

May 2024

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

*All or part of the May 2, 2024, 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. T***

*The open portions of the May 2, 2024, 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**

**May 2, 2024 – 10:00 a.m.**

1. Call roll of Committee members.
2. Consider the approval of the proposed minutes of the December 2023 committee meeting – Committee Chair.
3. Receive an overview of the Investment Management Committee’s Calendar Year 2024 Work Plan – Jase Auby.
4. CIO Update including Talent Management; Accomplishments; Notices; Awards; and Key Dates and Upcoming Events – Jase Auby.
5. Discuss the Fourth Quarter 2023 Performance Review – Mike McCormick, Aon.
6. Annual Review of Public Markets – Dale West, Brad Gilbert, Mohan Balachandran, Kyle Schmidt and Ashley Baum.
7. Semi-Annual Risk Report and Review of Key SAA Risk Metrics – James Nield and Stephen Kim.
8. Strategic Asset Allocation (SAA) Update and Review of Benchmark Best Practices – James Nield and Mike Simmons; and Mike McCormick, Aon.

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 December 7, 2023**

The Investment Management Committee of the Board of Trustees of the Teacher Retirement System of Texas met on December 7, 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 who participated:**

Mr. David Corpus, Chair  
Mr. John Elliott  
Mr. Jarvis V. 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  
Katy Hoffman, TRS  
James Nield, TRS  
Mark Telschow, TRS  
Mike Simmons, TRS  
Kendall Courtney, TRS  
Katherine Farrell, TRS  
Suzanne Dugan, Cohen Milstein  
Dr. Keith Brown, Board Advisor  
Steve Voss, Aon  
Mike McCormick, Aon.

Investment Management Committee Chairman, Mr. David Corpus, called the meeting to order at 2:28 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 September 2023, Investment Management Committee meeting – Chair David Corpus.**

On a motion by Ms. Sissney, seconded by Mr. Hollingsworth, the committee unanimously voted to approve the proposed minutes for the September 2023 Investment Management Committee meeting as presented.

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

Mr. Jase Auby provided an overview of IMD matters. He said as of third quarter the Trust ended one-year performance of 7.1 percent, 186 basis points of excess return. He noted for the three-year return with 6.1 percent, with 155 basis points of excess return, the best seen in the last 15 years. He noted having held the SPN Summit and Legal Summit recently. He said annual priority-setting process was underway to prepare for 2024. He referenced the two awards IMD received since the last meeting.

**4. Discuss the Third Quarter 2023 Performance Review – Steve Voss and Mike McCormick, AON.**

Mr. Mike McCormick provided an overview of the Trust's performance. He reviewed the market performance noting the four major components of the Trust. He noted the quarter faced uncertainty regarding inflation and the realization that the U.S. Fed was likely to keep rates higher for a longer period of time resulting in a decline across stocks and bonds. He reported the trailing 12 months were a very strong period for the Trust. He reviewed the asset allocation relative to the policy targets noting the absolute return segment has been overweight for a period of time, 3.2 percent over its policy target. He said for peer performance TRS was ranked number one right after the fall out of COVID but recently TRS investment style has been less in favor primarily due to the portfolio's overweight in U.S. Treasuries. Mr. McCormick concluded by stating generally the Trust outperformed relative to the benchmarks and that real estate drove most of the outperformance.

**5. Review of Investment Operations – Kendall Courtney.**

Ms. Kendall Courtney reviewed the mission of Investment Operations. She said the mission is simply to support the execution of all investment decisions and all decision-makers. She said the team is made up of the following five groups: Multi-Asset Trade Operations, Middle Office, Investment Data and Systems, Budget and Accounting, and Events and Facilities. She said Investment Operations two key roles were making sure that the data was accurate and there for all the key inputs and to implement those decisions. Ms. Courtney provided updates on the State Street contract that enhanced legal protections, service rights and increased significant savings to TRS. She also provided an update on the Investment Data Modernization (IDM) program noting the shift in final implementation to fourth quarter of 2026 and remains within budget. She concluded by referencing the very successful move to Alpha.

**6. Annual Review of Risk and Portfolio Management and Strategic Asset Allocation Kickoff – James Nield, Mark Telschow and Mike Simmons.**

Mr. James Nield provided an overview of the Risk and Portfolio Management Group. He said there were four key mandates of the group and would be highlighting two: PM portfolios and Trust strategy. Mr. Mark Telschow stated the PM portfolio is made up of two major Trust asset classes government bonds at \$21.5 billion and risk parity at \$12.3 billion. He reported the portfolios have had a positive period for alpha but total returns have struggled, in particular government bonds. He noted bonds have had the worst three-year return since inception at negative 15.7 percent. He said forward looking outlook for bonds has improved, yields have risen to higher levels. He said bonds serve as a source of liquidity for the Trust.

Mr. Telschow then reviewed the risk parity portfolio. He said risk parity was designed to offer more diversification, adding other asset classes to the portfolio mix, such as commodities and inflation-linked bonds. He said risk parity provided a better balance to the portfolio making the portfolio less vulnerable to changes in growth and inflation expectations.

Mr. Mike Simmons reported the Trust Strategy Team was created in fourth quarter of 2021 with the responsibility to improve portfolio construction of the Strategic Asset Allocation (SAA) through research and intelligence. He said the SAA is reviewed in totality at least every five years. He reviewed changes resulting from the 2019 study and how the landscape has changed since that time period. He stated the objectives of the SAA remain the same and are the starting point of the SAA process. He concluded by providing an overview of the SAA process for the Board to decide what changes to make at the September board meeting.

**7. Review of Strategic Asset Allocation best practices and key elements of an effective asset allocation process – Steve Voss and Mike McCormick.**

Mr. McCormick reiterated that the Strategic Asset Allocation was one of the most important decisions for the Board to make. He reported best practice was for every three to five years perform a review of strategic asset allocation. He said in establishing the SAA the following needed to be considered: time horizon, size of assets, the strategic advantages available to TRS, etc. He noted transparency of the process and documentation were important for stakeholders to follow and understand the robustness of the process.

There being no more business before the Investment Management Committee, the committee adjourned at 3:40 p.m.

Approved by the Investment Management Committee of the Board of Trustees of the Teacher Retirement System of Texas on May \_\_, 2024.

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Katherine H. Farrell  
Secretary of the TRS Board of Trustees

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Date





# CIO Update

Jase Auby, Chief Investment Officer

May 2024



# CIO Update

## IMD at a Glance

### Priorities

- **Performance.** Trust performance remains strong year to date on both an absolute and relative basis.
- **Strategic Partnership Network Summit.** Special topic will be investing in Europe and breakout sessions to cover Emerging Markets, Artificial Intelligence and Value Investing.
- **Culture.** Revised IMD Culture Statement to highlight key tenets critical to fulfilling our Mission.
- **Awards and Recognition.**
  - Ashley Baum, Managing Director, was appointed as a member of the Financial Accounting Standards Advisory Committee (FASAC)
  - Kirk Sims, Managing Director, was selected to the Power100 List
  - Grant Walker, Managing Director, was elected to the Pension Real Estate Association (PREA) Board of Directors
  - Sam Givray and Luke Luttrell, Real Estate, selected as PREA Koza Fellows

### Key Dates and Upcoming Events

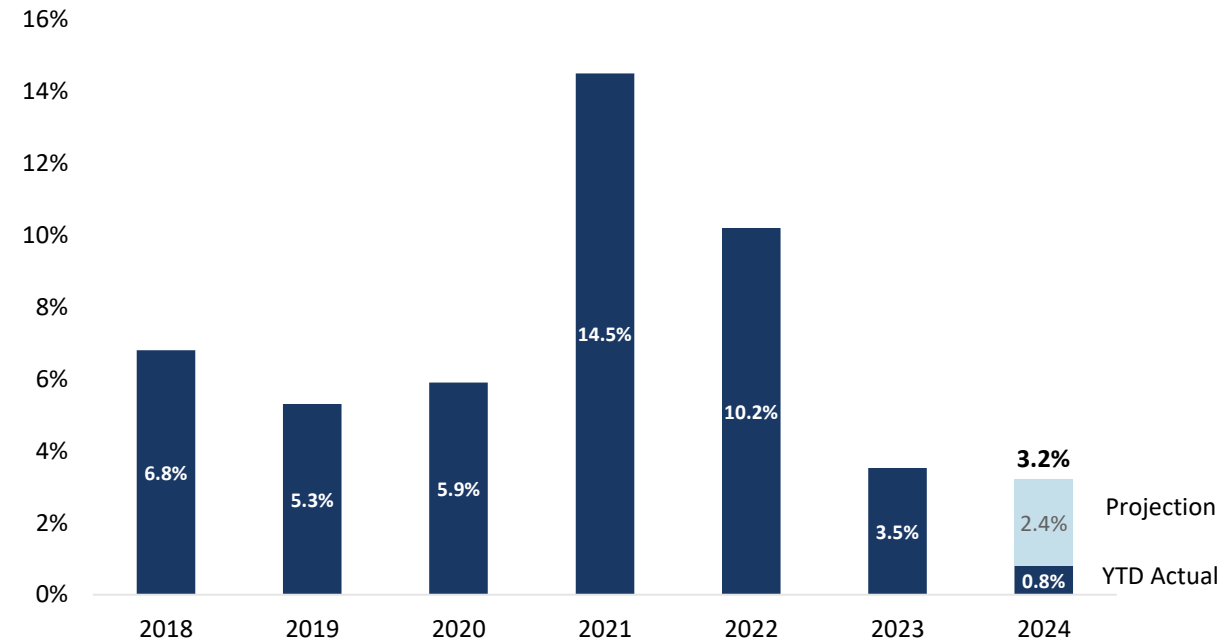
Event	Location	Dates
Strategic Partnership Network Summit	Austin, TX	May 16, 2024
Council of Institutional Investors Conference	New York, NY	Sept. 9 -11, 2024

### Our People

#### Snapshot as of March 2024

IMD FTEs	247
Contractors	8

#### Attrition Trend 2018 – 2024 (As of March 2024)



# IMD Culture Statement

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## ACCOUNTABILITY & TRANSPARENCY



## CURIOSITY



## CONSTRUCTIVE CANDOR



## CONTINUOUS IMPROVEMENT

We are long-term investors with a fiduciary duty to deliver absolute and excess returns through teamwork grounded in mutual respect and trust. The tenets below guide us in our mission:

1. We build trust through **ACCOUNTABILITY AND TRANSPARENCY**. We take ownership of our work and responsibility for the results. We consistently deliver on what we say we will do. We are transparent with our stakeholders and each other.
2. We approach work and each other with **CURIOSITY**. We seek to learn and innovate. We are open to new ideas, information, and perspectives and are willing to change our mind. We succeed through the meritocracy of ideas.
3. We practice **CONSTRUCTIVE CANDOR**. We reach understanding through open, transparent, and respectful dialogue. We communicate clearly when we give feedback, have difficult discussions, or share a competing view. We commit to decisions and move forward together knowing our views have been heard.
4. We strive for **CONTINUOUS IMPROVEMENT**. We evaluate our business and investment practices as well as ourselves for ways we can increase our effectiveness. We build efficient processes and eliminate needless bureaucracy. Each of us is in a position to make the IMD better.

# Investment Management Committee

## CY 2024 Work Plan

Informative (Receive)

Pre-Action (Review)

Action (Consider)





# Teacher Retirement System of Texas

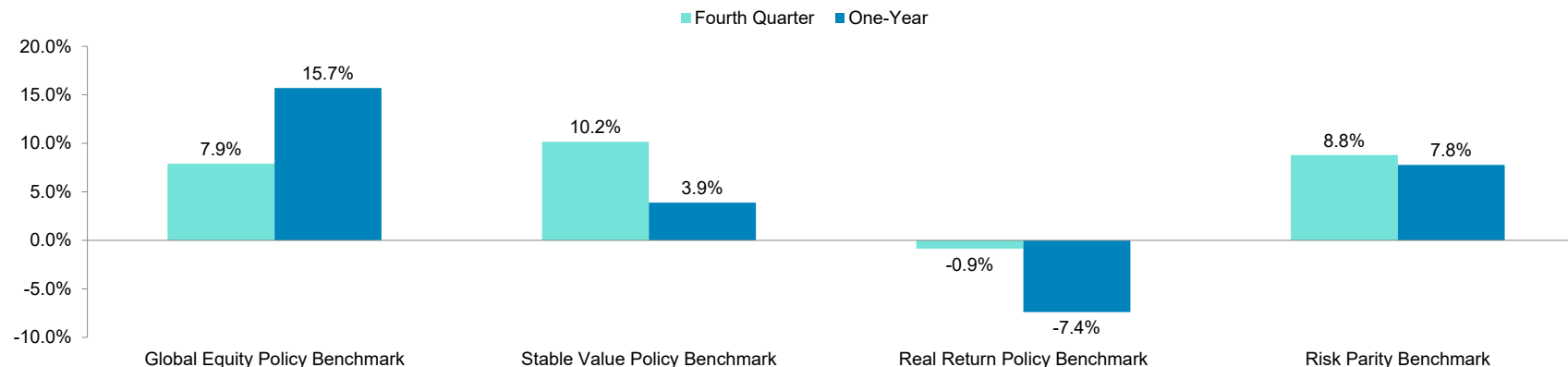
Performance Review:

Fourth Quarter 2023

Investment advice and consulting services provided by Aon Investments USA, Inc.  
To protect the confidential and proprietary information included in this material, it may  
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# Summary



**In Q4 2023, global equity markets rose due to a strong rally in November and December as market participants anticipated a higher probability of interest rate cuts in 2024.**

**Global equities rose 7.9% for the quarter, and they returned 15.7% over a trailing 1-year period**

**The U.S. Federal Reserve (Fed) kept its benchmark policy rate unchanged at 5.25%–5.50% for the third consecutive meeting. Fed chair Jerome Powell commented that the interest rate is now “likely at or near its peak for this tightening cycle”.**

**TRS returned 6.9% for the quarter which was 0.3 percentage points above its benchmark**

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

**For the trailing twelve months, TRS returned 9.7% versus the benchmark return of 7.6%**

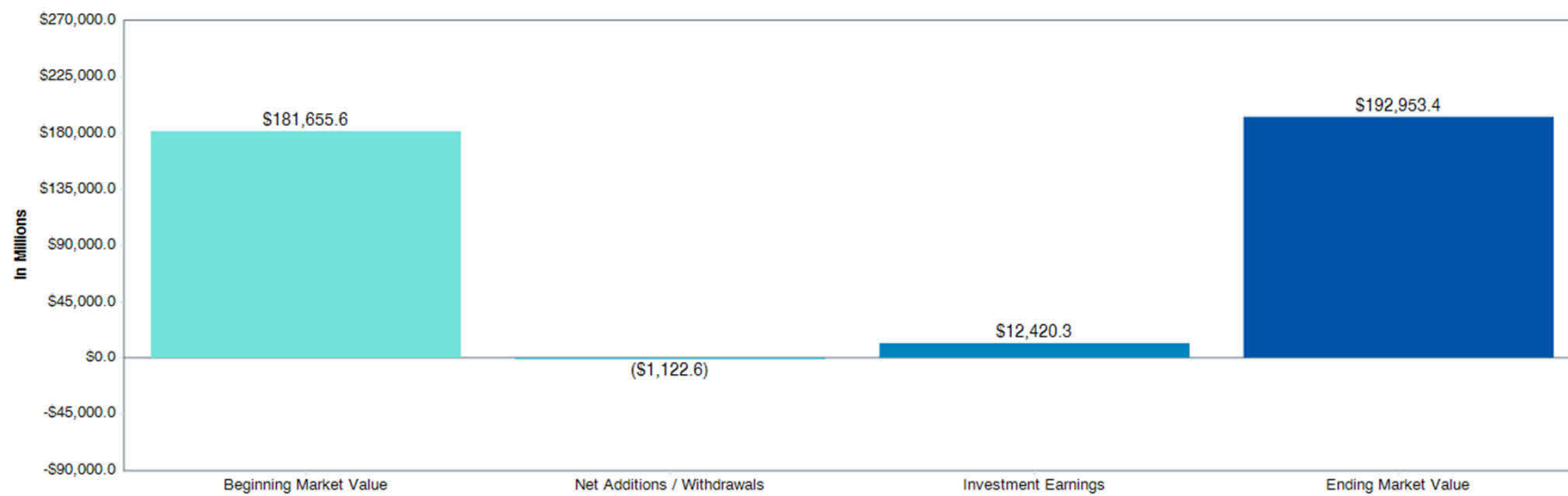
–Outperformance from the Global Equity, Real Return and Risk Parity asset classes were the primary drivers of relative performance

# 1. Market Summary – Fourth Quarter 2023

	Fourth Quarter	One Year	Three Years	Five Years	Ten Years
<b>Global Equity:</b>					
TF USA Benchmark	12.1%	26.3%	8.7%	15.3%	11.6%
TRS Non-US Developed Benchmark	10.6	17.9	4.3	8.4	4.3
TRS Emerging Markets Benchmark	10.4	14.8	-4.5	4.0	2.9
HFRI Fund of Funds Composite Index	3.4	6.4	2.3	5.1	3.3
State Street Private Equity Index (quarter lagged)	0.1	5.3	15.8	13.8	12.8
Global Equity Policy Benchmark	7.9	15.7	7.7	11.6	8.6
<b>Stable Value:</b>					
Bloomberg Barclays Long Treasury Index	12.7%	3.1%	-11.4%	-1.2%	2.3%
HFRI Fund of Funds Conservative Index	1.8	5.3	4.3	5.1	3.4
Absolute Return Benchmark	2.4	9.6	6.0	5.0	4.0
90 Day U.S. Treasury Bill	1.4	5.3	2.2	1.9	1.3
Stable Value Policy Benchmark	10.2	3.9	-7.7	0.4	2.6
<b>Real Return:</b>					
Bloomberg Barclays U.S. TIPS Index	4.7%	3.9%	-1.0%	3.2%	2.4%
NCREIF ODCE (quarter lagged)	-2.1	-12.9	6.2	4.7	7.2
Energy, Natural Resources & Infrastructure Benchmark	2.0	7.5	14.1	7.0	--
Goldman Sachs Commodities Index	-10.7	-4.3	19.2	8.7	-3.6
Real Return Policy Benchmark	-0.9	-7.4	8.4	5.5	6.3
<b>Risk Parity:</b>					
Risk Parity Benchmark	8.8%	7.8%	-3.5%	3.9%	3.1%
TRS Policy Benchmark	6.6%	7.6%	3.8%	7.7%	6.8%

