performance Ending 6/30/2023

## Total Fund vs. Total Fund Benchmark

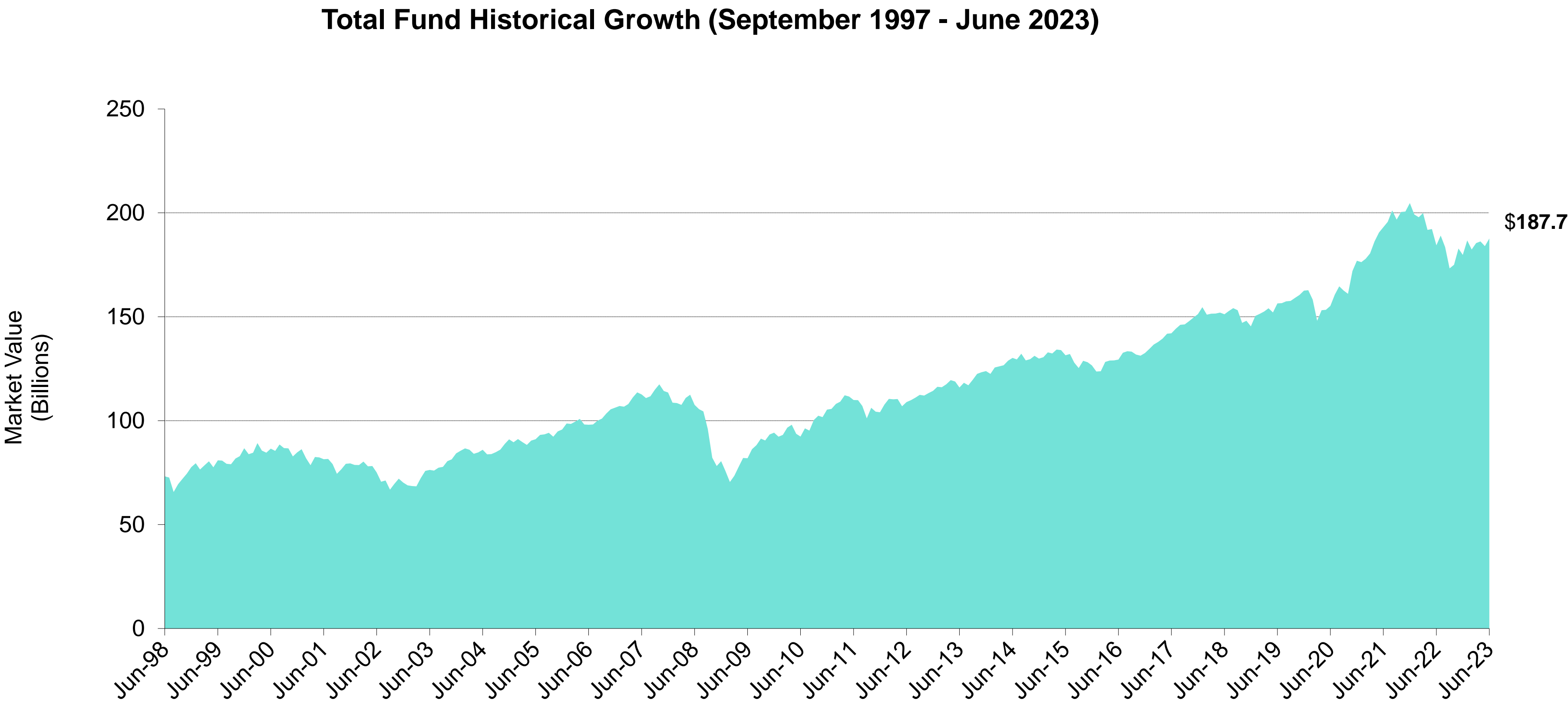
Ratio of Cumulative Wealth - 10 Years



Quarterly Excess Performance



# TRS Asset Growth



# External Manager Program: Public Equity Performance as of 6/30/2023

	Allocation (\$ in billions)	Second Quarter	YTD	One Year	Three Year	Five Year
<b>EP Total Global Equity</b>	<b>\$30.0</b>	<b>5.5</b>	<b>12.3</b>	<b>14.4</b>	<b>12.1</b>	<b>8.0</b>
EP Global Equity Benchmark	--	5.8	13.0	14.5	10.1	7.2
<i>Difference</i>	--	-0.3	-0.7	-0.1	+2.0	+0.8
<b>EP U.S.A.</b>	<b>\$11.2</b>	<b>6.7</b>	<b>12.3</b>	<b>14.2</b>	<b>15.8</b>	<b>11.0</b>
EP U.S.A. Benchmark	--	8.4	16.4	19.2	14.1	11.5
<i>Difference</i>	--	-1.7	-4.1	-5.0	+1.7	-0.5
<b>EP Non-U.S. Developed</b>	<b>\$6.9</b>	<b>4.0</b>	<b>14.5</b>	<b>21.9</b>	<b>9.2</b>	<b>5.9</b>
MSCI EAFE + Canada Policy Index	--	3.0	11.4	17.4	9.2	4.6
<i>Difference</i>	--	+1.0	+3.1	+4.5	0.0	+1.3
<b>EP Emerging Markets</b>	<b>\$5.6</b>	<b>4.1</b>	<b>8.5</b>	<b>2.6</b>	<b>6.1</b>	<b>3.7</b>
MSCI Emerging Markets Policy Index	--	3.5	7.4	1.4	2.2	0.9
<i>Difference</i>	--	+0.6	+1.1	+1.2	+3.9	+2.8
<b>EP World Equity</b>	<b>\$6.3</b>	<b>6.7</b>	<b>13.6</b>	<b>19.2</b>	<b>15.4</b>	<b>10.5</b>
EP World Equity Benchmark	--	6.4	14.0	16.6	11.3	8.4
<i>Difference</i>	--	+0.3	-0.4	+2.6	+4.1	+2.1

# External Manager Program: Stable Value/Total Program Performance as of 6/30/2023

	Allocation (\$ in billions)	Second Quarter	YTD	One Year	Three Year
<b>EP Total Stable Value</b>	<b>\$9.1</b>	<b>2.1</b>	<b>1.3</b>	<b>3.7</b>	<b>8.7</b>
EP Stable Value Benchmark	--	1.0	2.0	3.7	6.1
<i>Difference</i>	--	+1.1	-0.7	0.0	+2.6
<b>Total External Public Program</b>	<b>\$46.3</b>	<b>4.4</b>	<b>9.4</b>	<b>11.0</b>	<b>10.4</b>
EP External Public Benchmark	--	4.4	10.2	11.2	8.4
<i>Difference</i>	--	0.0	-0.8	-0.2	+2.0

*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 as of 6/30/2023

	Allocation (\$ in billions)	Second Quarter	YTD	One Year	Three Year
<b>Public Strategic Partnership</b>	<b>\$7.3</b>	<b>2.6</b>	<b>8.9</b>	<b>7.7</b>	<b>4.8</b>
Public SPN Benchmark	--	3.2	10.0	8.3	3.3
<i>Difference</i>	--	-0.6	-1.1	-0.6	+1.5
<b>BlackRock</b>	<b>\$2.5</b>	<b>3.3</b>	<b>10.0</b>	<b>9.9</b>	<b>5.3</b>
<b>JP Morgan</b>	<b>\$2.5</b>	<b>1.9</b>	<b>8.1</b>	<b>6.7</b>	<b>5.1</b>
<b>Morgan Stanley</b>	<b>\$2.2</b>	<b>2.6</b>	<b>8.5</b>	<b>6.2</b>	<b>4.0</b>

*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

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**Total Fund Performance Benchmark – 16.7% MSCI U.S.A. IMI, 12.1% MSCI EAFE plus Canada Index, 8.3% MSCI Emerging Markets Index, 17.2% State Street Private Equity Index (1 quarter lagged), 14.8% Blmb. Barc. Long Term Treasury Index, 4.6% HFRI FoF Conservative Index, 2.0% Citigroup 3 Mo. T-Bill Index, 16.5% NCREIF ODCE Index (1 quarter lagged), 6.5% Energy and Natural Resources Benchmark, 7.4% Risk Parity Benchmark, and -6.0% Asset Allocation Leverage Benchmark.**

**Global Equity Benchmark – 30.8% MSCI U.S.A. IMI, 22.3% MSCI EAFE plus Canada Index, 15.3% MSCI Emerging Markets Index, and 31.7% 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)

# Benchmarks (cont'd)

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## **Stable Value Benchmark – 76.3% Blmb. Barc. Long Term Treasury Index and 23.7% 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 – 71.7% NCREIF ODCE Index and 28.3% 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

# Description of Performance Attribution

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- 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
$$\text{Actual Weight of Asset Class} \times (\text{Actual Asset Class Return} - \text{Asset Class Benchmark Return})$$
- The bar labeled **Allocation Effect** illustrates the effect that a Total Fund's asset allocation has on its relative performance. Allocation Effect calculation =  $(\text{Asset Class Benchmark Return} - \text{Total Benchmark Return}) \times (\text{Actual Weight of Asset Class} - \text{Target Policy Weight of Asset Class})$ .
- 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 =  $(\text{Total Fund Actual Return} - \text{Total Fund Policy Return}) - \text{Current Selection Effect} - \text{Current Allocation Effect}$
  - **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 =  $\text{Total Fund Policy Return} - (\text{Asset Class Benchmark Return} \times \text{Target Policy Weight of Asset Class})$
- **Cumulative Effect**  
Cumulative Effect calculation =  $\text{Current Effect } t \times (1 + \text{Cumulative Total Fund Actual Return } t-1) + \text{Cumulative Effect } t-1 \times (1 + \text{Total Fund Benchmark Return } t)$



# Disclaimers and Notes





# Disclaimers and Notes

## Disclaimers:

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- Refer to Hedge Fund Research, Inc. [www.hedgefundresearch.com](http://www.hedgefundresearch.com) for more information on HFR indices

## 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 2023



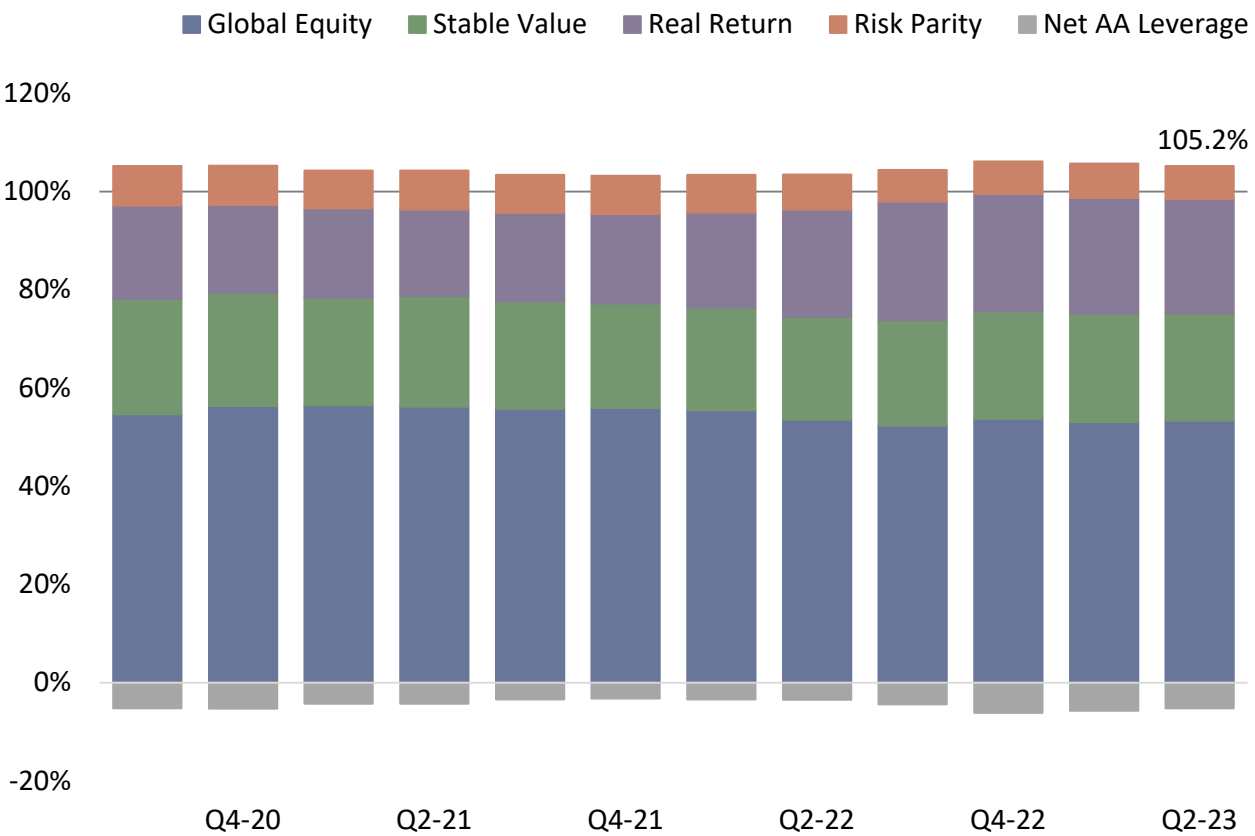
# All metrics in compliance

<b><u>Risk Metric</u></b>	<b><u>Value</u></b>	<b><u>In Compliance?</u></b>	<b><u>Page(s)</u></b>
<b>1. Asset Allocation (AA):</b> Overweight Stable Value	Overweight 2.4%	✓	3 - 5
<b>2. Drawdown Risk:</b> VaR estimate decreased	6.5% VaR	✓	6 - 8
<b>3. Tracking Error:</b> Total Trust TE range bound	130 bp	✓	9 - 10
<b>4. Leverage:</b> Trust leverage decreased slightly	-5.2% Net	✓	11 - 13
<b>5. Liquidity:</b> Remained strong	3.7x Coverage Ratio	✓	14
<b>6. Counterparty Risk:</b> Within Policy limits	Lowest Rating: A-	✓	15
<b>7. Derivatives:</b> Gross notional exposure stable	19.8% Gross Notional	✓	16 - 17
<b>8. Securities Lending:</b> Earnings stable	12.0% Utilization	✓	18

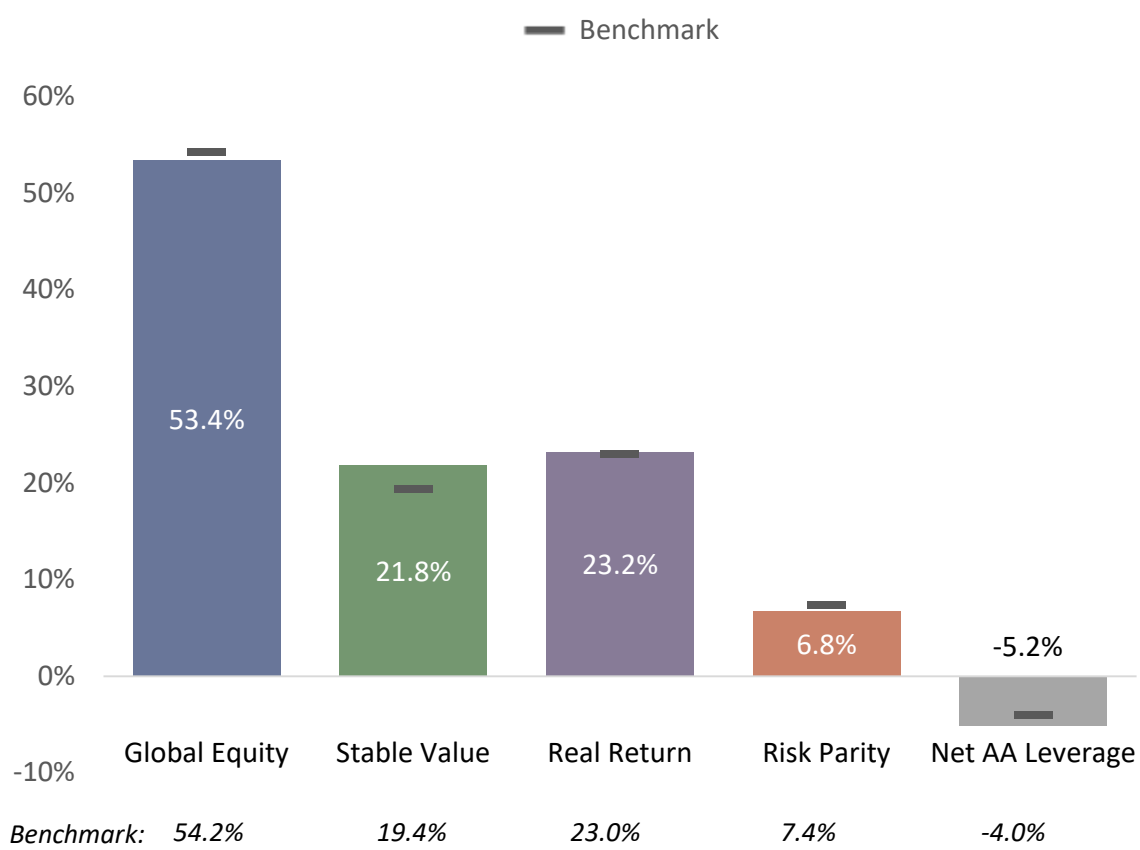
Unless otherwise noted, data presented as of June 30, 2023