## 2. Market Value Change

From October 1, 2023 to December 31, 2023



Summary of Cash Flows				
	1 Quarter	1 Year	3 Years	5 Years
<b>Total Fund</b>				
Beginning Market Value	181,655,621,941	179,746,129,720	176,944,644,153	145,409,462,787
+ Additions / Withdrawals	-1,122,614,348	-3,988,355,858	-12,537,178,977	-20,517,179,142
+ Investment Earnings	12,420,346,299	17,195,580,031	28,545,888,716	68,061,070,247
<b>= Ending Market Value</b>	<b>192,953,353,892</b>	<b>192,953,353,892</b>	<b>192,953,353,892</b>	<b>192,953,353,892</b>



### 3. Asset Allocation Detail

	Market Value \$ in millions) as of 12/31/2023		Interim Policy Target	Relative to Interim Policy Target	Long Term Policy Target	Long Term Policy Ranges
	(\$)	(%)				
<b>Investment Exposure</b>	--	105.0%	104.0%	+1.0%	104.0%	93-115%
Total U.S.A.	\$30,785	16.0%	16.3%	-0.3%	18.0	13-23%
Non-U.S. Developed	\$22,588	11.7%	11.8%	-0.1%	13.0	8-18%
Emerging Markets	\$16,292	8.4%	8.1%	+0.3%	9.0	4-14%
Private Equity	\$32,523	16.9%	18.0%	-1.1%	14.0	9-19%
<b>Global Equity</b>	<b>\$102,187</b>	<b>53.0%</b>	<b>54.2%</b>	<b>-1.2%</b>	<b>54.0</b>	<b>47-61%</b>
Government Bonds	\$26,489	13.7%	14.5%	-0.8%	16.0	0-21%
Stable Value Hedge Funds	\$10,162	5.3%	4.5%	+0.8%	5.0	0-10%
Absolute Return	\$6,471	3.4%	0.0%	+3.4%	0.0	0-20%
<b>Stable Value</b>	<b>\$43,122</b>	<b>22.3%</b>	<b>18.9%</b>	<b>+3.4%</b>	<b>21.0</b>	<b>14-28%</b>
Real Estate	\$29,668	15.4%	16.5%	-1.1%	15.0	10-20%
Energy, Natural Resource and Inf.	\$13,533	7.0%	7.1%	-0.1%	6.0	1-11%
Commodities	\$669	0.3%	0.0%	+0.3%	0.0	0-5%
<b>Real Return</b>	<b>\$43,870</b>	<b>22.7%</b>	<b>23.6%</b>	<b>-0.9%</b>	<b>21.0</b>	<b>14-28%</b>
Risk Parity	\$13,508	7.0%	7.2%	-0.2%	8.0	0-13%
<b>Risk Parity</b>	<b>\$13,508</b>	<b>7.0%</b>	<b>7.2%</b>	<b>-0.2%</b>	<b>8.0</b>	<b>0-13%</b>
Cash	\$4,531	2.3%	2.0%	+0.3%	2.0	0-7%
Asset Allocation Leverage	-\$14,265	-7.4%	-6.0%	-1.4%	-6.0	--
<b>Net Asset Allocation</b>	<b>-\$9,734</b>	<b>-5.0%</b>	<b>-4.0%</b>	<b>-1.0%</b>	<b>-4.0</b>	<b>--</b>
<b>Total Fund</b>	<b>\$192,953</b>	<b>100.0%</b>		<b>---</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.

## 4. Total TRS Performance Ending 12/31/2023

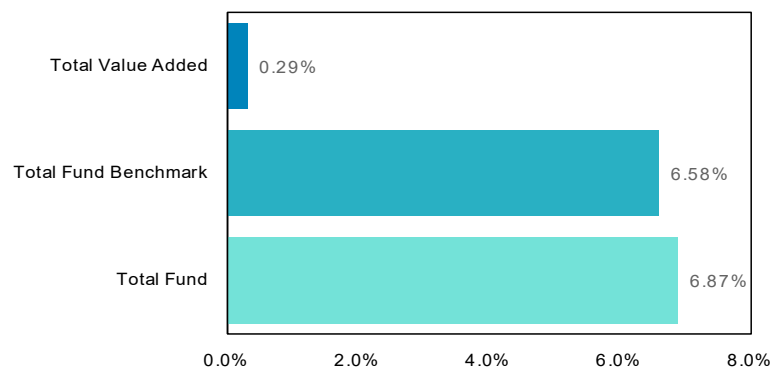
Return Summary



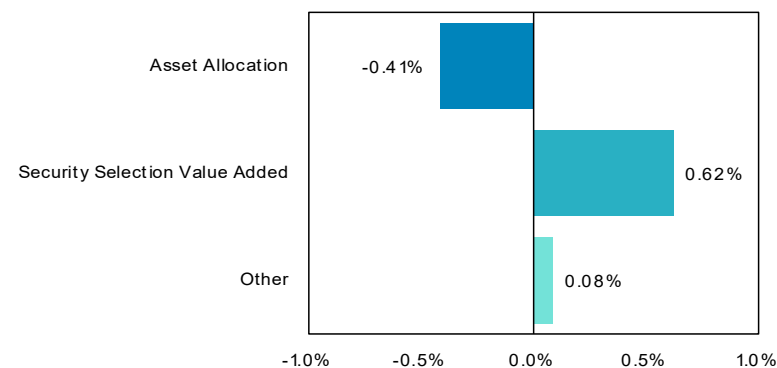
## 5. Total Fund Attribution – One Quarter Ending 12/31/2023

### Total Fund vs. Total Fund Benchmark

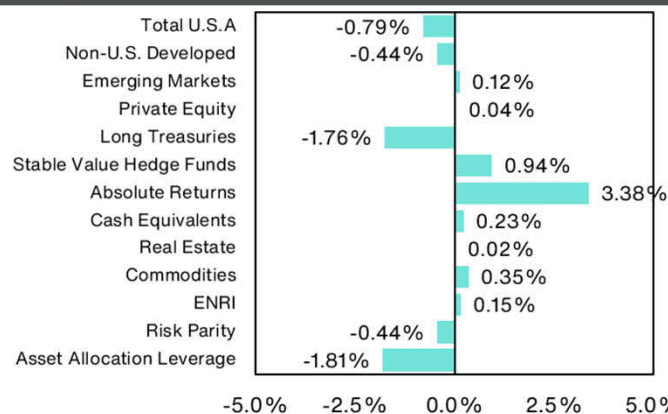
#### Total Fund Performance



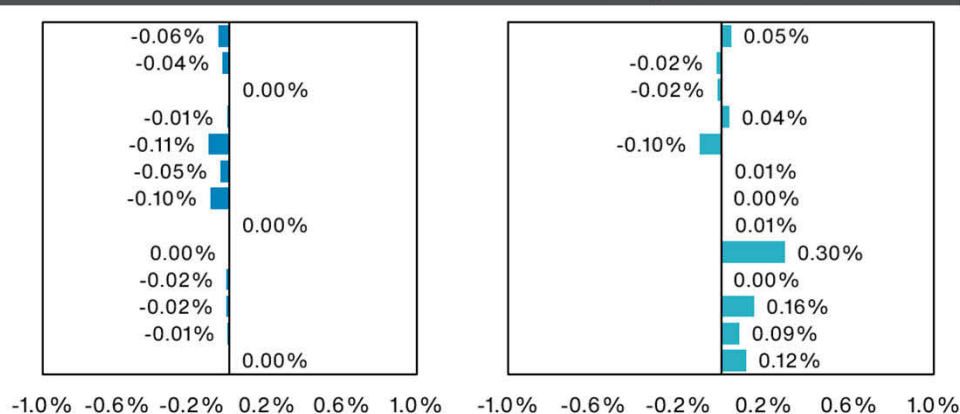
#### Total Value Added: 0.29%



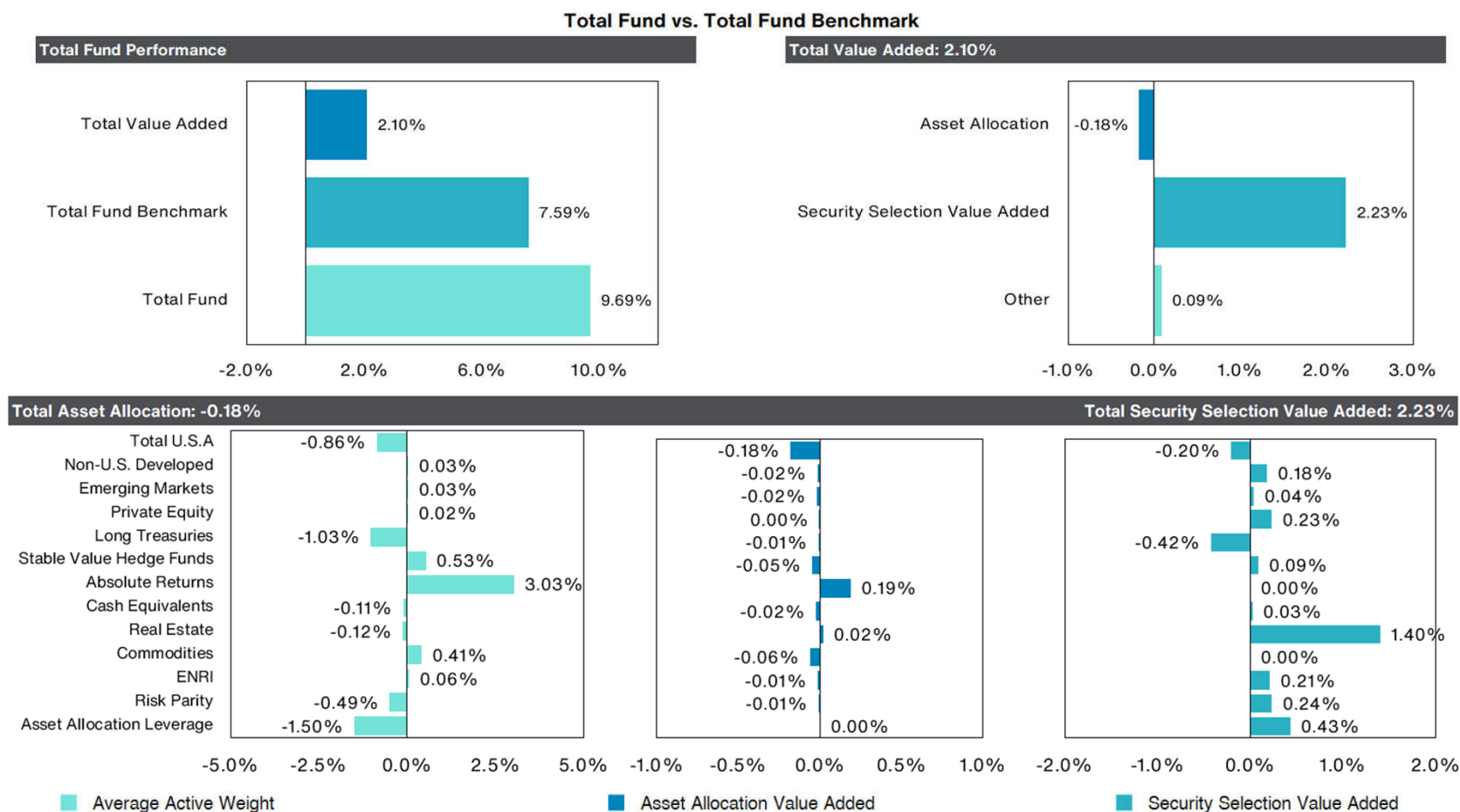
#### Total Asset Allocation: -0.41%



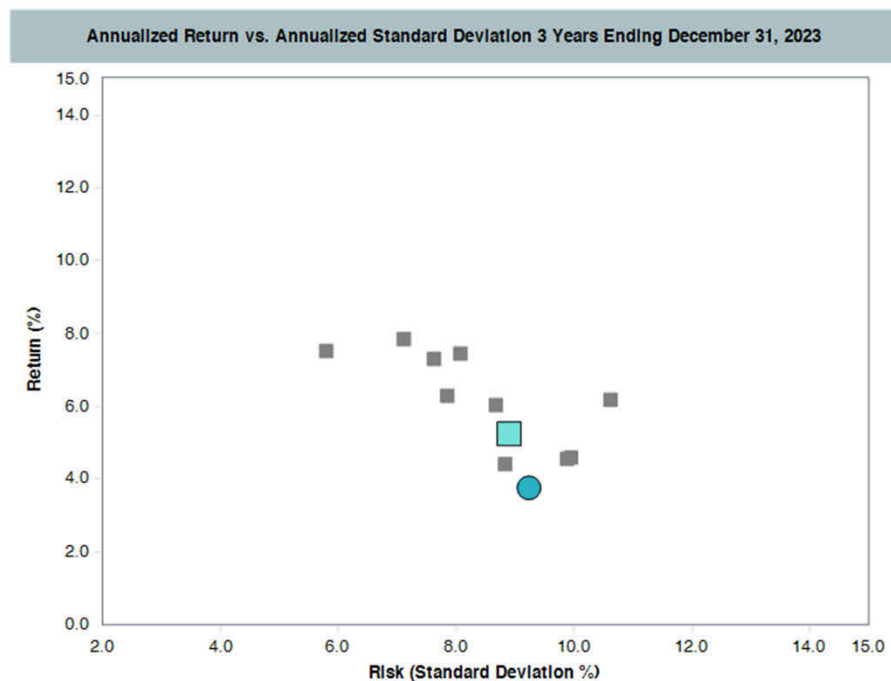
#### Total Security Selection Value Added: 0.62%



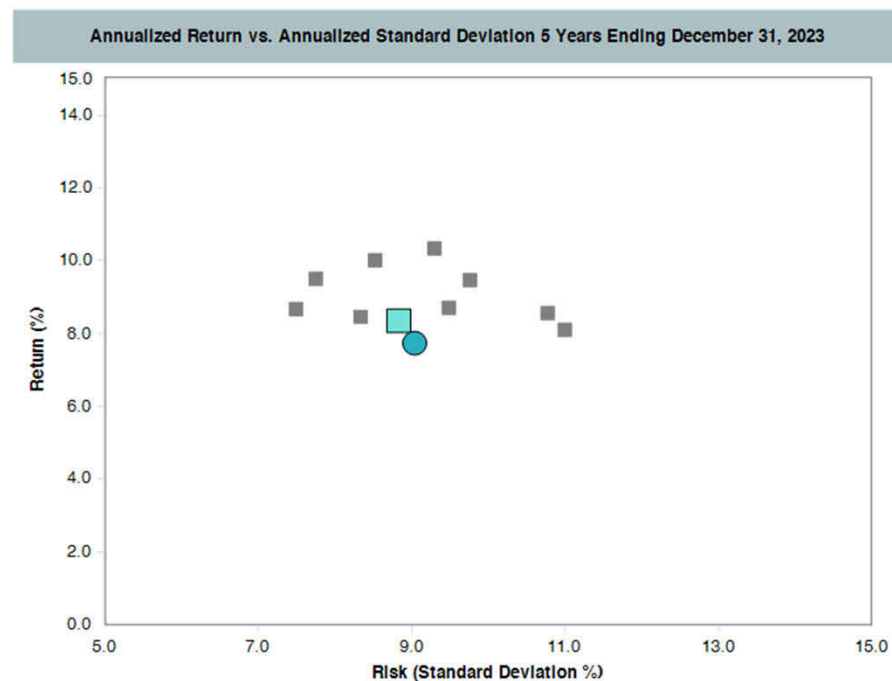
## 5. Total Fund Attribution – One Year Ending 12/31/2023



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



	Return	Standard Deviation
Total Fund	5.2	8.9
Total Fund Benchmark	3.8	9.2
Median	6.2	8.4

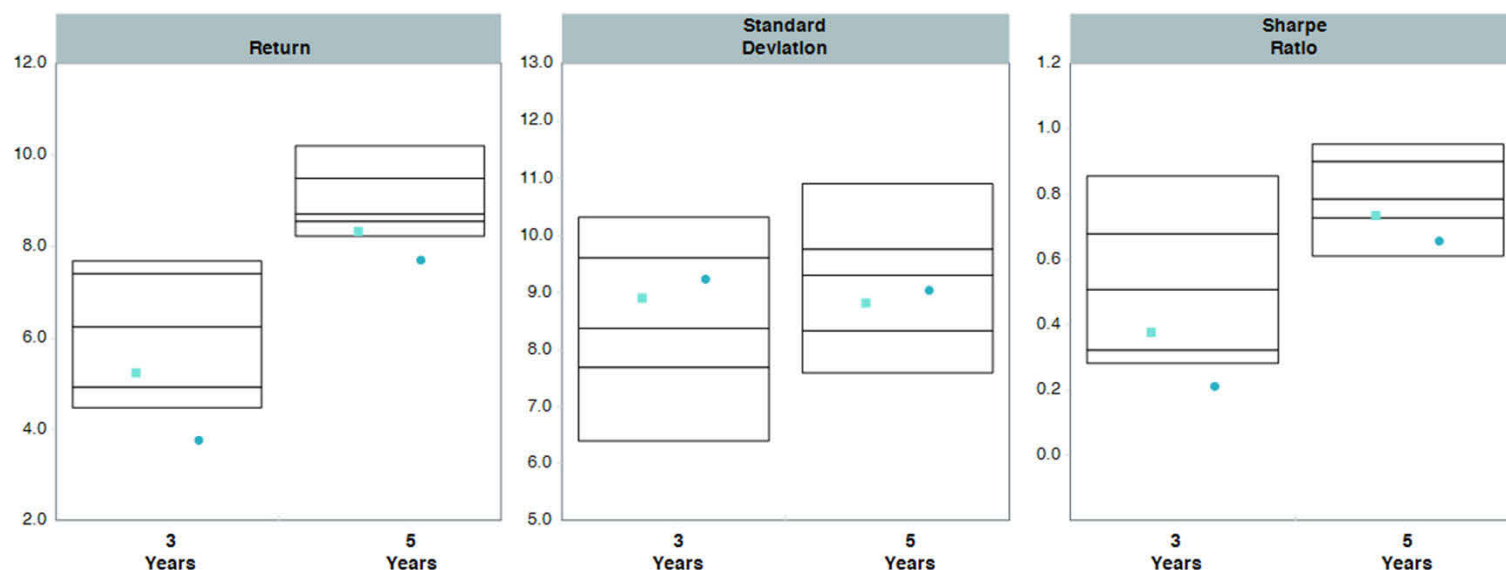


	Return	Standard Deviation
Total Fund	8.3	8.8
Total Fund Benchmark	7.7	9.0
Median	8.7	9.3

Note: Public Plan peer group composed of 10 and 9 public funds, for 3- and 5-year periods, with total assets in excess of \$10B as of 12/31/2023. 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	5.2 (73)	8.3 (92)	8.9 (33)	8.8 (58)	0.4 (71)	0.7 (74)
● Total Fund Benchmark	3.8 (100)	7.7 (100)	9.2 (30)	9.0 (55)	0.2 (100)	0.7 (86)
5th Percentile	7.7	10.2	10.3	10.9	0.9	1.0
1st Quartile	7.4	9.5	9.6	9.8	0.7	0.9
Median	6.2	8.7	8.4	9.3	0.5	0.8
3rd Quartile	4.9	8.6	7.7	8.3	0.3	0.7
95th Percentile	4.5	8.2	6.4	7.6	0.3	0.6
Population	10	9	10	9	10	9

Parentheses contain percentile rankings.