# Trust overweight investment exposure primarily due to Stable Value

Asset Class Weights Trend

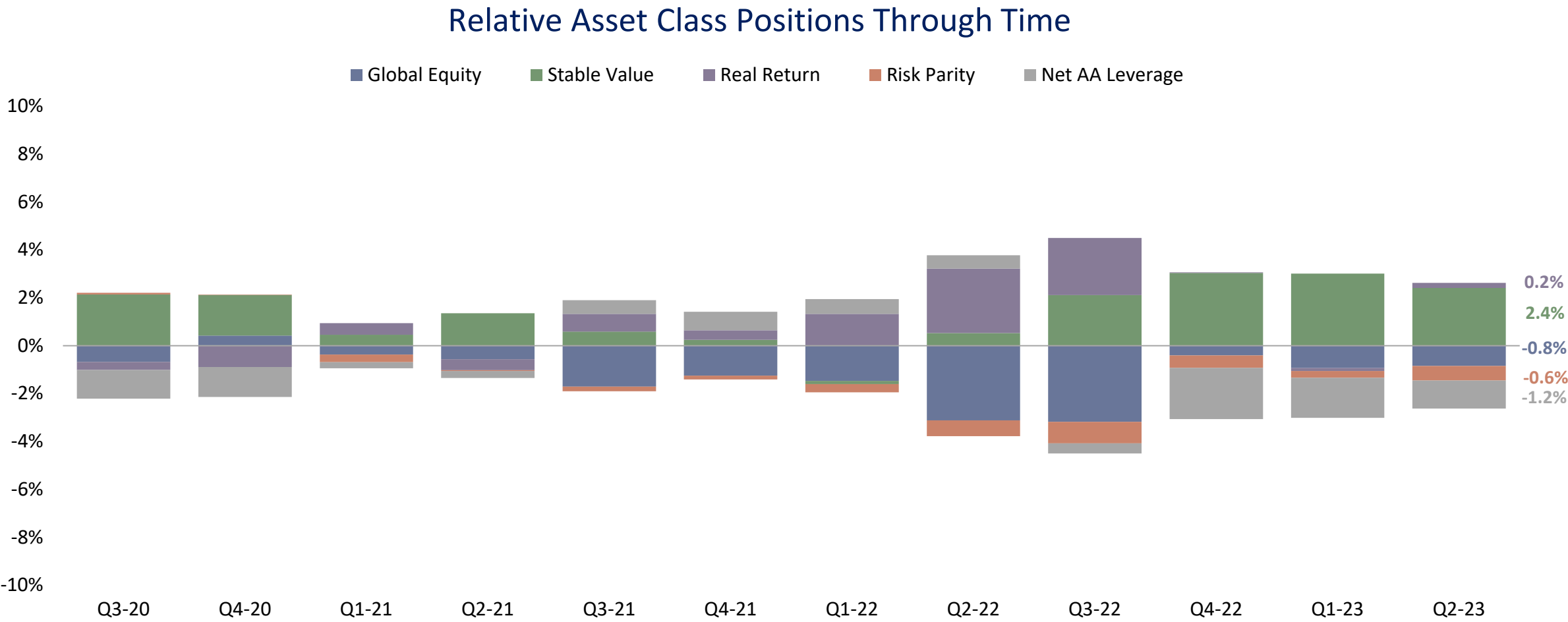


Asset Class Weights

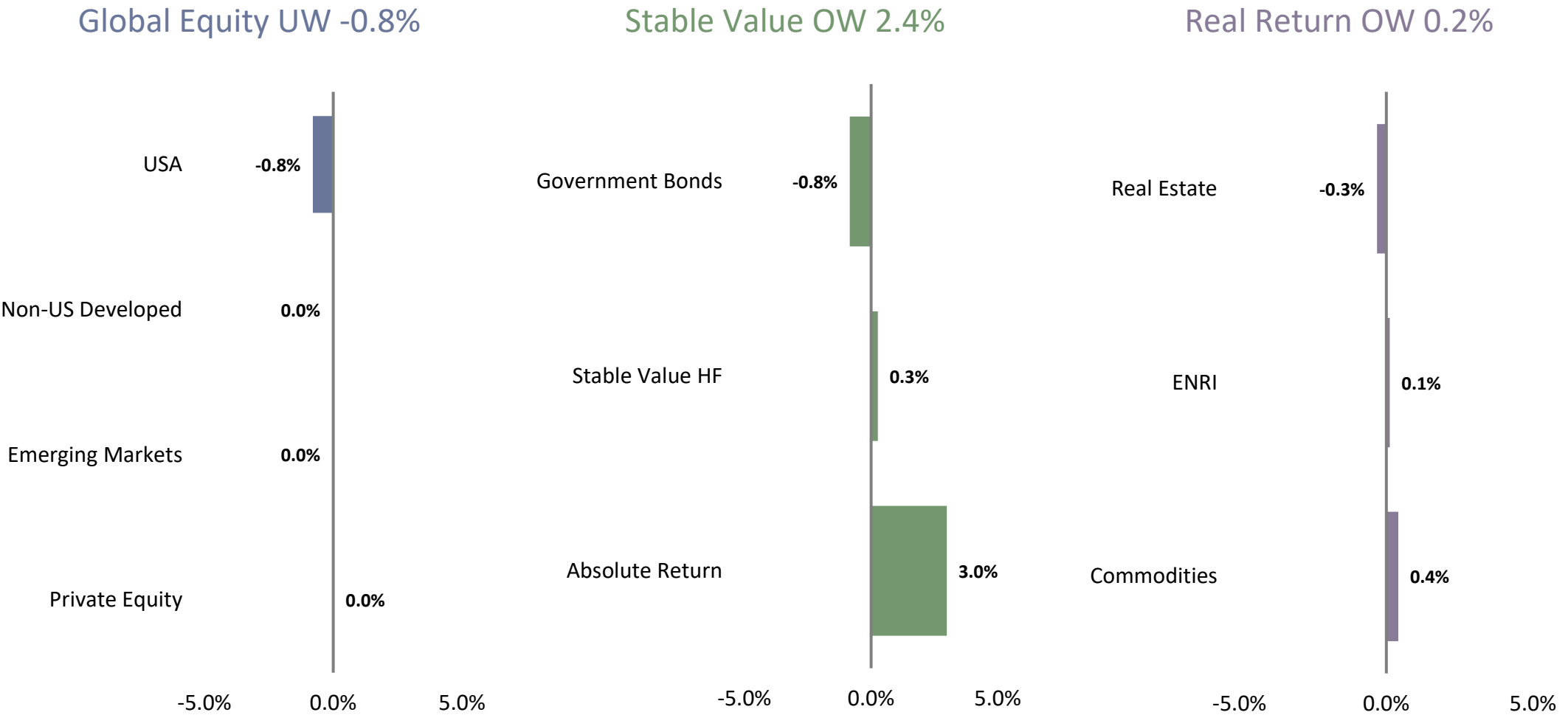


Source: State Street Bank; note: Net AA leverage is -5.2%, which indicates the Trust is levered by 5.2%

# Stable Value overweight partially offset by Global Equity and Risk Parity

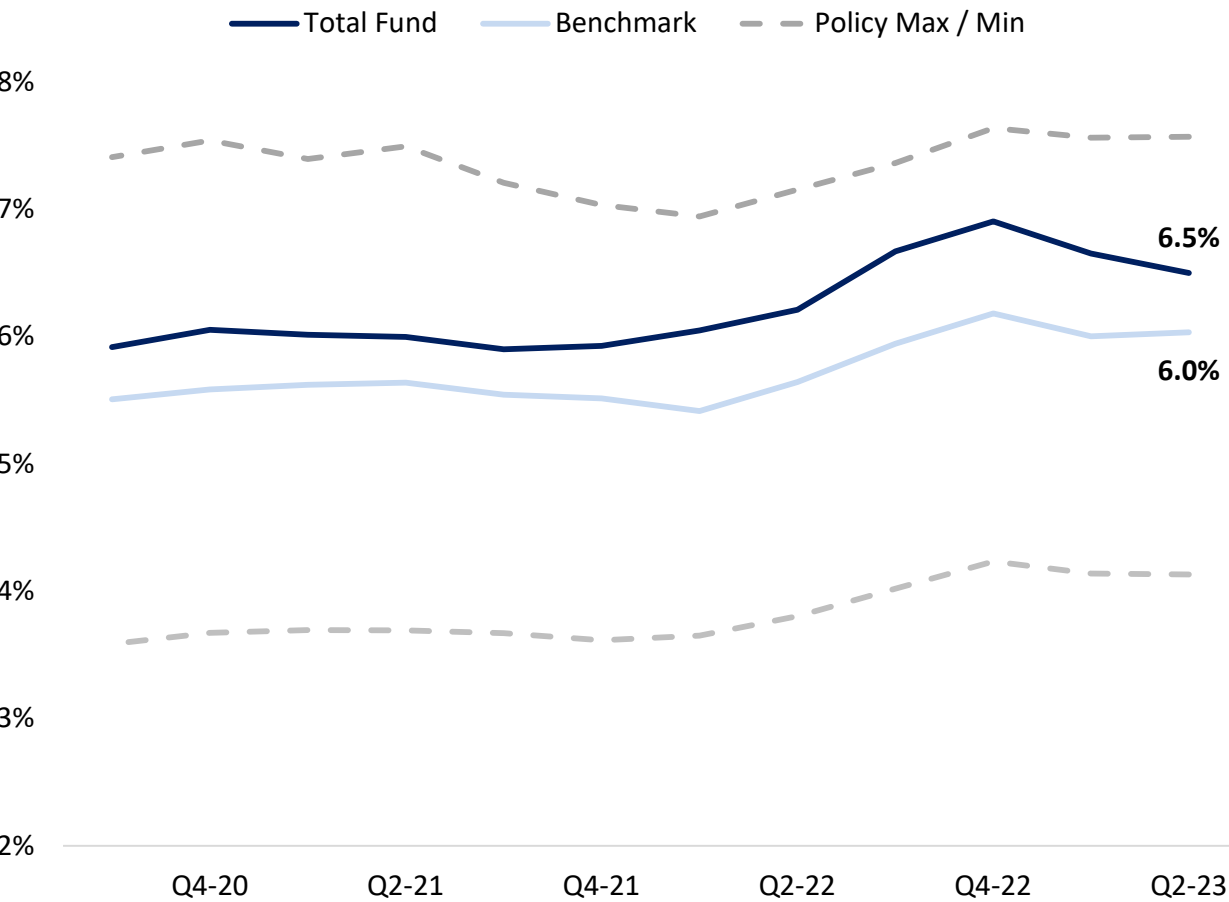


# Global Equity and Real Return allocations near target

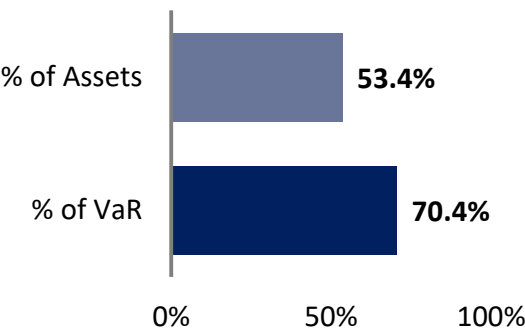


# VaR estimates decreased given 2023 market rebound

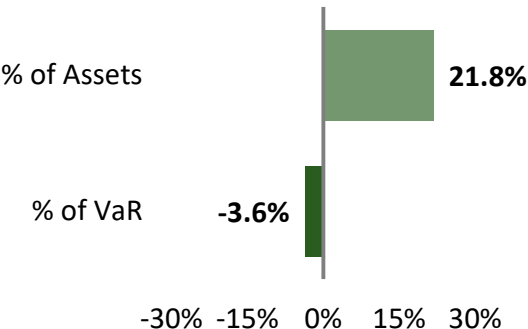
VaR History



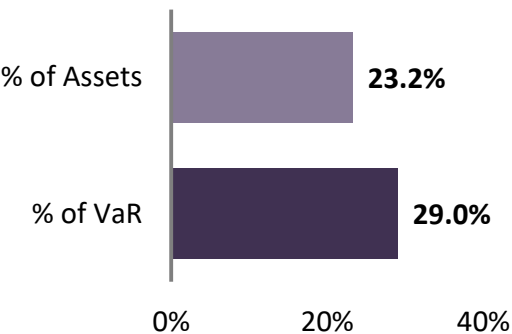
Global Equity



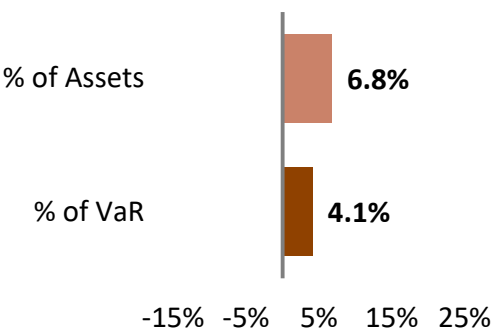
Stable Value



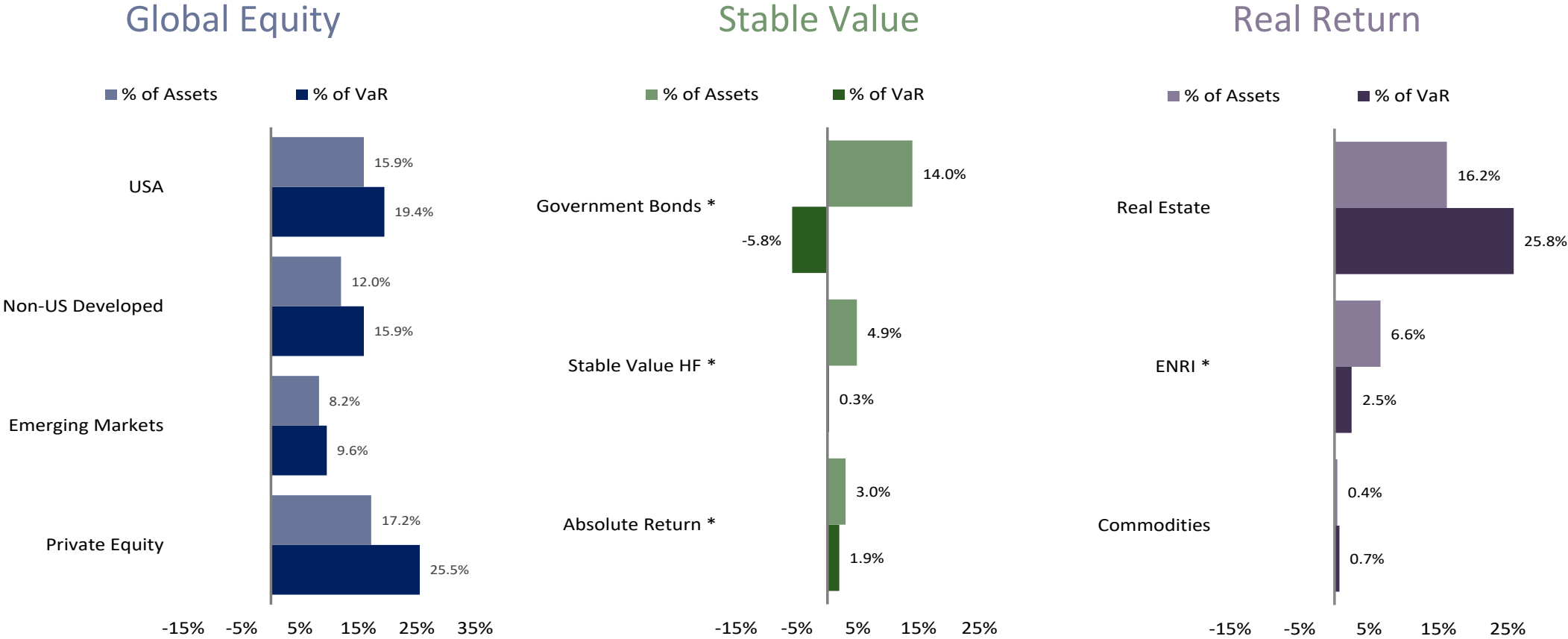
Real Return