## 6. TRS Performance vs. Peers (>\$10 Billion) as of 12/31/2023



	1 Quarter	1 Year	3 Years	5 Years	10 Years	20 Years	2022	2021	2020
■ Total Fund	6.9 (17)	9.7 (93)	5.2 (73)	8.3 (92)	7.3 (27)	7.1 (24)	-10.3 (60)	18.5 (31)	11.6 (52)
● Total Fund Benchmark	6.6 (28)	7.6 (100)	3.8 (100)	7.7 (100)	6.8 (87)	6.7 (59)	-10.9 (71)	16.5 (67)	12.6 (25)
5th Percentile	7.1	12.8	7.7	10.2	7.7	7.4	-4.0	21.8	14.8
1st Quartile	6.6	11.8	7.4	9.5	7.4	7.1	-7.2	19.2	12.6
Median	5.8	11.3	6.2	8.7	7.1	6.9	-9.4	16.8	11.7
3rd Quartile	5.3	10.5	4.9	8.6	6.8	6.7	-11.6	15.6	9.1
95th Percentile	3.6	9.3	4.5	8.2	6.3	6.2	-15.9	12.3	7.8
Population	21	17	10	9	8	8	26	39	38

Parentheses contain percentile rankings.

## 7. IPS Stated Trust Return Objectives ending 12/31/2023

	Five Year	Seven Year	Ten Year	Twenty Year
Total Fund	<b>8.3</b>	<b>8.1</b>	<b>7.3</b>	<b>7.1</b>
Total Fund Benchmark	7.7	7.5	6.8	6.7
<b>Difference</b>	<b>+0.6</b>	<b>+0.6</b>	<b>+0.5</b>	<b>+0.4</b>
Total Fund	<b>8.3</b>	<b>8.1</b>	<b>7.3</b>	<b>7.1</b>
Assumed Rate of Return	7.2	7.4	7.6	7.8
<b>Difference</b>	<b>+1.1</b>	<b>+0.7</b>	<b>-0.3</b>	<b>-0.7</b>
Total Fund	<b>8.3</b>	<b>8.1</b>	<b>7.3</b>	<b>7.1</b>
CPI + 5%	9.3	8.6	7.9	7.7
<b>Difference</b>	<b>-1.0</b>	<b>-0.5</b>	<b>-0.6</b>	<b>-0.6</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.*



## 8. Global Equity: Performance Summary Ending 12/31/2023

	Fourth Quarter	One Year	Three Year	Five Year	Ten Year
<b>Total Global Equity</b>	<b>7.8</b>	<b>15.9</b>	<b>7.8</b>	<b>11.1</b>	<b>8.3</b>
Total Global Equity Benchmark	7.9	15.7	7.7	11.6	8.6
<i>Difference</i>	<i>-0.1</i>	<i>+0.2</i>	<i>+0.1</i>	<i>-0.5</i>	<i>-0.3</i>
<b>Total U.S. Equity</b>	<b>12.5</b>	<b>24.8</b>	<b>10.0</b>	<b>14.4</b>	<b>10.3</b>
Total U.S. Equity Benchmark	12.1	26.3	8.7	15.3	11.6
<i>Difference</i>	<i>+0.4</i>	<i>-1.5</i>	<i>+1.3</i>	<i>-0.9</i>	<i>-1.3</i>
<b>Non-U.S. Equity</b>	<b>10.4</b>	<b>17.9</b>	<b>1.3</b>	<b>7.3</b>	<b>4.3</b>
Non-U.S. Equity Benchmark	10.5	16.7	0.8	6.8	3.8
<i>Difference</i>	<i>-0.1</i>	<i>+1.2</i>	<i>+0.5</i>	<i>+0.5</i>	<i>+0.5</i>
<b>Non-U.S. Developed</b>	<b>10.4</b>	<b>19.6</b>	<b>4.2</b>	<b>8.5</b>	<b>4.7</b>
TRS Non-U.S. Developed Benchmark	10.6	17.9	4.3	8.4	4.3
<i>Difference</i>	<i>-0.2</i>	<i>+1.7</i>	<i>-0.1</i>	<i>+0.1</i>	<i>+0.4</i>
<b>Emerging Markets</b>	<b>10.2</b>	<b>15.4</b>	<b>-3.0</b>	<b>5.3</b>	<b>3.7</b>
TRS Emerging Market Benchmark	10.4	14.8	-4.5	4.0	2.9
<i>Difference</i>	<i>-0.2</i>	<i>+0.6</i>	<i>+1.5</i>	<i>+1.3</i>	<i>+0.8</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 12/31/2023 (cont'd)

	Fourth Quarter	One Year	Three Year	Five Year	Ten Year
<b>Total Public Equity</b>	<b>11.3</b>	<b>20.9</b>	<b>5.1</b>	<b>10.2</b>	<b>6.8</b>
Public Equity Benchmark	11.2	21.0	4.4	10.5	7.2
<i>Difference</i>	<i>+0.1</i>	<i>-0.1</i>	<i>+0.7</i>	<i>-0.3</i>	<i>-0.4</i>
<b>Total Private Equity</b>	<b>1.2</b>	<b>6.3</b>	<b>14.6</b>	<b>12.9</b>	<b>13.2</b>
Private Equity Benchmark	1.0	4.9	15.9	14.1	12.9
<i>Difference</i>	<i>+0.2</i>	<i>+1.4</i>	<i>-1.3</i>	<i>-1.2</i>	<i>+0.3</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 12/31/2023

	Fourth Quarter	One Year	Three Year	Five Year	Ten Year
<b>Total Stable Value</b>	<b>8.1</b>	<b>3.5</b>	<b>-5.4</b>	<b>1.6</b>	<b>4.0</b>
Total Stable Value Benchmark	10.2	3.9	-7.7	0.4	2.6
<i>Difference</i>	<i>-2.1</i>	<i>-0.4</i>	<i>+2.3</i>	<i>+1.2</i>	<i>+1.4</i>
<b>Total Government Bonds</b>	<b>11.9</b>	<b>0.1</b>	<b>-12.8</b>	<b>-1.9</b>	<b>2.2</b>
Treasury Benchmark	12.7	3.1	-11.4	-1.2	2.3
<i>Difference</i>	<i>-0.8</i>	<i>-3.0</i>	<i>-1.4</i>	<i>-0.7</i>	<i>-0.1</i>
<b>Stable Value Hedge Funds</b>	<b>2.0</b>	<b>7.1</b>	<b>7.6</b>	<b>7.4</b>	<b>6.0</b>
Hedge Funds Benchmark	1.8	5.3	4.3	5.1	3.4
<i>Difference</i>	<i>+0.2</i>	<i>+1.8</i>	<i>+3.3</i>	<i>+2.3</i>	<i>+2.6</i>
<b>Absolute Return</b>	<b>3.8</b>	<b>14.2</b>	<b>8.2</b>	<b>8.4</b>	<b>8.3</b>
Absolute Return Benchmark	2.4	9.6	6.0	5.0	4.0
<i>Difference</i>	<i>+1.4</i>	<i>+4.6</i>	<i>+2.2</i>	<i>+3.4</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.

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## 10. Real Return: Performance Summary Ending 12/31/2023

	Fourth Quarter	One Year	Three Year	Five Year	Ten Year
<b>Total Real Return</b>	1.0	-1.1	11.9	8.4	8.6
Real Return Benchmark	-0.9	-7.4	8.4	5.5	6.3
<i>Difference</i>	+1.9	+6.3	+3.5	+2.9	+2.3
<b>Real Estate</b>	-0.3	-5.4	10.6	8.5	10.3
Real Estate Benchmark	-2.1	-12.9	6.2	4.7	7.2
<i>Difference</i>	+1.8	+7.5	+4.4	+3.8	+3.1
<b>Energy, Natural Resources, and Infrastructure</b>	4.1	10.7	15.7	7.9	--
Energy and Natural Res. Benchmark	2.0	7.5	14.1	7.0	--
<i>Difference</i>	+2.1	+3.2	+1.6	+0.9	
<b>Commodities</b>	2.6	-4.2	4.5	11.1	-1.9
Commodities Benchmark	-10.7	-4.3	19.2	8.7	-3.6
<i>Difference</i>	+13.3	+0.1	-14.7	+2.4	+1.7

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 12/31/2023

---

	Fourth Quarter	One Year	Three Year	Five Year	Ten Year
Total Risk Parity	10.1	11.2	-1.1	4.1	4.2
Risk Parity Benchmark	8.8	7.8	-3.5	3.9	3.1
<i>Difference</i>	+1.3	+3.4	+2.4	+0.2	+1.1

*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.*

## 12. Cash Equivalents: Performance Summary Ending 12/31/2023

---

	Fourth Quarter	One Year	Three Year	Five Year	Ten Year
Cash Equivalents	1.8	6.6	3.0	2.4	2.5
Cash Benchmark	1.4	5.3	2.2	1.9	1.3
<i>Difference</i>	+0.4	+1.3	+0.8	+0.5	+1.2

*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.*

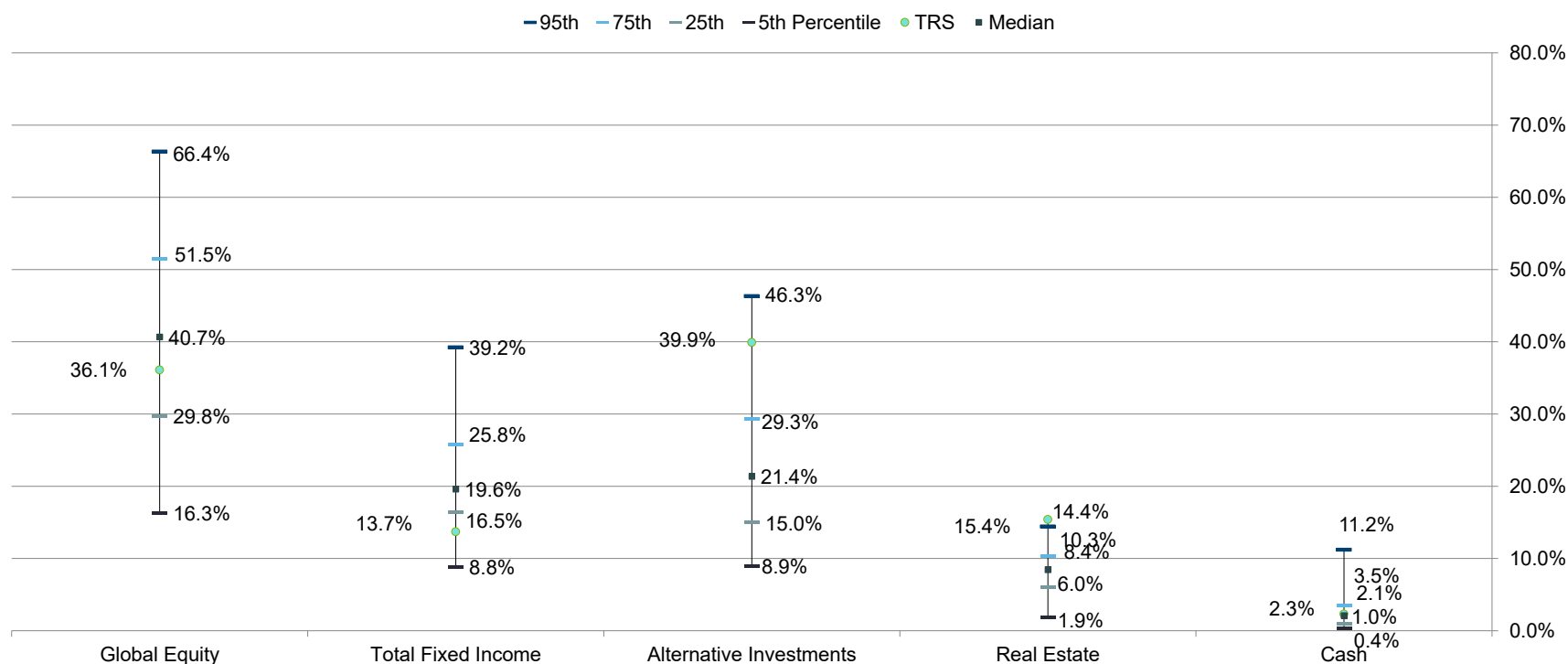
## Appendix – Supplemental Reporting



Investment management consulting services provided by Aon Investments USA Inc.

## TRS Commitment Levels vs. Peers (>\$10 Billion) as of 12/31/2023

- 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.