Risk Parity

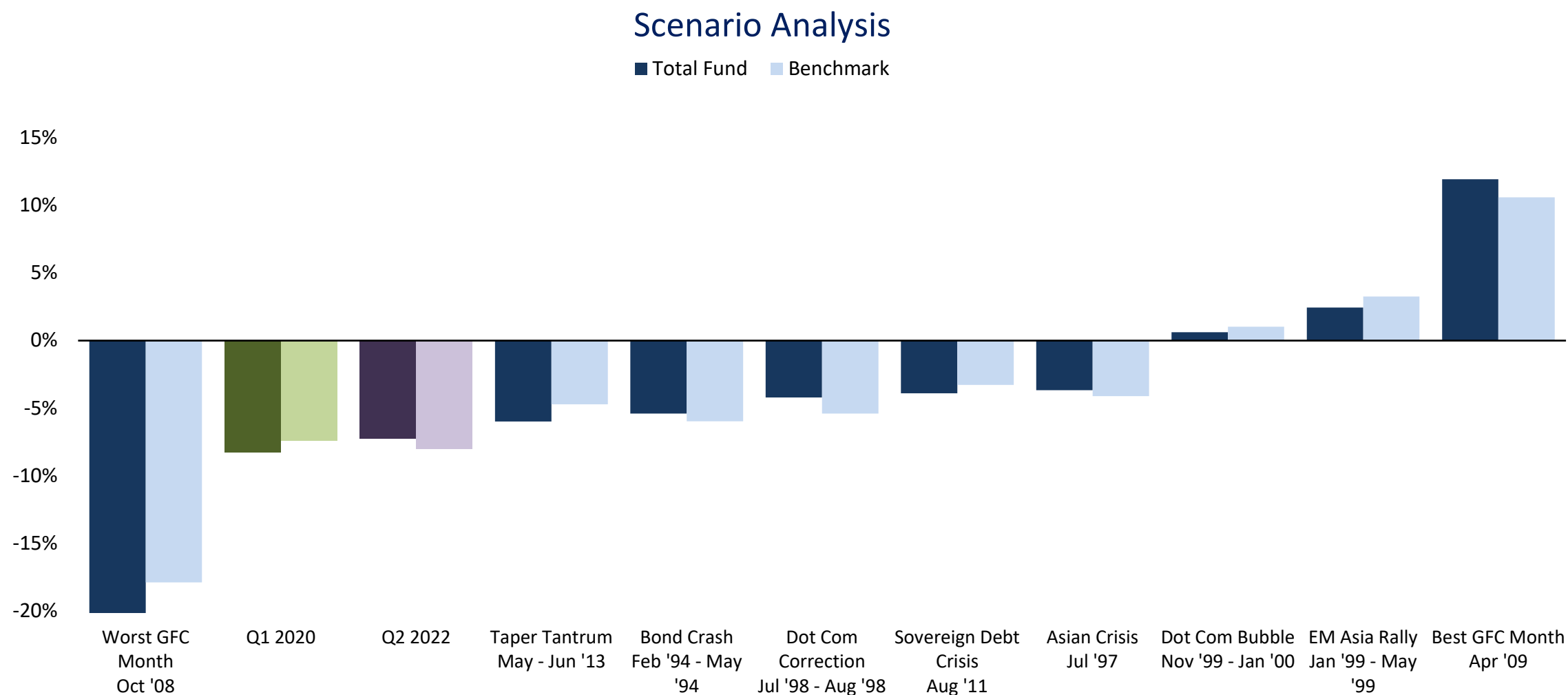


# Stable Value assets remain a key source of diversification



\* These assets contribute less risk than their dollar allocation

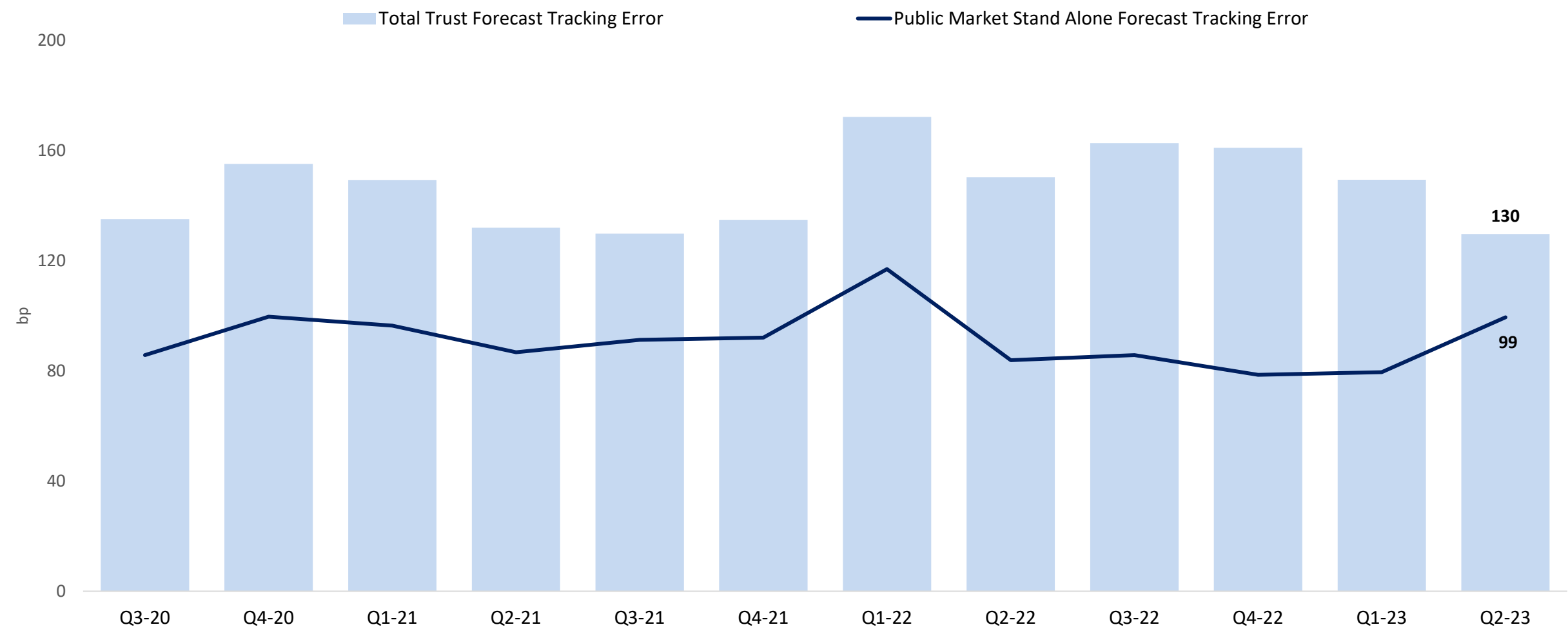
# Predicted Trust drawdowns in line with benchmark



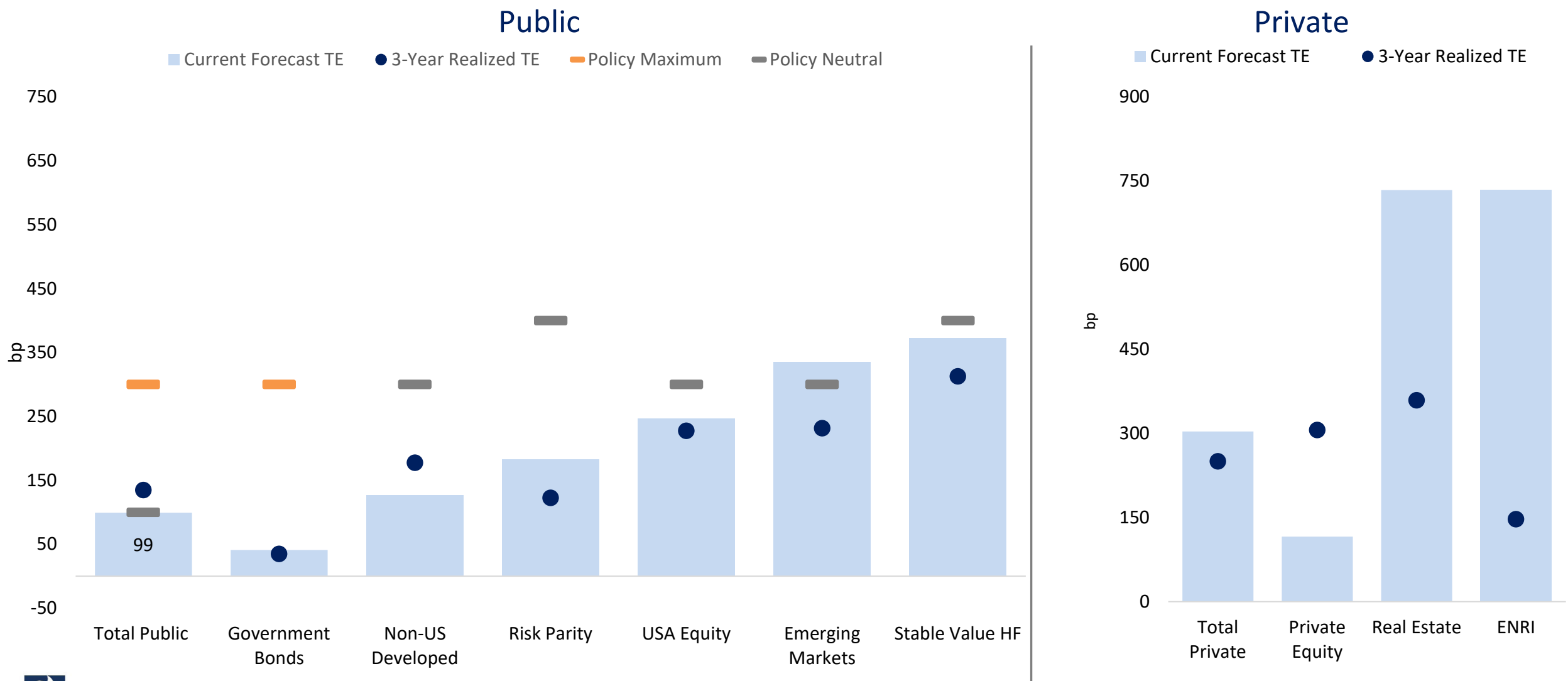
Source: State Street Bank; note: data shown are predicted drawdowns given current allocation, except for Q1 2020 and Q2 2022, which reflect realized performance