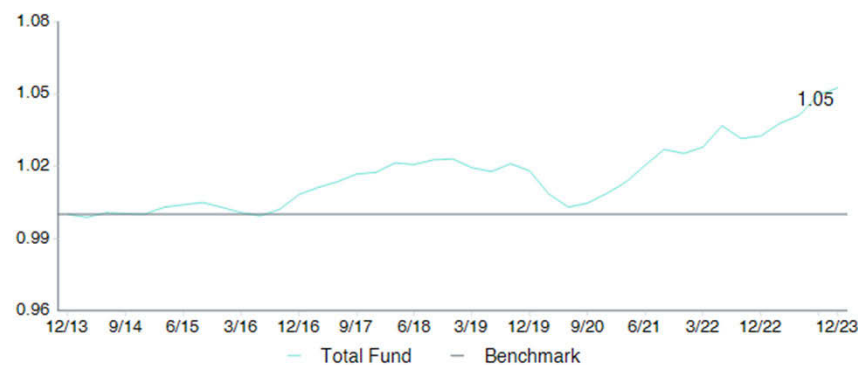




# Historical Excess Performance Ending 12/31/2023

## Total Fund vs. Total Fund Benchmark

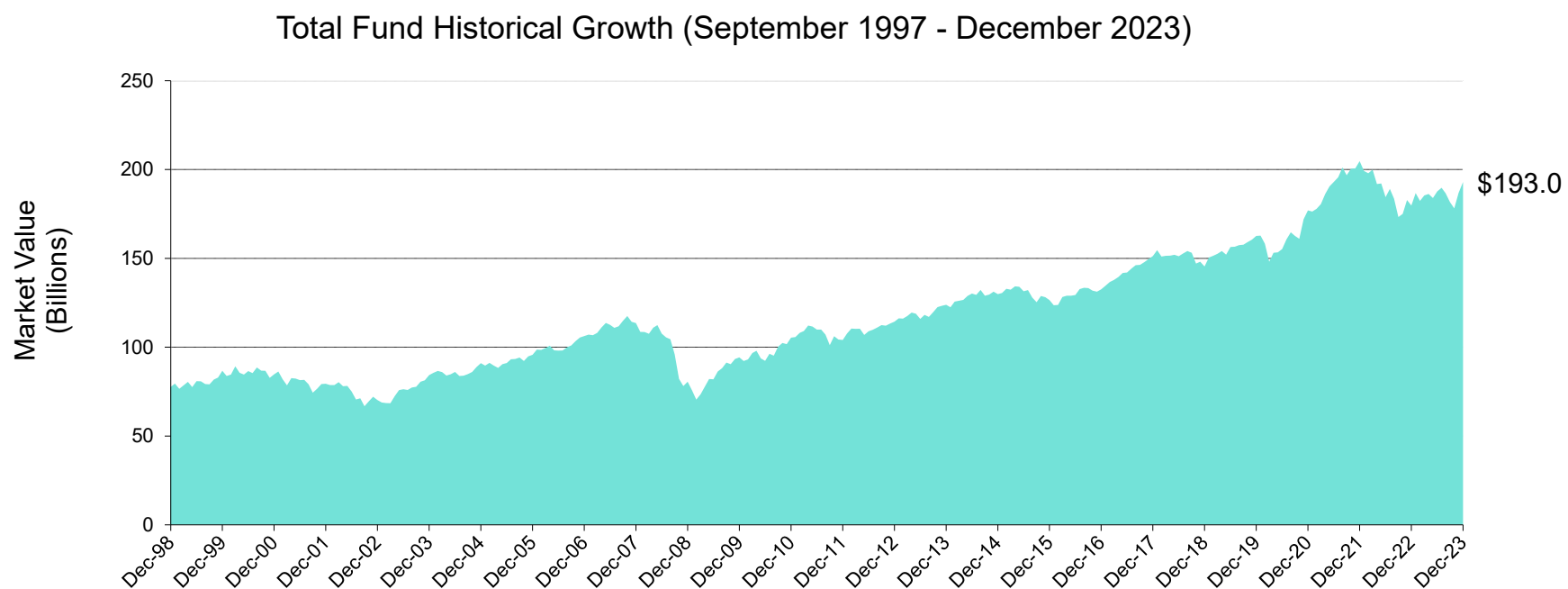
Ratio of Cumulative Wealth - 10 Years



Quarterly Excess Performance



# TRS Asset Growth



## External Manager Program: Public Equity Performance as of 12/31/2023

	Allocation (\$ in billions)	Fourth Quarter	One Year	Three Year	Five Year
<b>EP Total Global Equity</b>	<b>\$31.5</b>	<b>11.3</b>	<b>21.3</b>	<b>6.0</b>	<b>12.2</b>
EP Global Equity Benchmark	--	11.4	21.4	4.5	10.9
<i>Difference</i>	--	-0.1	-0.1	+1.5	+1.3
<b>EP U.S.A.</b>	<b>\$11.9</b>	<b>12.5</b>	<b>23.7</b>	<b>9.9</b>	<b>15.3</b>
EP U.S.A. Benchmark	--	12.1	26.3	8.7	15.3
<i>Difference</i>	--	+0.4	-2.6	+1.2	0.0
<b>EP Non-U.S. Developed</b>	<b>\$7.1</b>	<b>10.5</b>	<b>21.6</b>	<b>3.5</b>	<b>10.6</b>
MSCI EAFE + Canada Policy Index	--	10.6	17.9	4.3	8.4
<i>Difference</i>	--	-0.1	+3.7	-0.8	+2.2
<b>EP Emerging Markets</b>	<b>\$5.9</b>	<b>9.1</b>	<b>13.7</b>	<b>-2.2</b>	<b>6.9</b>
MSCI Emerging Markets Policy Index	--	10.4	14.8	-4.5	4.0
<i>Difference</i>	--	-1.3	-1.1	+2.3	+2.9
<b>EP World Equity</b>	<b>\$6.6</b>	<b>12.2</b>	<b>24.2</b>	<b>10.5</b>	<b>14.6</b>
EP World Equity Benchmark	--	11.5	22.7	5.8	12.1
<i>Difference</i>	--	+0.7	+1.5	+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.

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## External Manager Program: Stable Value/Total Program Performance as of 12/31/2023

	Allocation (\$ in billions)	Fourth Quarter	One Year	Three Year
<b>EP Total Stable Value</b>	<b>\$10.2</b>	<b>2.0</b>	<b>7.1</b>	<b>7.6</b>
EP Stable Value Benchmark	--	1.8	5.3	4.3
<i>Difference</i>	--	+0.2	+1.8	+3.3
<b>Total External Public Program</b>	<b>\$49.4</b>	<b>9.4</b>	<b>17.2</b>	<b>5.5</b>
EP External Public Benchmark	--	9.3	17.0	3.8
<i>Difference</i>	--	+0.1	+0.2	+1.7

*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 12/31/2023

	Allocation (\$ in billions)	Fourth Quarter	One Year	Three Year
<b>Public Strategic Partnership</b>	<b>\$7.7</b>	<b>12.2</b>	<b>14.8</b>	<b>0.2</b>
Public SPN Benchmark	--	11.6	15.5	-0.2
<i>Difference</i>	--	+0.6	-0.7	+0.4
<b>BlackRock</b>	<b>\$2.7</b>	<b>11.3</b>	<b>15.5</b>	<b>1.0</b>
<b>JP Morgan</b>	<b>\$2.7</b>	<b>13.3</b>	<b>14.3</b>	<b>0.1</b>
<b>Morgan Stanley</b>	<b>\$2.3</b>	<b>11.8</b>	<b>14.7</b>	<b>-0.4</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

---

**Total Fund Performance Benchmark – 16.3% MSCI U.S.A. IMI, 11.8% MSCI EAFE plus Canada Index, 8.1% MSCI Emerging Markets Index, 18.0% State Street Private Equity Index (1 quarter lagged), 14.5% Blmb. Barc. Long Term Treasury Index, 4.5% HFRI FoF Conservative Index, 2.0% Citigroup 3 Mo. T-Bill Index, 16.5% NCREIF ODCE Index (1 quarter lagged), 7.1% Energy and Natural Resources Benchmark, 7.2% Risk Parity Benchmark, and -6.0% Asset Allocation Leverage Benchmark.**

**Global Equity Benchmark – 30.1% MSCI U.S.A. IMI, 21.8% MSCI EAFE plus Canada Index, 14.9% MSCI Emerging Markets Index, and 33.2% 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)

## Benchmarks (cont'd)

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### **Stable Value Benchmark – 76.4% Blmb. Barc. Long Term Treasury Index and 23.6% 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 – 70.0% NCREIF ODCE Index and 30.0% 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.  
$$\text{Allocation Effect calculation} = (\text{Asset Class Benchmark Return} - \text{Total Benchmark Return}) \times (\text{Actual Weight of Asset Class} - \text{Target Policy Weight of Asset Class})$$
- 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. 
$$\text{Cash Flow Effect calculation} = (\text{Total Fund Actual Return} - \text{Total Fund Policy Return}) - \text{Current Selection Effect} - \text{Current Allocation Effect}$$
  - **Benchmark Effect** results from the weighted average return of the asset classes' benchmarks being different from the Total Funds' policy benchmark return. 
$$\text{Benchmark Effect calculation} = \text{Total Fund Policy Return} - (\text{Asset Class Benchmark Return} \times \text{Target Policy Weight of Asset Class})$$
- **Cumulative Effect**  
$$\text{Cumulative Effect calculation} = \text{Current Effect } t \times (1 + \text{Cumulative Total Fund Actual Return } t-1) + \text{Cumulative Effect } t-1 \times (1 + \text{Total Fund Benchmark Return } t)$$



## Disclaimers and Notes



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# Disclaimers and Notes

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- The client portfolio data presented in this report have been obtained from the custodian. Aon has compared this information to the investment managers' reported returns and believes the information to be accurate. Aon has not conducted additional audits and cannot warrant its accuracy or completeness. This document is not intended to provide, and shall not be relied upon for, accounting and legal or tax advice.
- 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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ATTN: Aon Investments Compliance Officer

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# Annual Review of Public Markets

Dale West, Senior Managing Director, Public Markets  
Brad Gilbert, Managing Director, External Public Markets  
Mohan Balachandran, Senior Managing Director,  
Multi-Asset Strategies  
Kyle Schmidt, Director, Multi-Asset Strategies

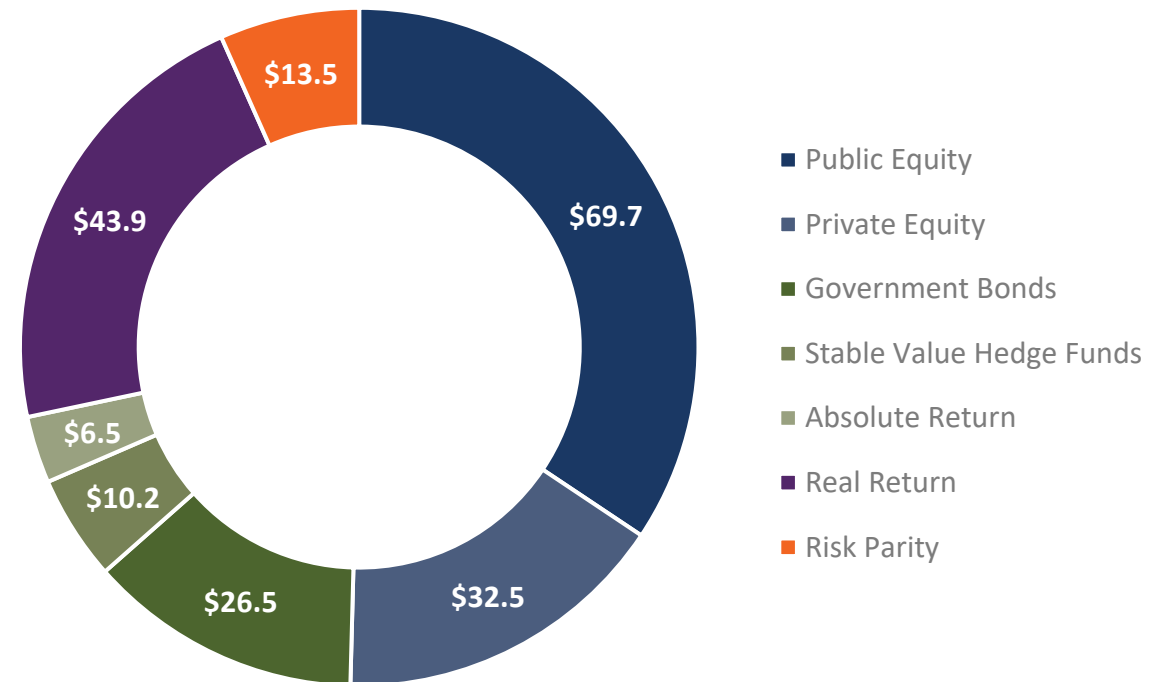
May 2024



# Agenda

- I. Public Equity
- II. Stable Value Hedge Fund
- III. Absolute Return

**TOTAL TRUST as of  
December 31, 2023**  
*in billions*



Trust Investment Exposure	\$202.7
Cash/Asset Allocation Leverage	(\$9.7)
<b>Total Trust</b>	<b>\$193.0</b>

# Public Markets Overview

## Internal Fundamental (IFM)

No. of People: 21

AUM: \$11.4B

Mission: Develop and invest across a collection of boutique strategies implemented by internal teams using predominantly fundamental research.

## External Public Markets (EPU)

No. of People: 12

AUM: \$49.5B

Mission: Identify and invest with external managers to access strategies which complement internal TRS capabilities. Mandates include equity funds, hedge funds and Strategic Partnerships.

## Multi-Asset Strategies (MSG)

No. of People: 18

AUM: \$16.2B

Mission: Create value by using quantitative analysis to systematically identify and capitalize on opportunities across all public assets with a disciplined and risk-managed approach.

## Special Opportunities (SO)

No. of People: 6

AUM: \$6.5B

Mission: Capture unique and niche investments for the Trust. Investments are predominantly public market co-investments and illiquid credit.

## Public Markets Analytics (PuMA)

No. of People: 7

Mission: Provide timely, high-quality data and analysis to enhance investment understanding and decisions across Public Markets.

## Rotational Analyst Program (RAP)

No. of People: 5

Mission: Attract and train high-potential early career investors who rotate among Public Markets groups during a 3-year program.

# Philosophy

---

## Active Management

We believe active management will add value over time

## Factors

Targeting factors that are compensated in the long run, such as value, is a key active strategy

## Internal

We prefer to manage strategies internally when we have the resources and skills to compete with external managers

## External

When we don't have internal capabilities, we can select external managers who will add value net of fees

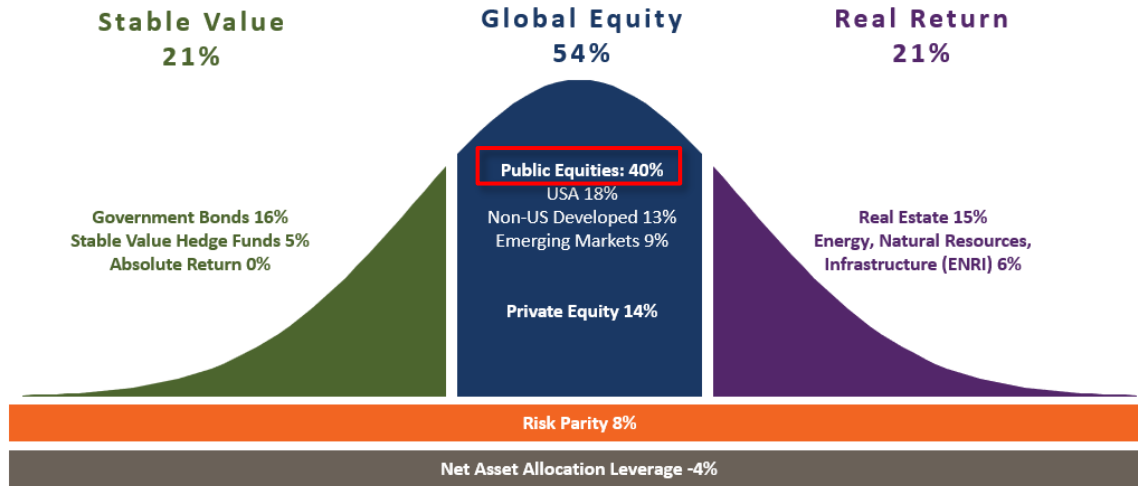
## Efficient Markets

Active management is most successful in less efficient markets, including international and small caps

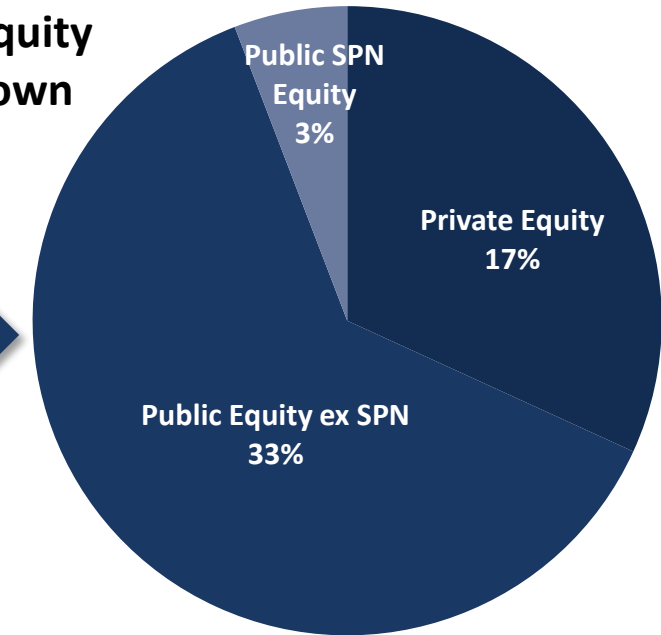


# Global Equity Overview

Global Equity's role in the Trust:



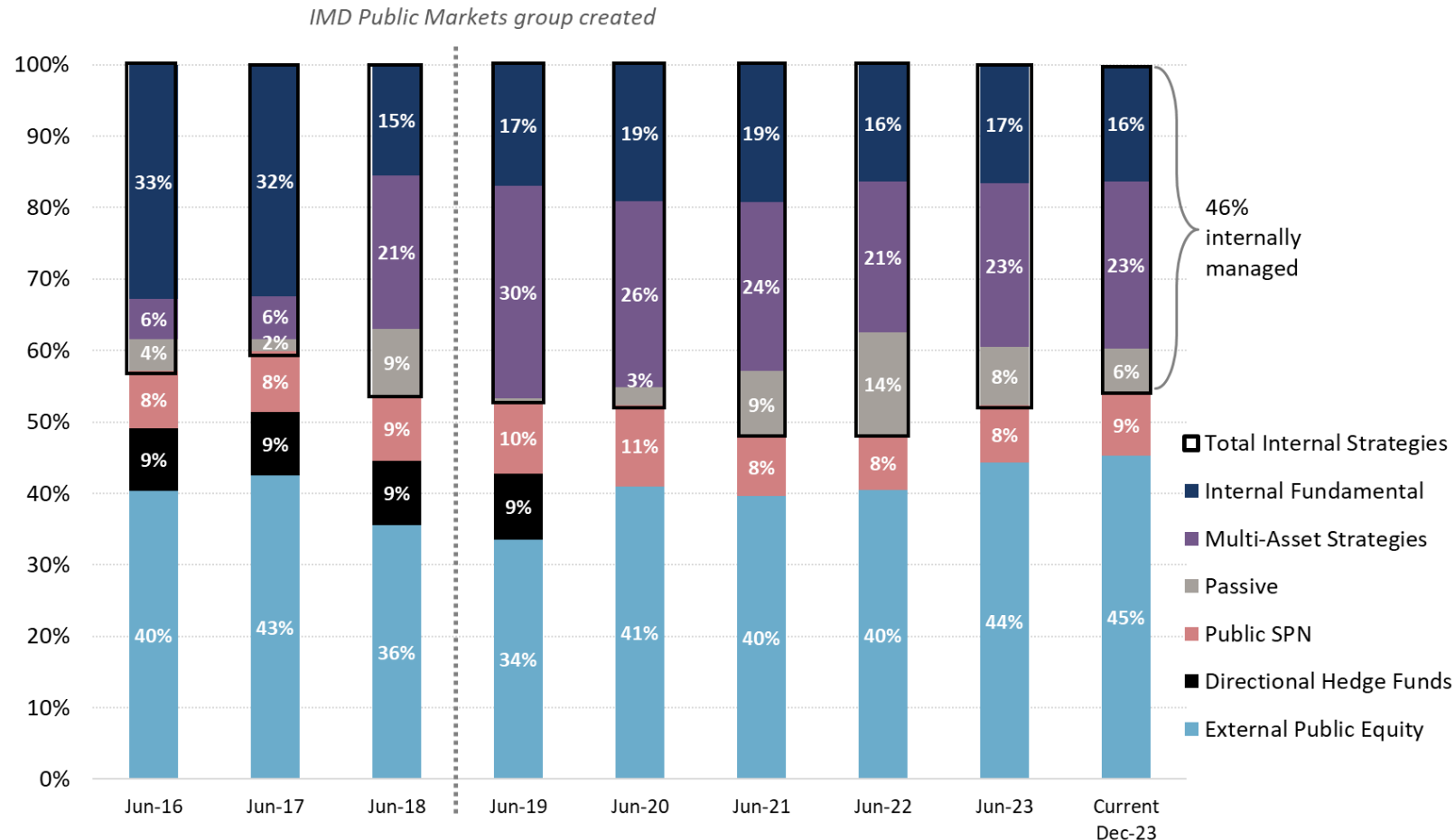
## Global Equity Breakdown



Public Equity Portfolio		
As of 12/31/2023	Assets (in billions)	Assets % of Trust
External Manager/ Public SPN	\$37.5	19%
Multi-Asset Strategies	16.2	8%
Internal Fundamental	11.4	6%
Passive & Transition	4.5	2%
<b>Total Public Equity</b>	<b>\$69.5</b>	<b>36%</b>