# Forecasted Trust tracking error remains range bound

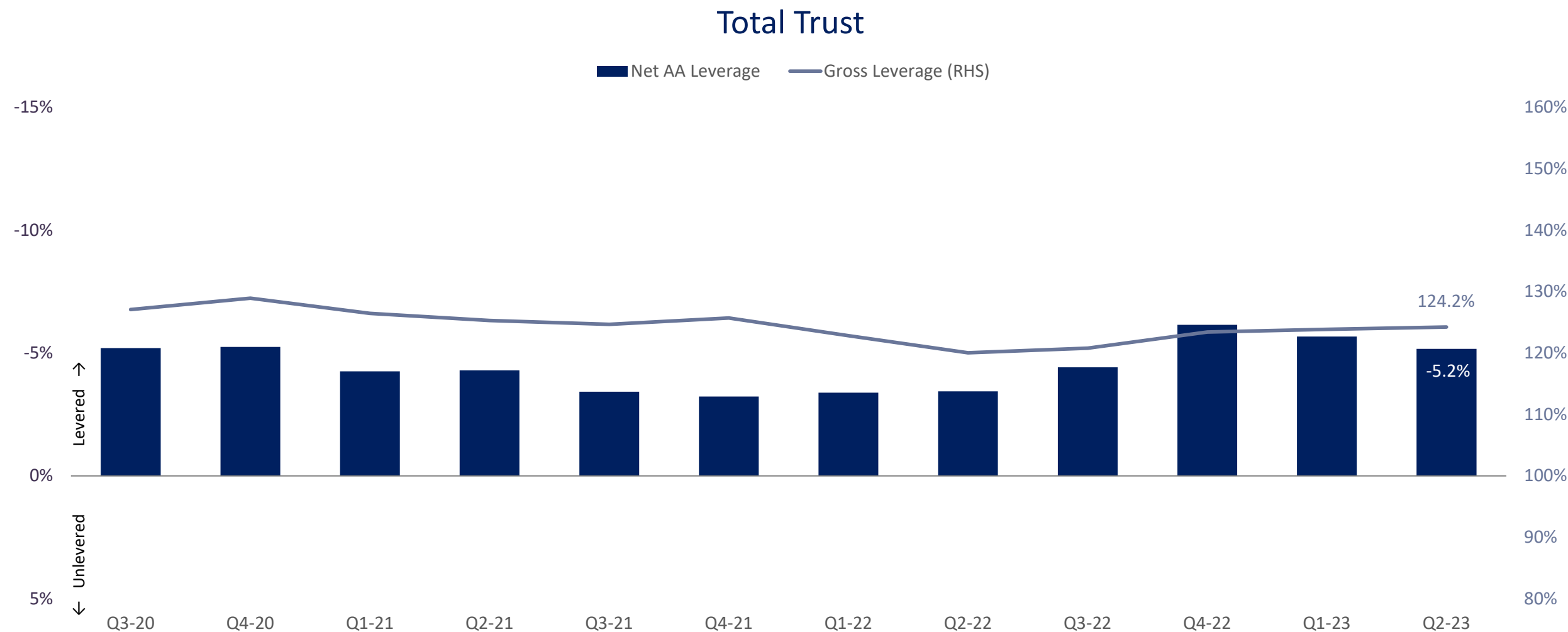


# Forecasted tracking error near historical norms

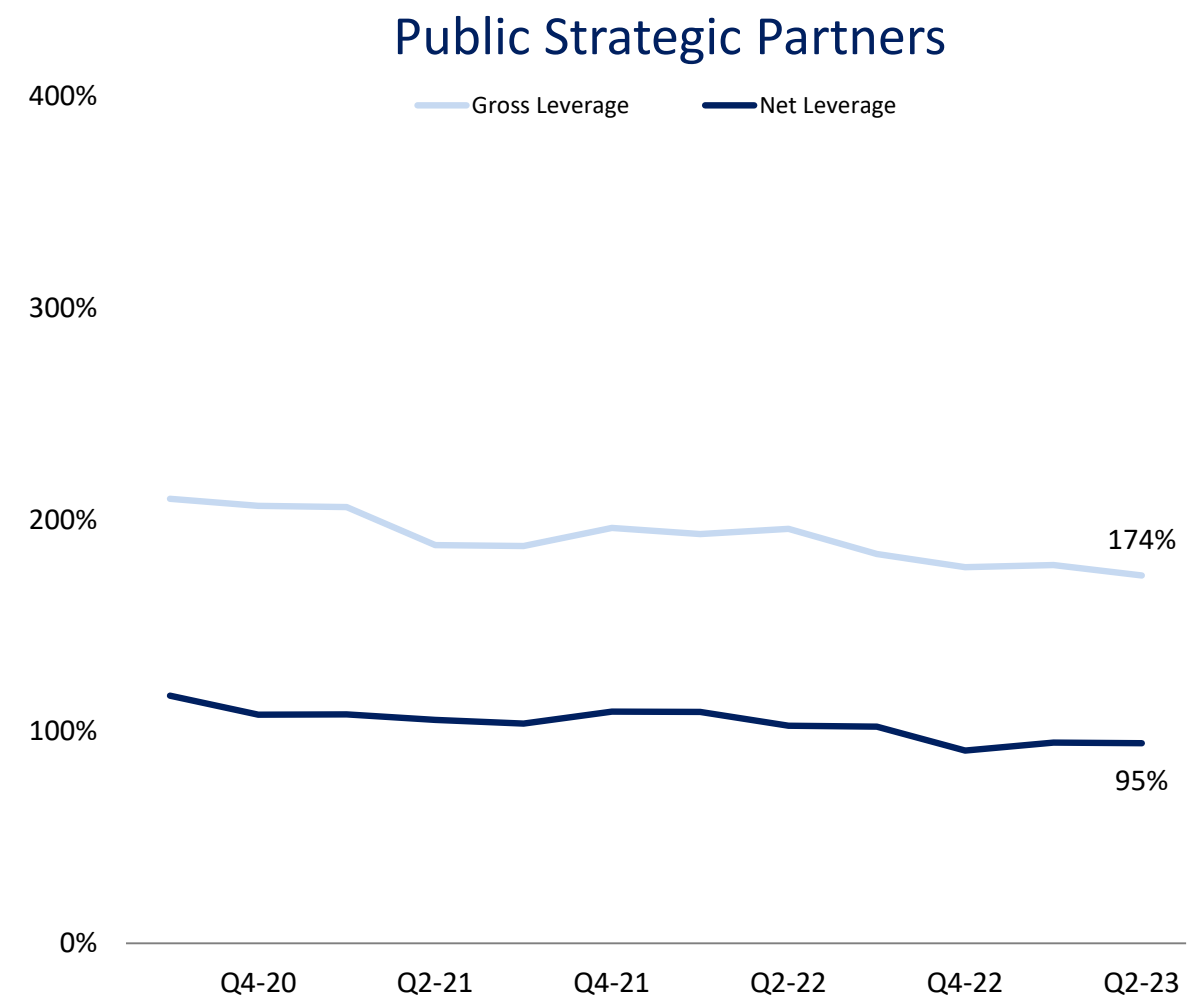
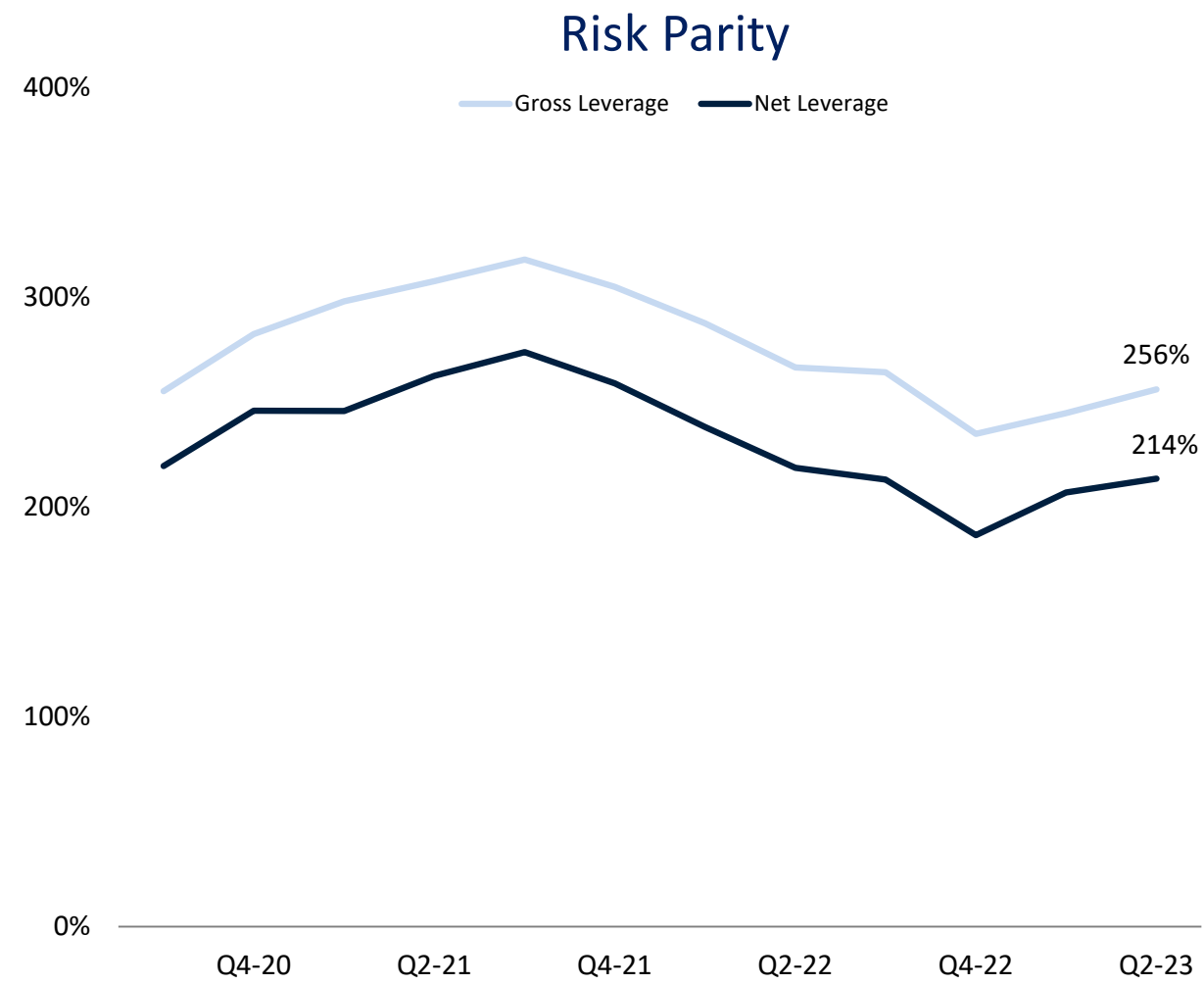


Source: State Street Bank; note: current forecast tracking error uses past experiences from January 1, 2008 to June 30, 2023 and therefore includes the effects of the Global Financial Crisis; External World Equity had tracking error of 297 bp realized, 317 bp forecasted with a policy neutral of 300