# Internal & External Management

## Public Equity Split by Strategy Group



# Public Equity Performance

Public Equity Portfolios excluding Strategic Partnership						
As of December 31, 2023						
	Assets (\$ millions)	Assets (percent of Trust)	1-Year		3-Year (Annualized)	
			Return (%)	Alpha (bp)	Return (%)	Alpha (bp)
<b>US</b>	<b>\$23,160</b>	<b>12.0</b>	<b>24.8</b>	<b>-146</b>	<b>10.0</b>	<b>124</b>
TRS USA Benchmark			26.3		8.7	
<b>Non-US Developed</b>	<b>18,805</b>	<b>9.7</b>	<b>18.9</b>	<b>98</b>	<b>3.5</b>	<b>-85</b>
TRS Non-US Developed Benchmark			17.9		4.3	
<b>Emerging Markets</b>	<b>14,155</b>	<b>7.3</b>	<b>15.3</b>	<b>47</b>	<b>-3.5</b>	<b>102</b>
TRS Emerging Market Benchmark			14.8		-4.5	
<b>World Equity</b>	<b>7,458</b>	<b>3.9</b>	<b>24.0</b>	<b>128</b>	<b>10.5</b>	<b>469</b>
TRS Custom World Benchmark			22.7		5.8	
<b>Total Public Equity</b>	<b>\$63,578</b>	<b>32.9</b>	<b>20.9</b>	<b>-3</b>	<b>5.2</b>	<b>75</b>
Public Equity Policy Benchmark			20.9		4.4	

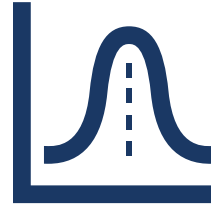
- Public equity portfolios were in line with strong equity markets in 2023, with international portfolios outperforming. In aggregate, the portfolio outperformed for the three-year period.
- The portfolios generated \$5M in relative dollar value added (RDVA) in 2023 and \$1,351M over the last three years

# Special Topic: Internal Quantitative Strategies



## SCALE

- \$17 Billion AUM
- \$24 Billion Gross Exposure
- \$3 Billion Short Exposure
- \$1.84 Billion 3 Year RDVA



## RISK

- 3% Tracking Error
- \$510 Million Annual Risk Budget



## IMPLEMENTATION

- \$40 Billion Annual Turnover
- 5,117 Positions
- Global Execution across entire capitalization spectrum

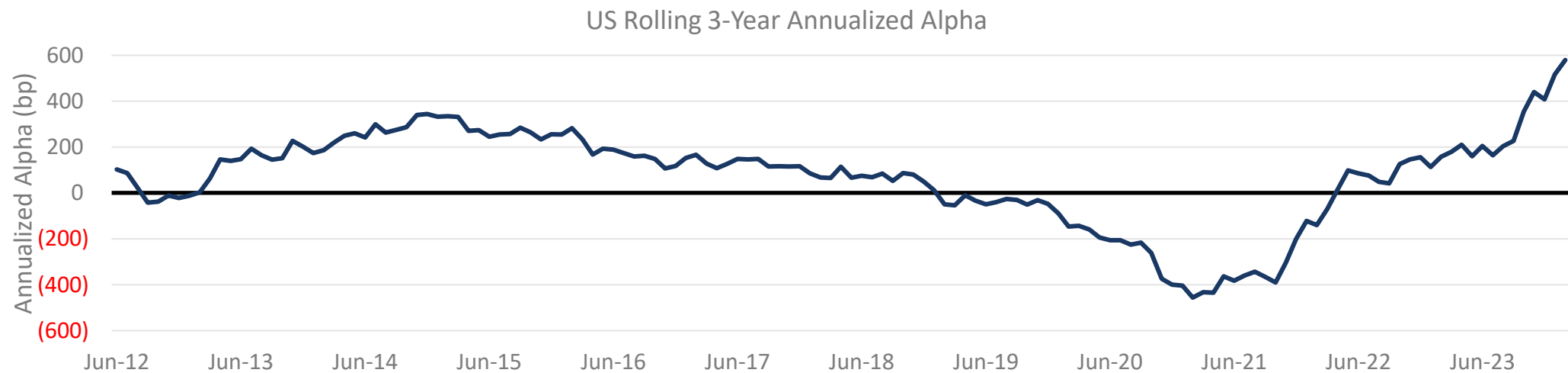
Core philosophy underlying the portfolios is Continuous Improvement and Innovation

- Acknowledge that markets are constantly evolving, and portfolios need to respond accordingly
- Successful portfolios requires continuous improvement of product design in the areas of Data, Technology and Processes

# Special Topic: Internal Quantitative Strategies

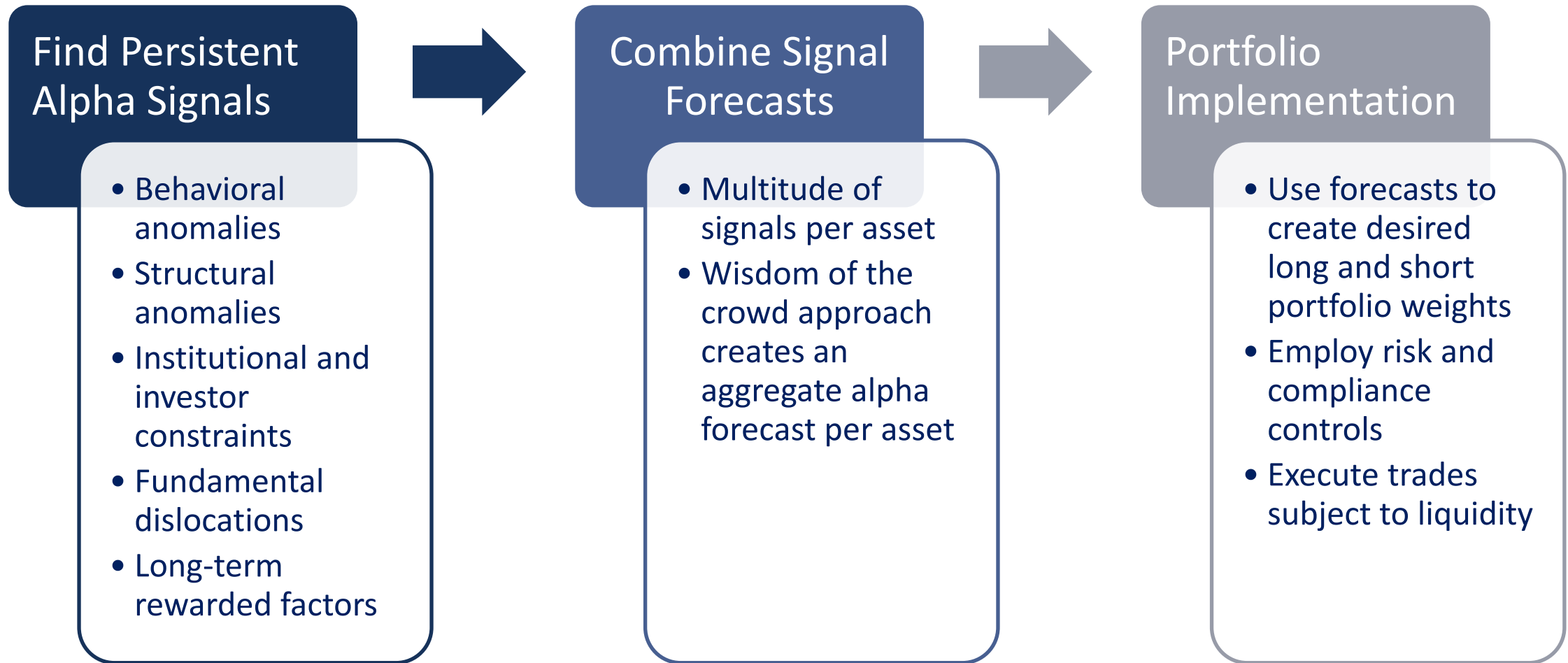
## Performance Summary

Internal Quantitative Equity Portfolios as of February 2024								
Portfolio	Return (%)				Alpha (bp)			
	1-Year	3-Year	5-Year	Inception	1-Year	3-Year	5-Year	Inception
US	34.0	15.9	15.2	15.3	536	579	113	119
Non-US Developed	17.8	7.7	6.9	7.4	344	301	2	109
Emerging Markets	16.9	-3.9	2.8	4.9	283	167	40	50
<b>Internal Quant Total</b>	<b>26.0</b>	<b>9.2</b>	<b>10.0</b>	<b>11.4</b>	<b>427</b>	<b>400</b>	<b>63</b>	<b>121</b>



# Special Topic: Internal Quantitative Strategies

Quant 101



# Special Topic: Internal Quantitative Strategies

## Quant 101 Example: Systematizing the Buffett Approach Using Quality and Value Signals

“Long ago, Ben Graham taught me that price is what you pay; **Value** is what you get. Whether we’re talking about socks or stocks, I like buying **Quality** merchandise when it is marked down.”

- Warren Buffett

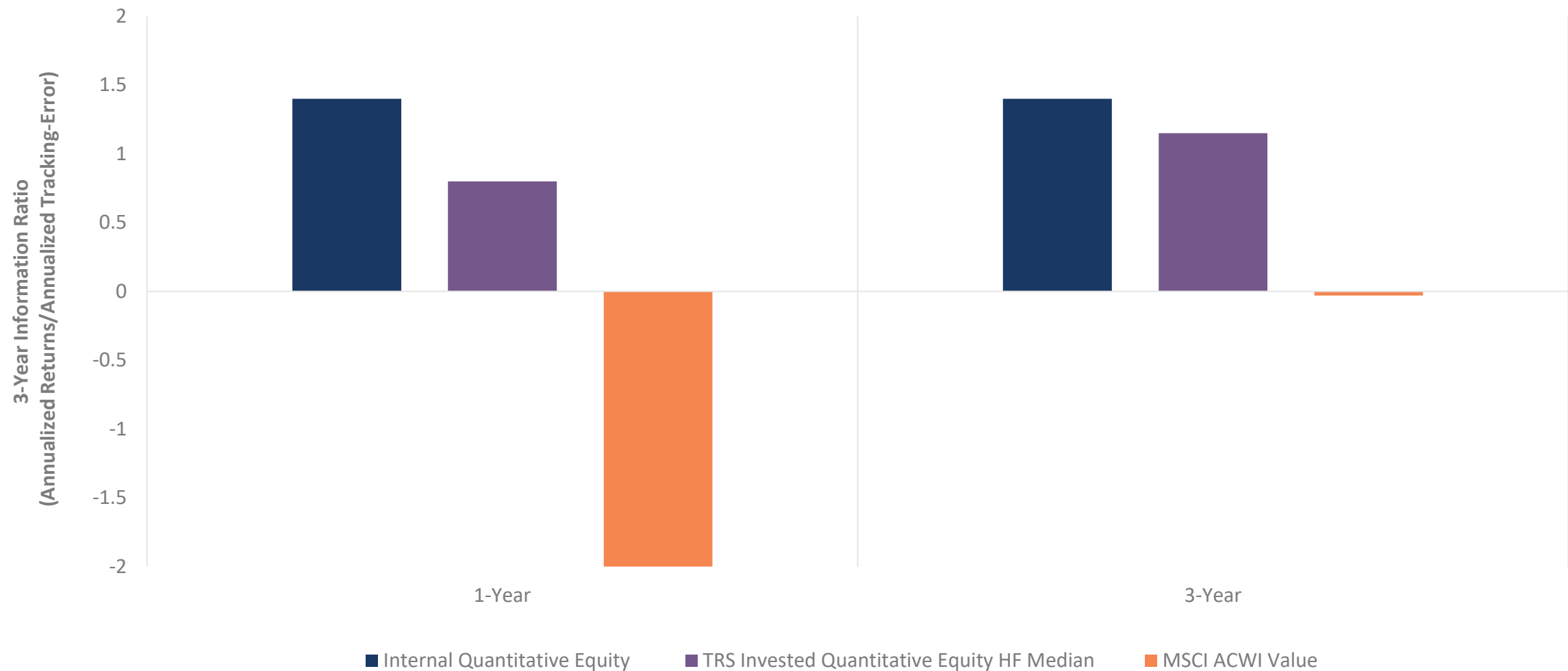
- **Value:** Typically consists of ratios that help you determine what fundamental return you get for the price you are paying:
  - Price/Earnings, Price/Sales, Price/Cash-Flow, etc.
- **Quality:** Typically consists of measures that help you determine the consistency of fundamental returns:
  - Return on Equity, Return on Assets, Profit Margins, etc.



Note: This is a fictitious example of a quant strategy that could be built using a Buffett-like Value + Quality approach. Real TRS research signal Quality and Value composites as-of February 2024 are used to give an example of a few of the long and short names that a quant portfolio utilizing this approach may have held.

# Special Topic: Internal Quantitative Strategies

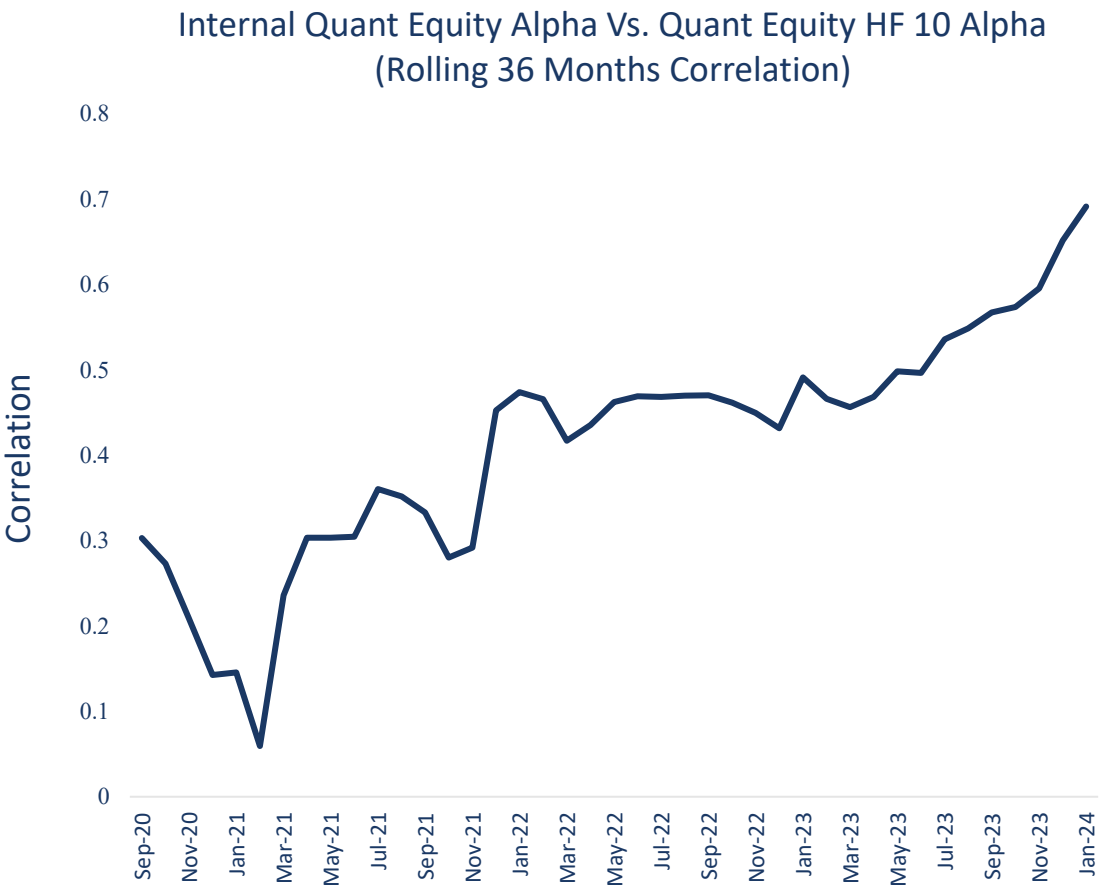
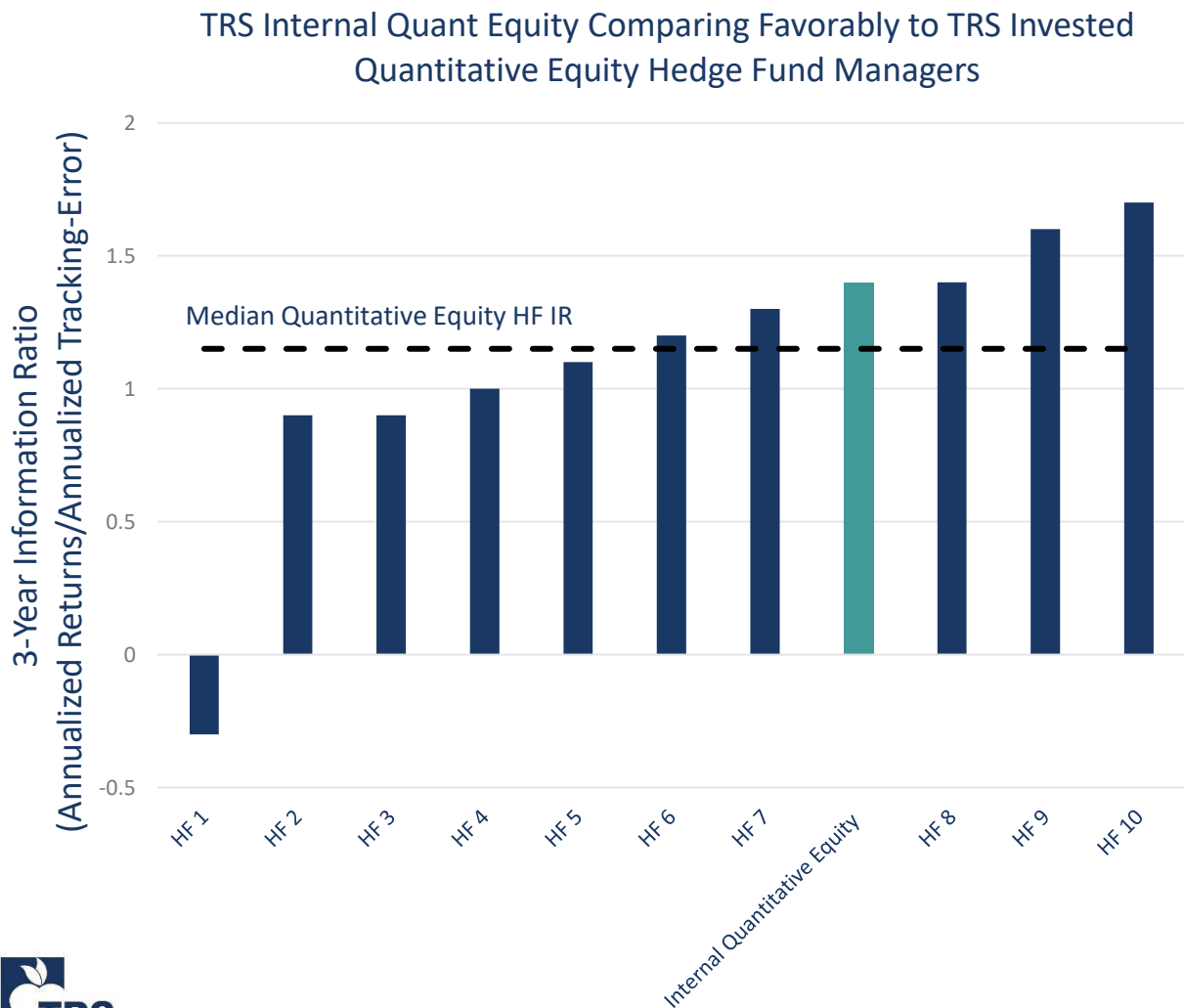
TRS Internal Portfolios compare well to External Quant Hedge Funds and differentiated from Value





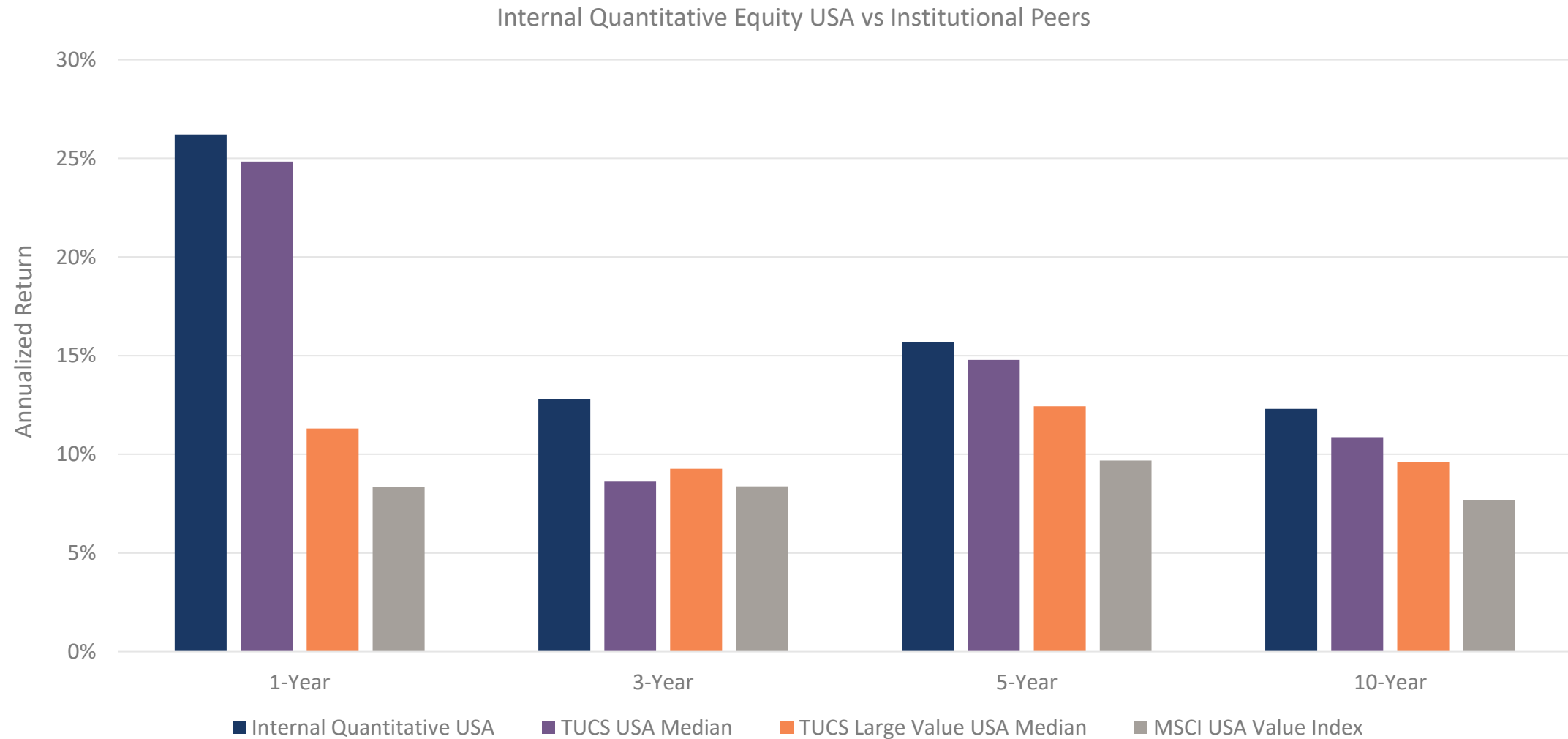
# Special Topic: Internal Quantitative Strategies

## Comparing TRS Portfolios to Sophisticated External Managers



# Special Topic: Internal Quantitative Strategies

## Internal Quantitative Equity USA Compares Favorably to Institutional Peers and Value



# Special Topic: Internal Quant Equity

## Continuous Improvement

---

- Move to cloud infrastructure
  - Improve ability to handle larger complex data sets
  - Development of faster signals
- Modernizing software development
  - Redevelopment of codebase to incorporate newer signals and rapid rebalances
- Expanded use of Machine Learning and AI techniques
  - Signal research and combination as well as risk management
- Improved execution
  - Ensure ability to quickly implement continuous portfolio rebalances

# Public Markets SPN

*Performance as of December 31, 2023*

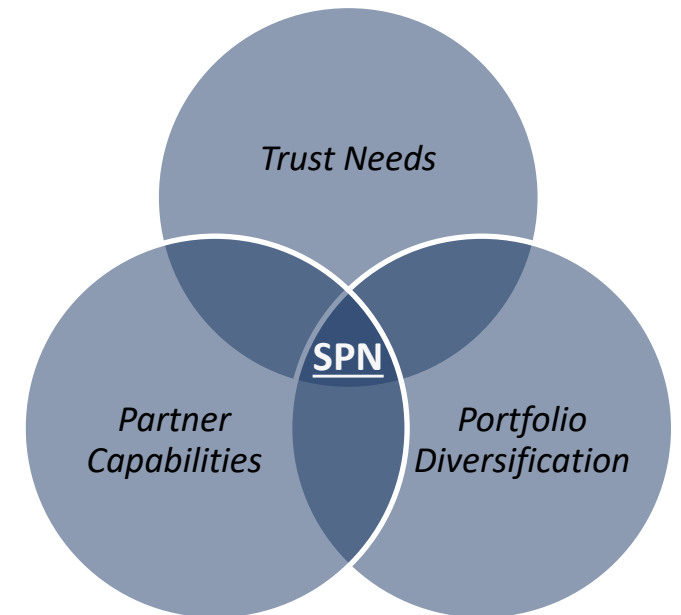
Program	Assets		Annualized Return			Annualized Alpha		
	NAV (\$, millions)	% of Trust	1-Year	3-Year	Since Inception	1-Year	3-Year	Since Inception
BlackRock	\$2,674	1.4%	+15.5%	1.0%	<b>7.0%</b>	+4bp	+118bp	<b>+114bp</b>
JP Morgan	2,678	1.4	+14.3	0.1	<b>6.9</b>	-117	+28	<b>+106</b>
Morgan Stanley	2,312	1.2	+14.7	-0.4	<b>6.1</b>	-82	-15	<b>+23</b>
<b>Total Public SPN<sup>1</sup></b>	<b>\$7,664</b>	<b>4.0%</b>	<b>+14.8%</b>	<b>0.2%</b>	<b>6.6%</b>	<b>-65bp</b>	<b>+45bp</b>	<b>+75bp</b>

## Multi-Asset SPN Portfolio Objectives:

- Outperform custom benchmark with same public markets objectives and constraints as TRS
- Deliver best-in-class resources to Texas

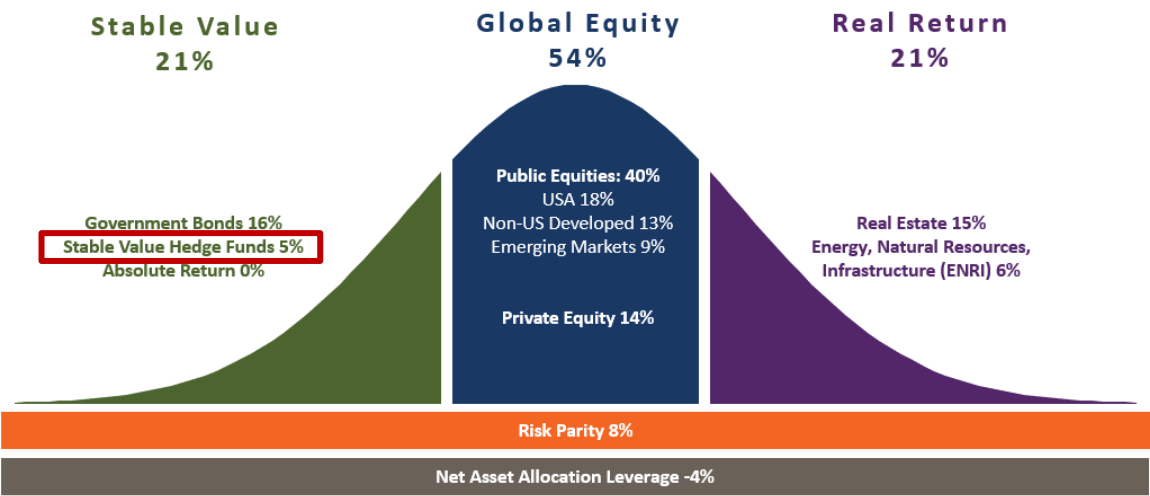
## Achievements:

- More than \$1.3 billion in relative dollar value added since inception
- Diversified portfolios result in better risk adjusted returns
- Customized research projects, conferences, deep dives, insight series

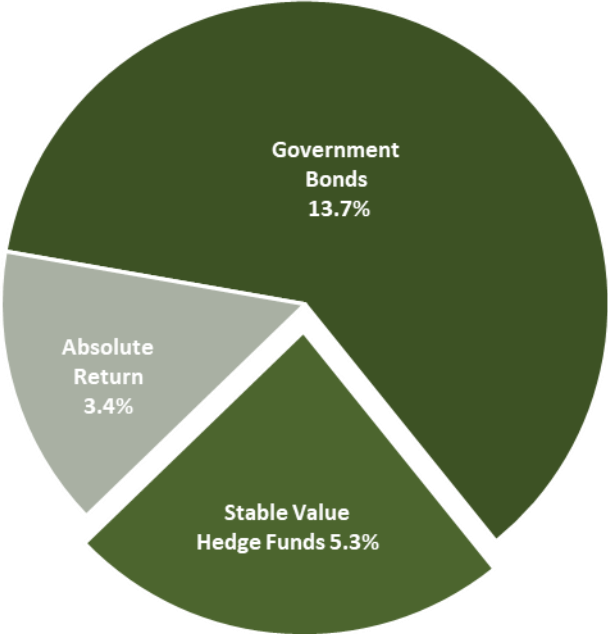


# Stable Value Overview

## Stable Value's role in the Trust:



## Stable Value Breakdown



STABLE VALUE HEDGE FUND PORTFOLIO		
As of 12/31/2023	Assets (in billions USD)	Assets (percent of Trust)
Equity Market Neutral	\$3.51	1.8%
Macro and Commodities	2.2	1.2%
Fixed Income	0.1	0.1%
Multi-Strategy	2.1	1.1%
Trends and Volatility	1.3	0.7%
Reinsurance	0.8	0.4%
<b>Total Portfolio</b>	<b>\$10.16</b>	<b>5.3%</b>






# Stable Value Hedge Fund Performance

Stable Value Hedge Funds As of December 31, 2023							
	Assets (in millions)	1-Year		3-Year		Since Inception October 2011	
		Return (%)	Alpha (bp)	Return (%)	Alpha (bp)	Return (%)	Alpha (bp)
<b>Stable Value Hedge Funds</b>	<b>\$10,162</b>	<b>7.1</b>	<b>179</b>	<b>7.6</b>	<b>334</b>	<b>5.5</b>	<b>178</b>
<i>HFRI Fund of Funds Conservative Index</i>		5.3		4.3		3.8	

Returns and excess returns are annualized for periods longer than one year.

- SVHF outperformance in 2023 was driven by strong performance in Reinsurance and Equity Market Neutral strategies.
  - Performance among macro hedge funds was mixed, and trend-following strategies lagged
- SVHF has been a consistent outperformer over longer time periods
  - Over 3 years, SVHF added \$911 million in relative dollar value add (RDVA) versus the policy benchmark
  - Since inception, SVHF added \$1,642 million in RDVA versus the policy benchmark

# Stable Value Hedge Fund Portfolio

Stable Value Hedge Fund Objectives	Status	Details
<b>Hedge Fund Types</b> Focus on absolute return hedge funds		<ul style="list-style-type: none"> <li>• Return: 5.5%<sup>1</sup></li> <li>• Sharpe Ratio: 1.4</li> </ul>
<b>Market Sensitivity and Risk</b> Core strategies have low to negative market sensitivity		<ul style="list-style-type: none"> <li>• Correlation to Global Equities<sup>2</sup>: 0.2</li> <li>• Beta to Global Equities: 0.0</li> </ul>
<b>Market Regime Performance</b> Expected to have positive returns when markets are down		<ul style="list-style-type: none"> <li>• Outperformed equities in every down month for stocks, by an average of 3.8%</li> <li>• Positive returns in 73% of 51 down equity months since October 2011</li> </ul>
<b>Performance versus US Treasuries</b> Expected to outperform US Treasuries over the long term		<ul style="list-style-type: none"> <li>• 5.5% return versus Treasuries<sup>3</sup> 1.2%;</li> <li>• 3.1% volatility versus Treasuries 12.5%</li> <li>• 12/31/23 10-year Treasury yield-to-maturity: 3.9%</li> </ul>
<b>Performance versus Benchmark</b> Stable Value HF benchmark <sup>4</sup> with target tracking error of 4%		<ul style="list-style-type: none"> <li>• 1.8% ahead of Stable Value HF benchmark since inception</li> <li>• Tracking error of 2.7%</li> </ul>