# Gross AA Leverage remained stable

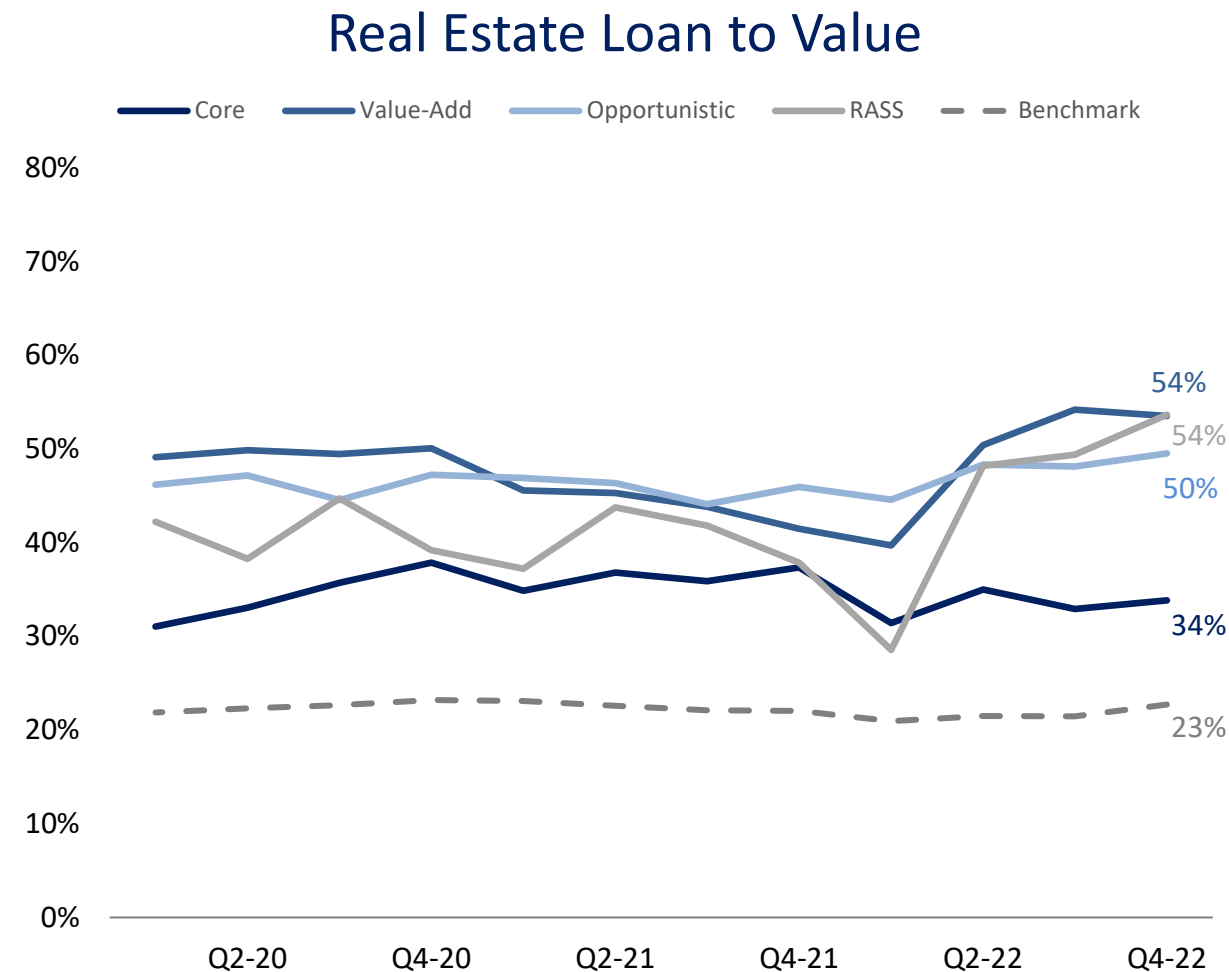
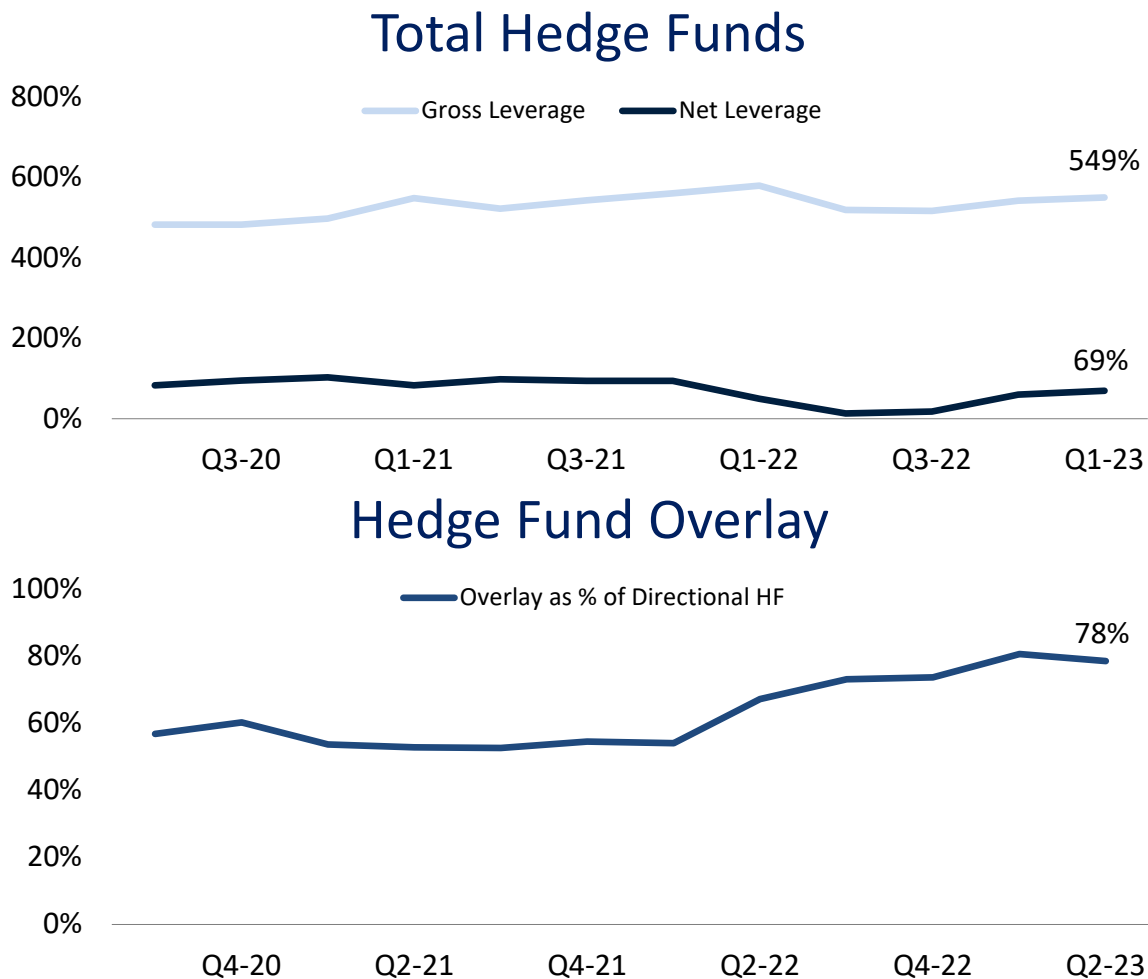


# Risk Parity leverage up from recent lows



Source: State Street Bank

# Hedge Fund Overlay increased to compliment lower Hedge Fund beta



# Trust liquidity remained strong

Sources of Liquidity (\$, billions)	Market Value	Stressed Value
Internal Cash	\$ 3.0	\$ 3.0
Unencumbered Government Bonds	10.5	8.7
Risk Parity	12.7	7.3
Other Liquid Assets (Equity, Commodities)	55.0	28.0
<b>Total Sources of Liquidity</b>	<b>\$ 81.2</b>	<b>\$ 47.0</b>

Note: Excluded illiquid assets, bond collateral, and Hedge Funds

	\$ 106.5	NA
--	----------	----

Uses of Liquidity (\$, billions)	Market Value	Stressed Value
Operational Uses of Liquidity		\$ (0.4)
Stressed Securities Lending		(0.9)
Stressed Derivatives		(6.5)
Stressed Repo		(2.4)
Stressed Private Markets		(2.6)
<b>Total Uses of Liquidity</b>	<b>\$ (0.1)</b>	<b>\$ (12.8)</b>

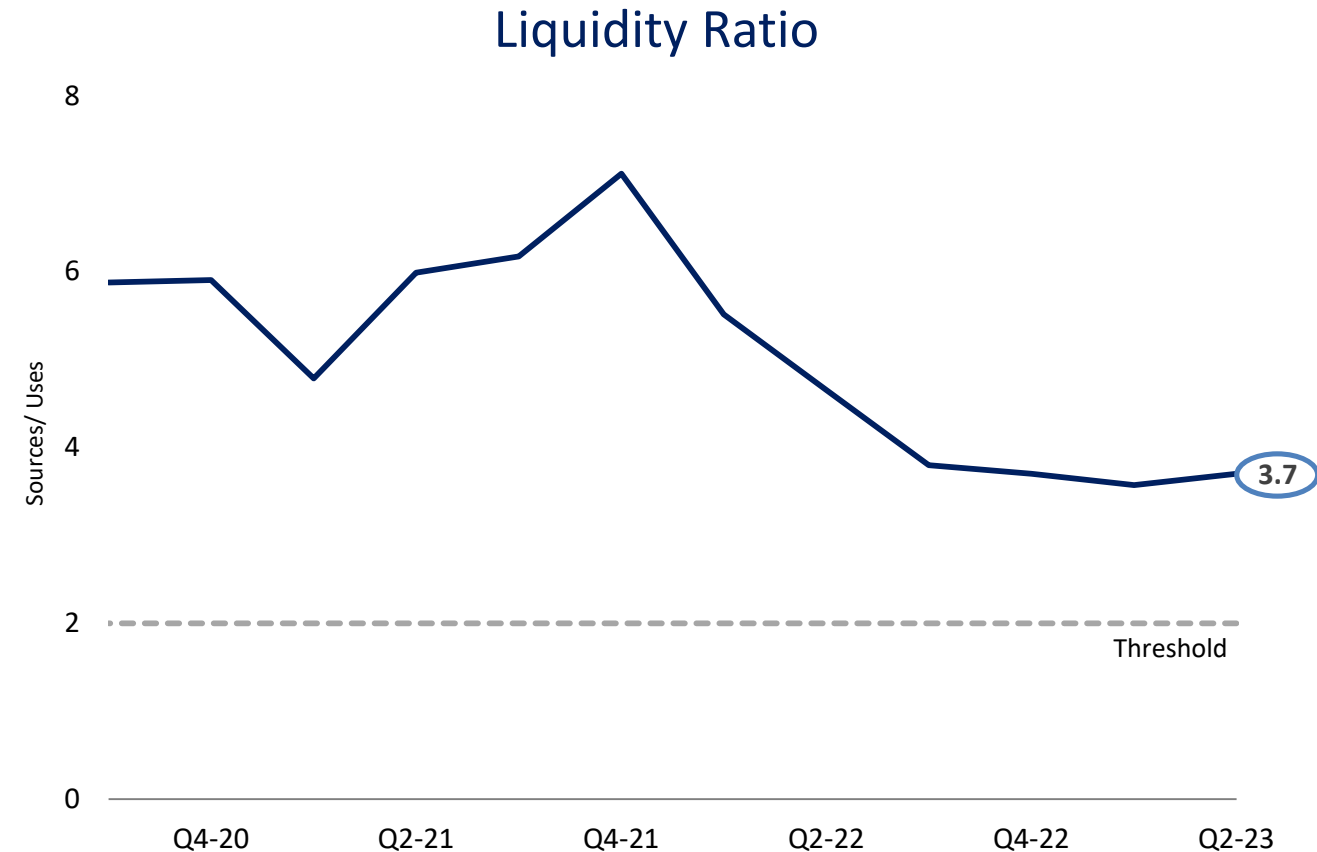
Liquidity Ratio	
<b>Ratio (Sources/Uses)</b>	<b>3.7</b>
Alert Threshold	2.0
<b>Test Result</b>	<b>Pass</b>

Note: Net Stressed Liquidity (Sources less Uses)

	\$ 34.2
--	---------

Note: Past 12 Months of Benefit Payments

	\$ 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.