Sources: State Street Bank, Bloomberg

Note: Performance is annualized and is net of fees

<sup>1</sup>Dates: October 2011 (inception) to December 2023

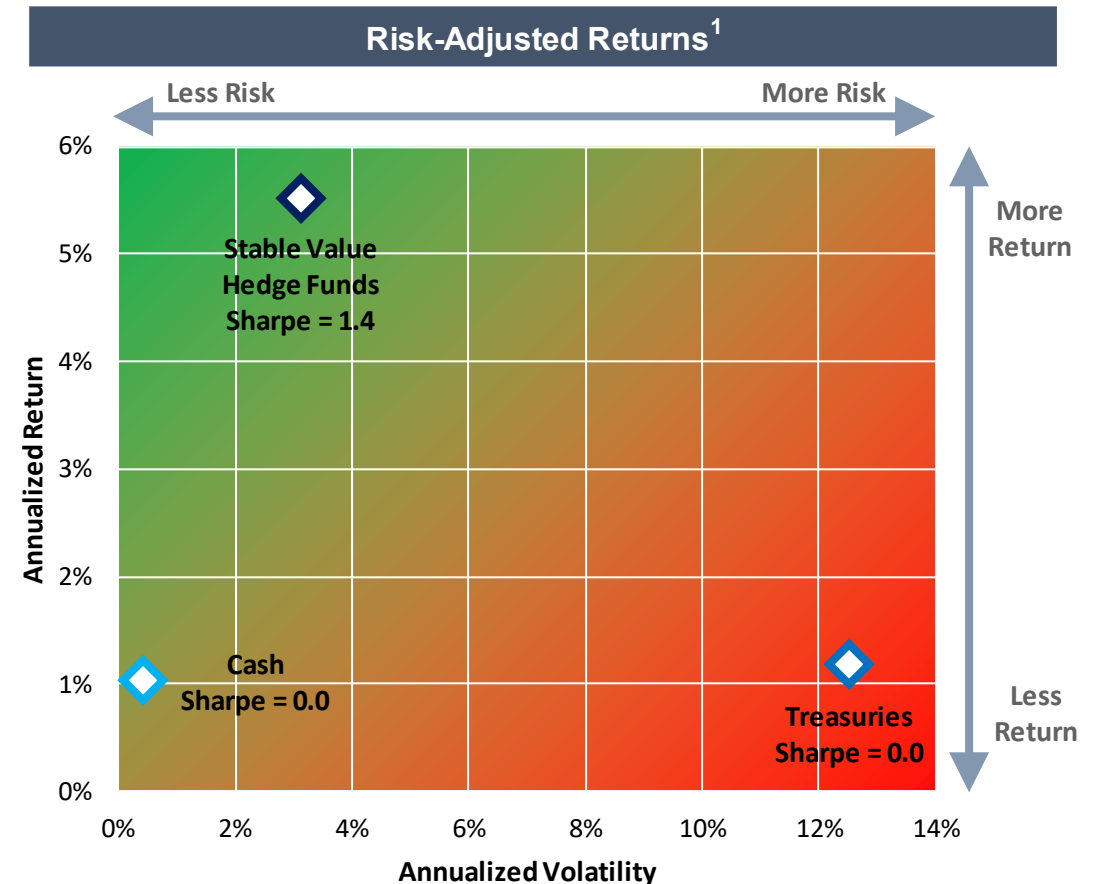
<sup>2</sup>MSCI All Country World Index

<sup>3</sup>Bloomberg Barclays US Long Treasury Total Return Index

<sup>4</sup>HFRI Fund of Funds Conservative Index

# Stable Value Hedge Funds and Treasuries

- Stable Value Hedge Funds have generated more than 4x the return of Treasuries on one quarter of the volatility, since inception
- Yields on Treasuries remain at levels well below the historical performance of Stable Value Hedge Funds
- Stable Value Hedge Funds remain an important absolute return asset for the Trust



<sup>1</sup> Dates: October 2011 (inception) to December 2023

<sup>2</sup> Return of Bloomberg US Long Treasury Total Return Index

<sup>3</sup> Return of Citigroup 3-month Treasury Bill



# Public Markets 2024 Priorities

---

- Taking advantage of opportunities resulting from market turbulence
- Preparing for necessary adjustments to the equity portfolio from SAA changes
- Improving fee alignment when cash rates are high
- Continuing to develop risk management and hedging tools as we pursue more specialized strategies such as sector and single-country funds
- Pursuing attractive absolute return opportunities while the equity risk premium appears low
- Maintaining a culture that is collaborative and accountable

# APPENDIX

# Public Markets Senior Leadership Team



**Dale West, CFA**  
**Sr. Managing Director**  
MBA, Stanford



**Mark Albert, CFA**  
**Director**  
MBA, University of Michigan



**Mohan Balachandran, PhD**  
**Sr. Managing Director**  
PhD, Physics, Brown University



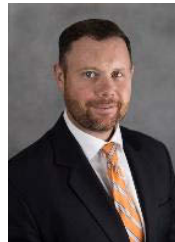
**Ashley Baum, CFA, CPA**  
**Managing Director**  
MPA, UT Austin



**Patrick Cosgrove, CFA**  
**Director**  
MBA, St. Mary's University



**Jean-Benoit Daumerie, CFA**  
**Director**  
MBA, Rice University



**Brad Gilbert, CFA, CAIA**  
**Managing Director**  
BBA, UT Austin



**Joel Hinkhouse, CFA**  
**Director**  
MBA, University of Chicago



**Matt Talbert, PhD**  
**Director**  
PhD, Economics, UT Austin



**KJ Van Ackeren, CFA**  
**Managing Director**  
MBA, Texas Christian University



**Kyle Wynne, CFA, FRM**  
**Director**  
MS, University of Chicago

- Five distinct groups with one leadership team
- One comprehensive view of portfolio construction
- Improved communication and alignment

# External Public Markets



**Brad Gilbert, CFA, CAIA**  
**Managing Director**  
**Head of External Public Markets**  
BBA, UT Austin

**EXPERIENCE SUMMARY**  
8 CFA Charterholders  
7 Master's Degrees  
5 CAIA Charterholders  
1 Certified FRM



**Jean-Benoit Daumerie, CFA**  
**Director**  
MBA, Rice University



**Scott Gonsoulin, CFA**  
**Director**  
MS, Texas A&M



**Joel Hinkhouse, CFA**  
**Director**  
MBA, University of Chicago



**Lulu Llano, CFA**  
**Director**  
BBA, UT Austin



**Steven Wilson, CAIA**  
**Director**  
MBA, Rice University



**John Hall, CFA**  
**Investment Manager**  
MBA, London Business School



**McKenna Phillips, CFA, CAIA**  
**Sr. Associate**  
BBA, UT Austin



**Sibe Wen, CFA, CAIA, FRM**  
**Sr. Associate**  
MS, UT Austin



**Michael Ijeh, CAIA**  
**Associate**  
MA, George Mason

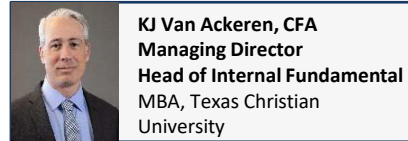


**Mindu Dasanayake**  
**Sr. Analyst**  
BBA, UT San Antonio

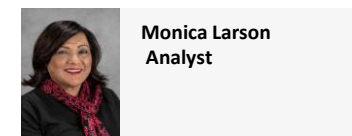
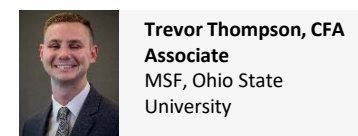
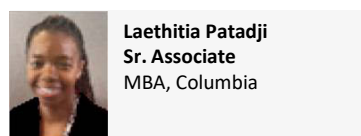
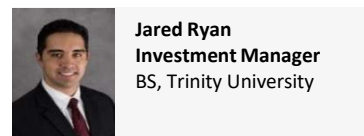
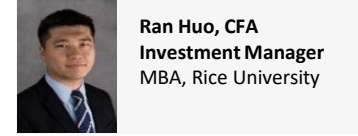
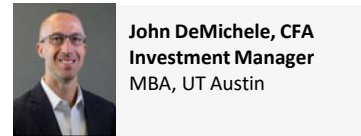
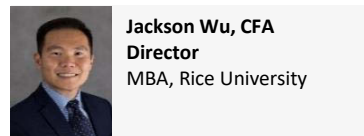
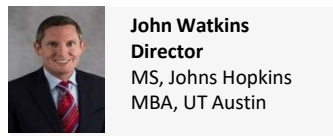
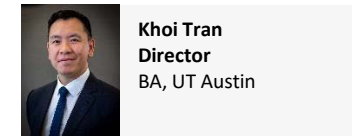
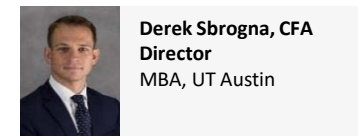
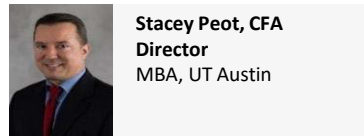
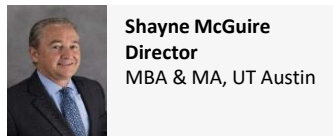
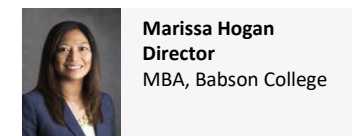
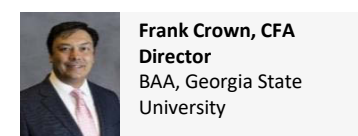
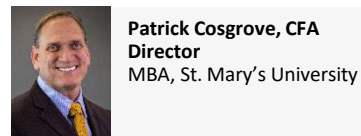
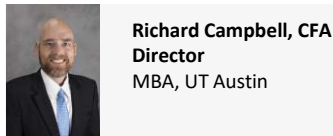


**Jon Klekman**  
**Analyst**  
BA, SUNY Binghamton

# Internal Fundamental



**EXPERIENCE SUMMARY**  
14 CFA Charterholders  
18 Master's Degrees



# Multi-Asset Strategies



## EXPERIENCE SUMMARY

5 PhD Degrees  
3 CFA Charterholders  
1 CPA  
12 Master's Degrees



**Mark Albert, CFA**  
Director  
*MBA, University of Michigan*



**Ryan Leary, CFA**  
Director  
*MBA, Rice University*



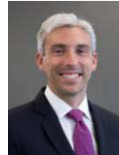
**Kyle Schmidt**  
Director  
*MBA, SMU*



**Wayne Speer, CFA**  
Director  
*MBA, SMU*



**Matt Talbert, PhD**  
Director  
*PhD, UT Austin*



**Solomon Gold**  
Investment Manager  
*MS, UT Austin*



**Sudhanshu "Sunny" Pathak**  
Investment Manager  
*MS, Columbia University*



**Gabriel Salinas, PhD**  
Investment Manager  
*PhD, UT Austin*



**Yan Zhang**  
Investment Manager  
*MBA, University of Chicago*



**Paul Nguyen**  
Senior Associate  
*MS, University of Virginia*



**Anthony Paolini, CPA**  
Senior Associate  
*MPA, UT Austin*



**Eddie Pluhar, PhD**  
Senior Associate  
*PhD, University of Missouri*



**Bardia Farajnejad**  
Associate  
*MS, UCLA Anderson*



**Peter Ruymgaart, PhD**  
Associate  
*PhD, UT Austin*



**Chris Steeves**  
Associate  
*MS, UT Austin*



**Arjun Mudunuru**  
Contractor  
*MS, UT San Antonio*



**Gabriela Ramirez**  
Administrative Assistant

# Public Markets Analytics



**Kyle Wynne, CFA, FRM**  
**Director**  
**Head of Public Markets Analytics**  
MS, University of Chicago

**EXPERIENCE SUMMARY**  
1 CFA Charterholder  
3 Master's Degrees Holders  
1 Certified FRM



**Kevin Taylor**  
**Investment Manager**  
MS, UT Austin



**Chad White**  
**Sr. Associate**  
MSF, Tulsa  
MS, MS&T



**Lamont Colter**  
**Associate**  
BS, Texas State University



**Irma A. Martinez**  
**Sr. Analyst**  
BBA, St. Edwards



**Logan Deboo**  
**Analyst**  
BA, University of British Columbia



**John Onyango**  
**Analyst**  
BBA, Texas State University

# Rotational Analyst Program

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**KJ Van Ackeren, CFA**  
**Managing Director**  
**Head of Internal Fundamental**  
MBA, Texas Christian  
University

**EXPERIENCE SUMMARY**  
2 Master's Degrees



**Drew Gambrell**  
**Sr. Analyst**  
MSF, Texas A&M



**Thomas Sharron**  
**Sr. Analyst**  
MPA, BBA, UT Austin



**Joseph Cavazos**  
**Analyst**  
BBA, UT Austin



**Yui Chu**  
**Analyst**  
BA, NYU



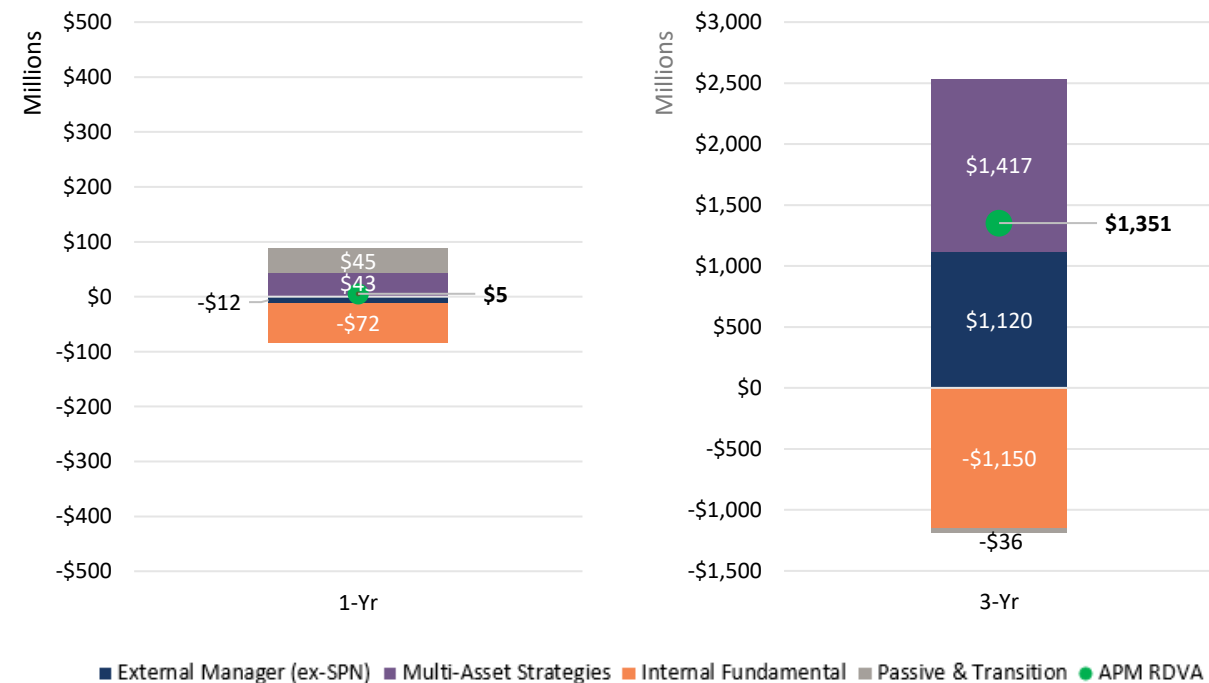
**Ariel Furman**  
**Analyst**  
BS, UT Dallas



# Public Equity Performance by Strategy Group

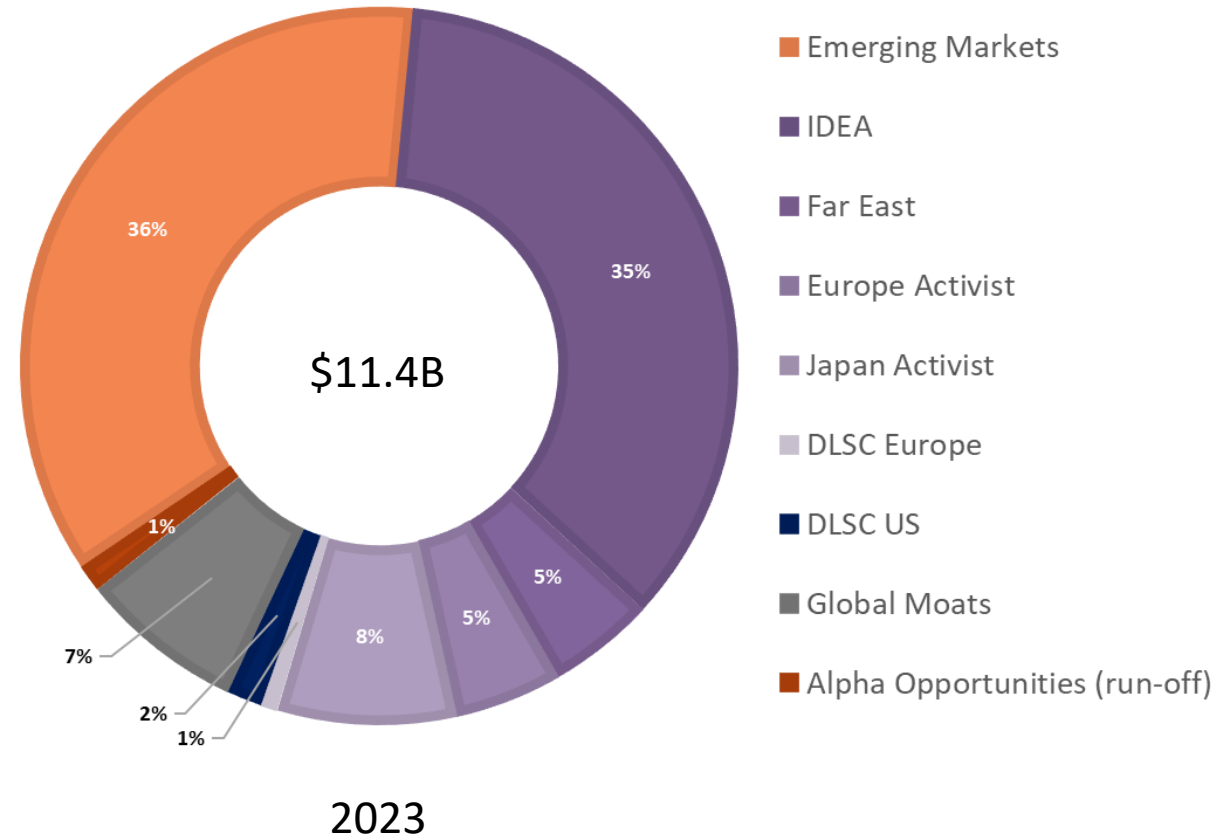
- Internal quantitative strategies were the top contributor to outperformance versus equity benchmarks on a 1- and 3- year basis
- External managers added value across all time horizons
  - In 2023, external managers focused on the USA were unable to keep up with strong and narrow markets
- For 2023, internal fundamental portfolios in emerging markets and international mid-cap contributed positively, offset by underperformance in developed market large cap strategies