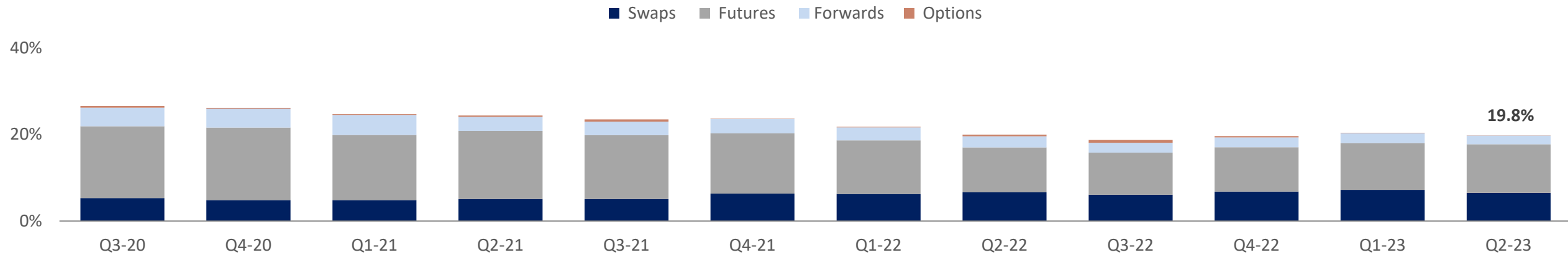
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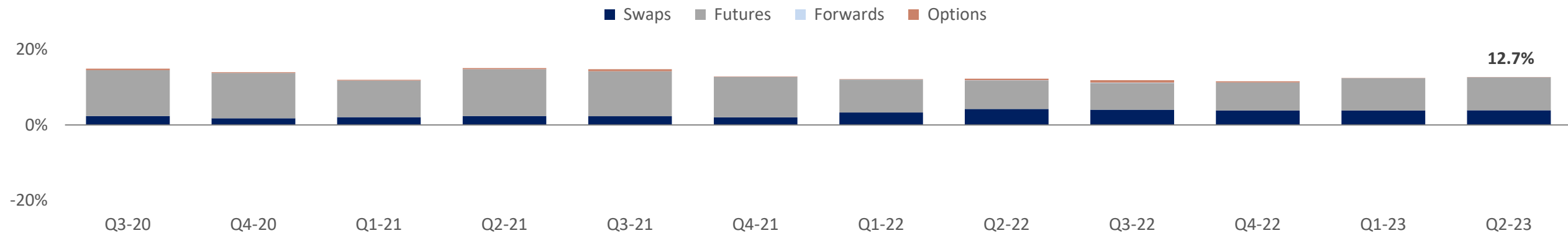


# Derivative gross and net notional remained stable

## Gross Notional by Instrument (% of Total Trust)

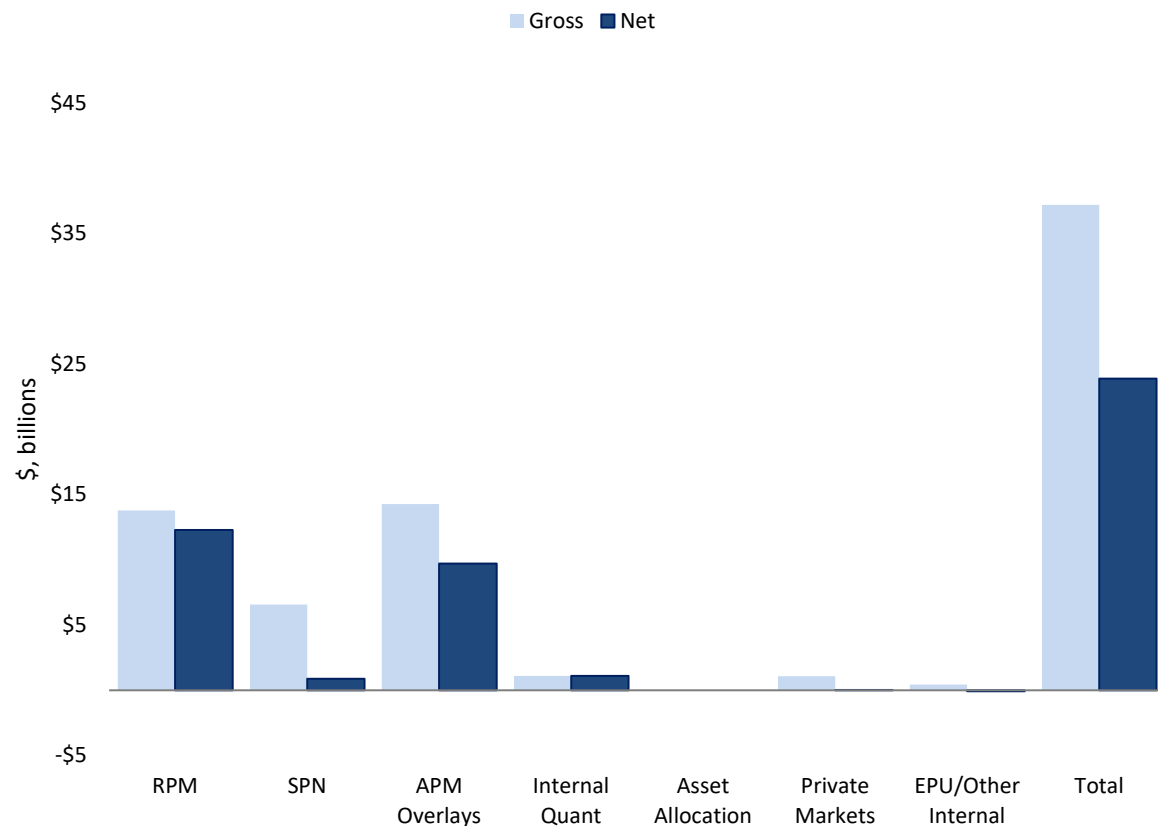


## Net Notional by Instrument (% of Total Trust)



# Derivatives contributed small portion of drawdown risk

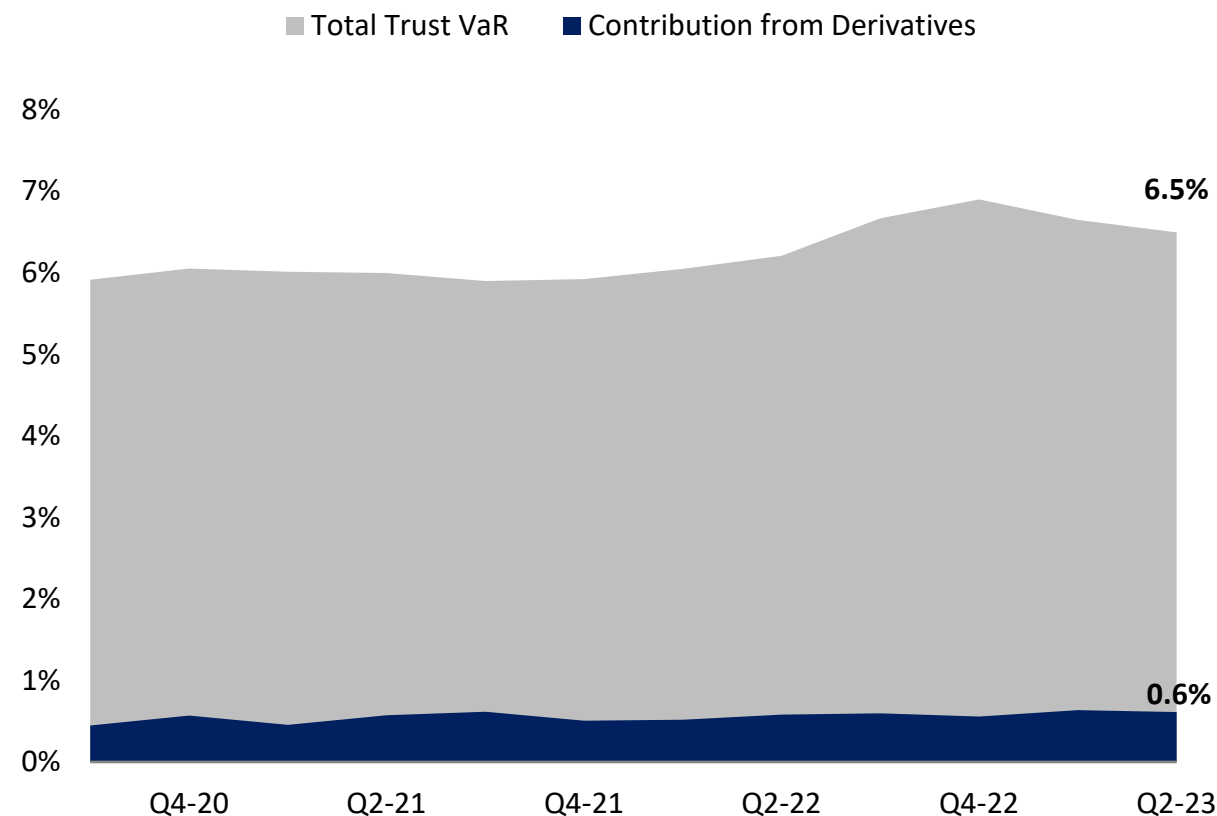
## Gross vs Net Derivatives Notional by Portfolio



● Total Gross = \$37.2b

● Total Net = \$23.9b

## VaR Contribution from Derivatives



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## In conclusion, key points are the following:

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- Trust maintained an overweight to investment exposure
- VaR estimates improved due to market rebound
- Government Bonds provide diversification and other benefits
- Risk metrics remain in compliance