Public Equity Relative Dollar Value Added  
as of December 31, 2023



# Internal Fundamental Portfolio Mix

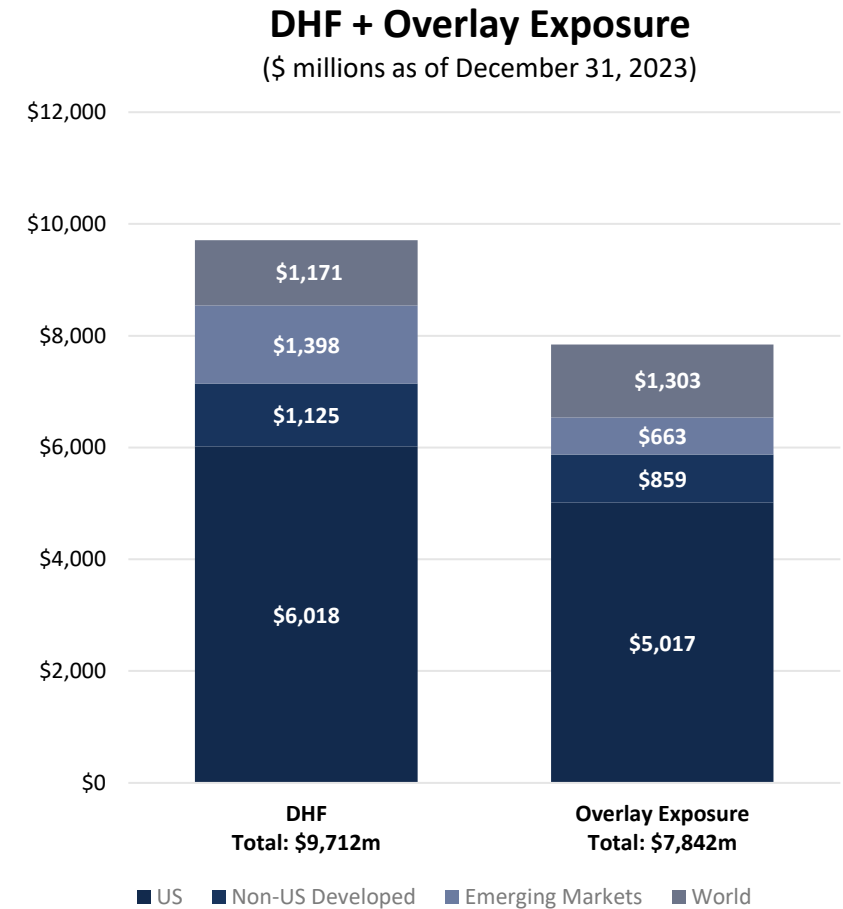
- Boutique structure leads to more targeted strategies with well-defined philosophy and process
  - No need to invest in all markets and all strategies
- The portfolio has \$0 allocated to US Large Cap today



# Directional Hedge Fund Update

## Overview of Changes

- In the 2019 SAA review, Directional Hedge Funds (DHF) were integrated within the Public Equity portfolio
- Funds are allocated to specific regional portfolios based on manager holdings
- The IMD uses an overlay portfolio to achieve full portfolio risk (Beta 1.0 to policy benchmarks)
- The Public Markets Portfolio Construction Team incorporates DHF manager allocations and risk contributions into portfolio decisions and manages the overlay.
- Currently DHF represents 5% of Trust assets



# Directional Hedge Fund Update

## Results to Date

DHF + Overlay Performance Inception to Date (Oct 19 - Dec 23)				
	DHF + Overlay Return	Benchmark Return	Excess Return (bp)	Dollar Value Added (millions)
US	15.3%	14.5%	76	\$239.8
Non-US Developed	5.9%	6.7%	-80	-\$55.3
Emerging Markets <sup>1</sup>	13.9%	0.7%	1320	\$310.5
World <sup>2</sup>	14.7%	9.2%	554	\$137.2
				<u>\$632.2</u>

<sup>1</sup> Emerging Markets+Overlay inception: November 2020.

<sup>2</sup> World DHF+Overlay inception: February 2021.

Returns and excess returns are annualized for periods longer than one year.

- The DHF + Overlay portfolio generated \$632 million in DVA since inception (October 2019)
  - These results are included in overall Public Equity performance
- The overlay has made the DHF allocation more efficient by bringing equity risk up to full target and by making hedge fund returns comparable to broad equity benchmarks

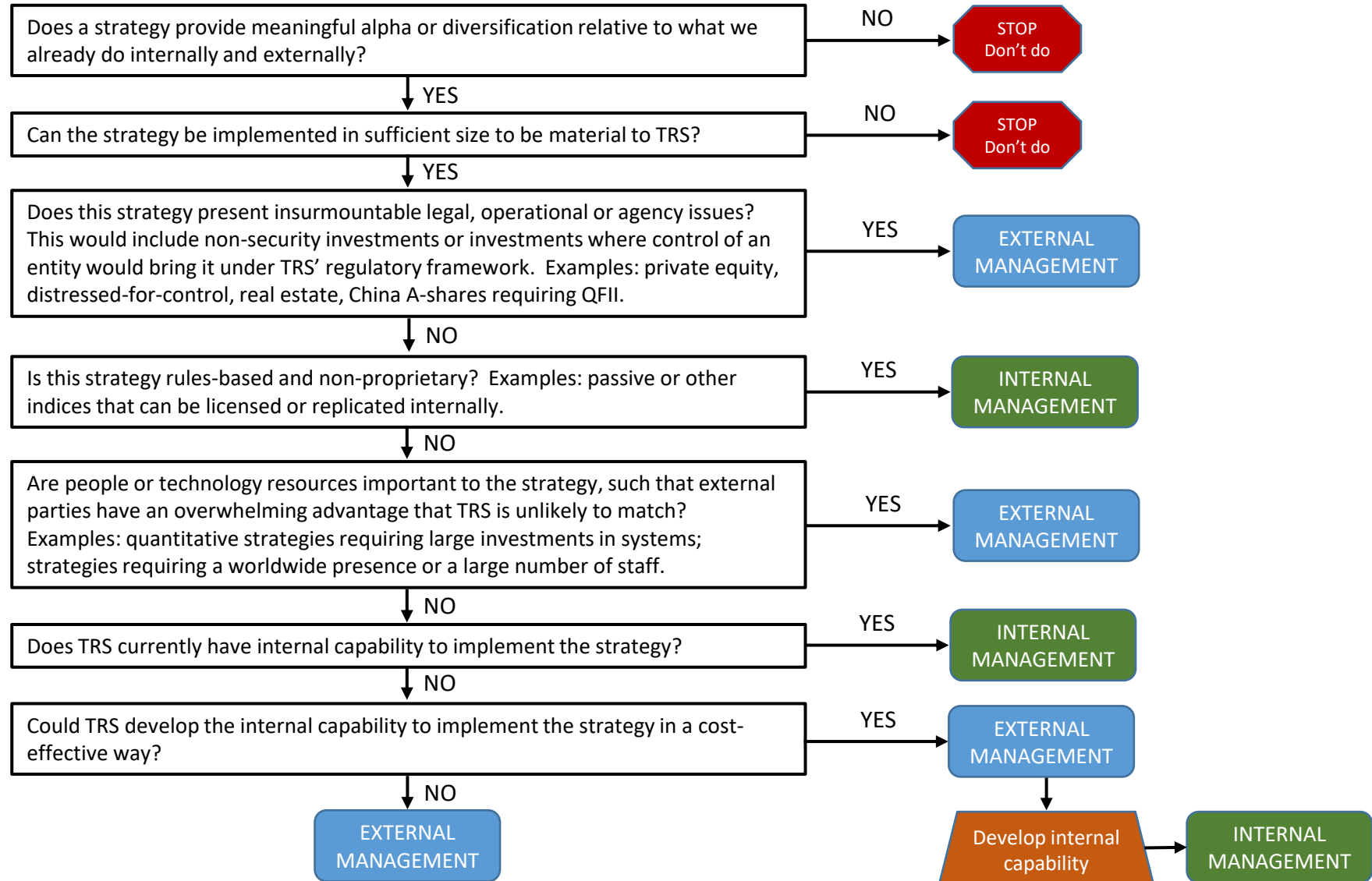
# Legislative Authority Detail for Agency Agreements

## As of December 31, 2023

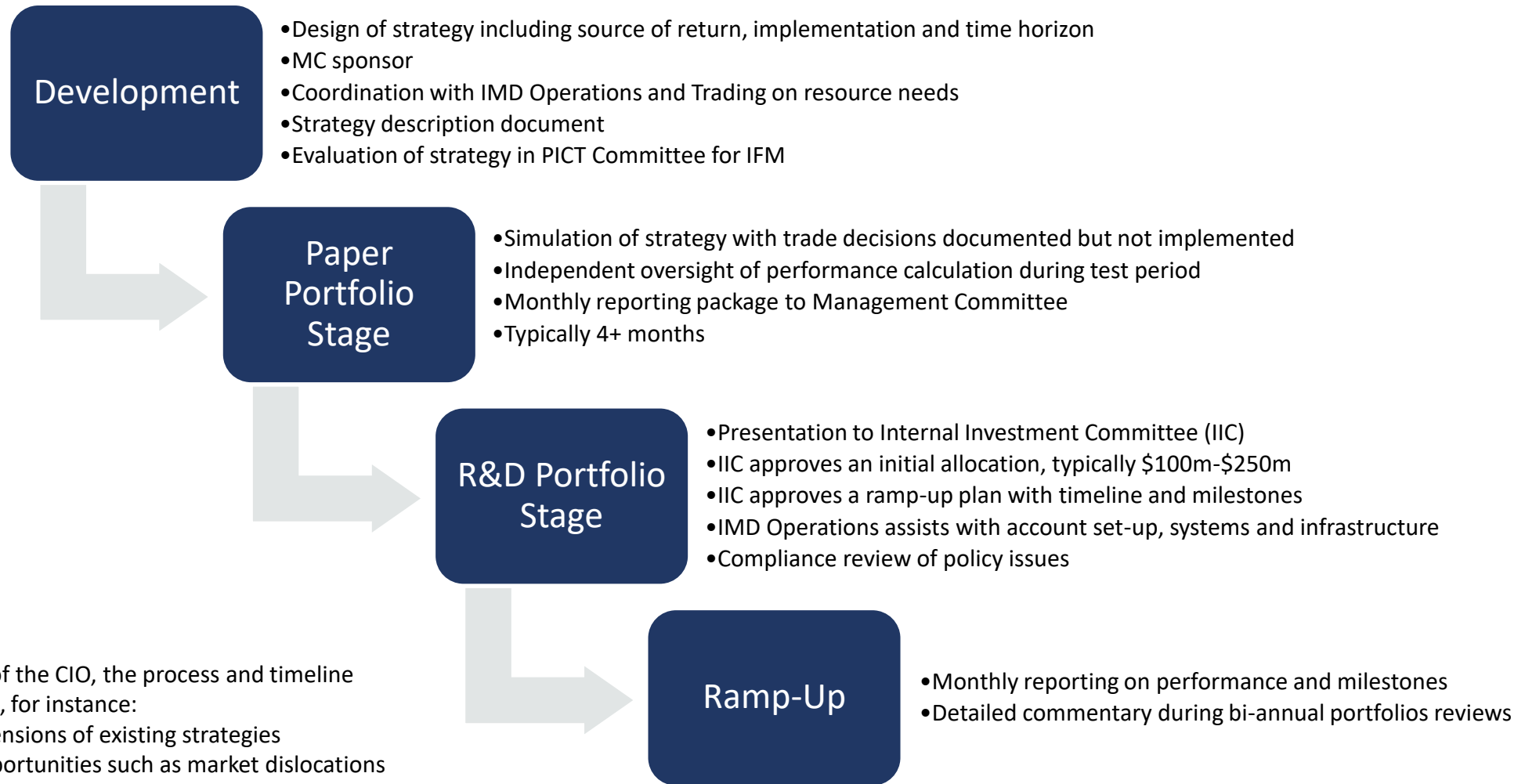
	# of Portfolios			Assets (\$ billion)			Percentage of Trust		
	Agency	LP	Total	Agency	LP	Total	Agency	LP	Total
External Managers									
US Portfolio	2	14	16	\$1.4	\$5.4	\$6.9	0.7%	2.8%	3.6%
Non-US Developed	4	4	8	\$2.4	\$3.5	\$5.9	1.3%	1.8%	3.1%
Emerging Markets	4	6	10	\$2.0	\$2.0	\$4.1	1.0%	1.1%	2.1%
World Equity	2	5	7	\$1.8	\$3.6	\$5.4	0.9%	1.9%	2.8%
<b>Total Equity</b>	<b>12</b>	<b>29</b>	<b>41</b>	<b>\$7.7</b>	<b>\$14.5</b>	<b>\$22.2</b>	<b>4.0%</b>	<b>7.5%</b>	<b>11.5%</b>
<b>Public Markets SPN</b>	<b>3</b>		<b>3</b>	<b>\$7.7</b>		<b>\$7.7</b>	<b>4.0%</b>		<b>4.0%</b>
<b>Real Estate</b>	<b>1</b>		<b>1</b>	<b>\$0.3</b>		<b>\$0.3</b>	<b>0.2%</b>		<b>0.2%</b>
<b>Totals</b>	<b>16</b>	<b>29</b>	<b>45</b>	<b>\$15.7</b>	<b>\$14.5</b>	<b>\$30.2</b>	<b>8.1%</b>	<b>7.5%</b>	<b>15.6%</b>
<b>Hedge Funds</b>									
Global Equity					\$8.7			4.5%	
Stable Value					\$11.0			5.7%	
Risk Parity					\$0.2			0.1%	
<b>Totals</b>					<b>\$19.9</b>			<b>10.3%</b>	

- TRS is limited by law to 30% Agency Agreement authority. 15.6% is currently utilized
- The Investment Policy Statement limits the allocation to Hedge Funds to 15%. Current allocation is 10.3%.

# Internal / External Decision Tree for Investment Strategies

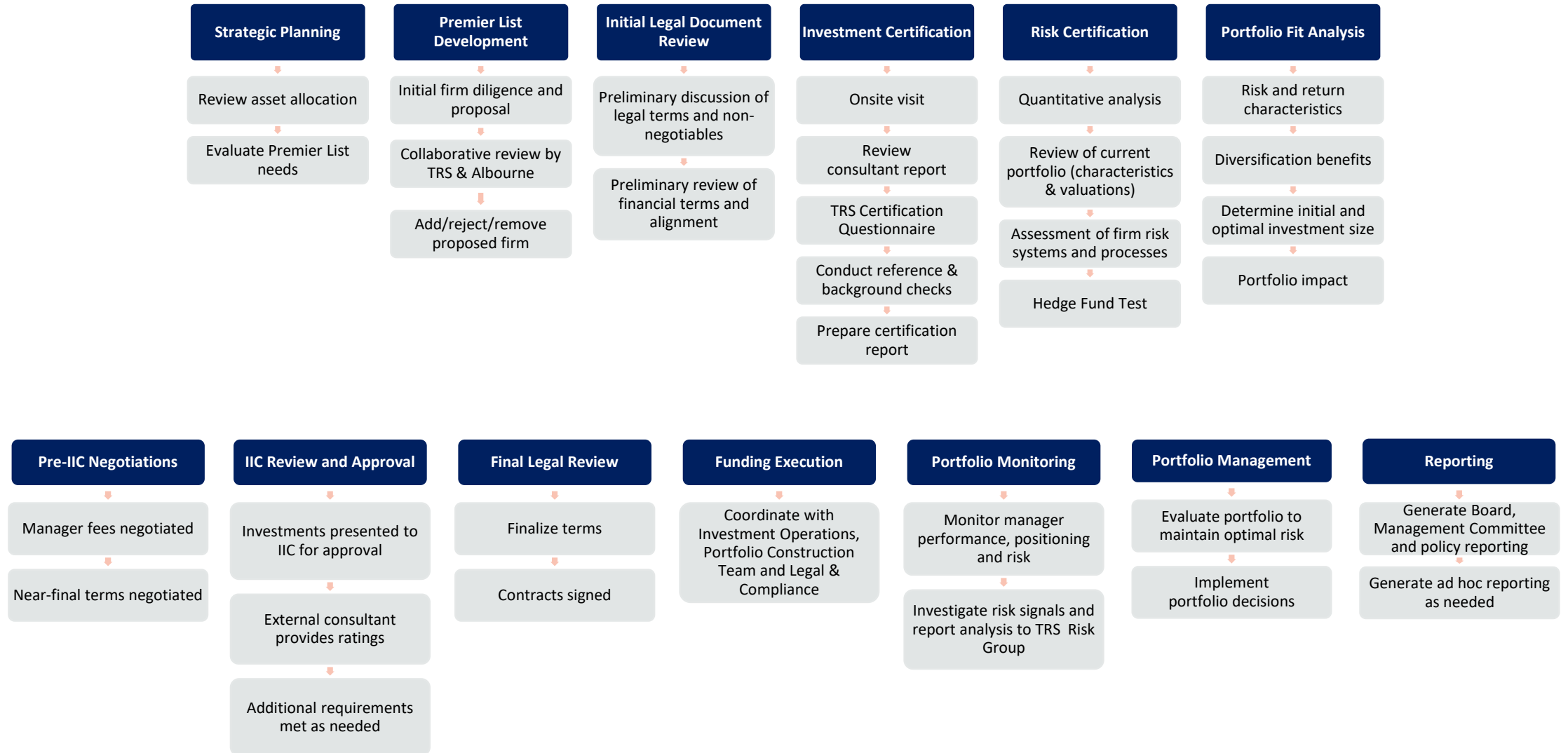


# Developing New Internal Portfolios



# External Manager Critical Processes

## Texas Way





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# Annual Review of Absolute Return

Ashley Baum, Managing Director

May 2024



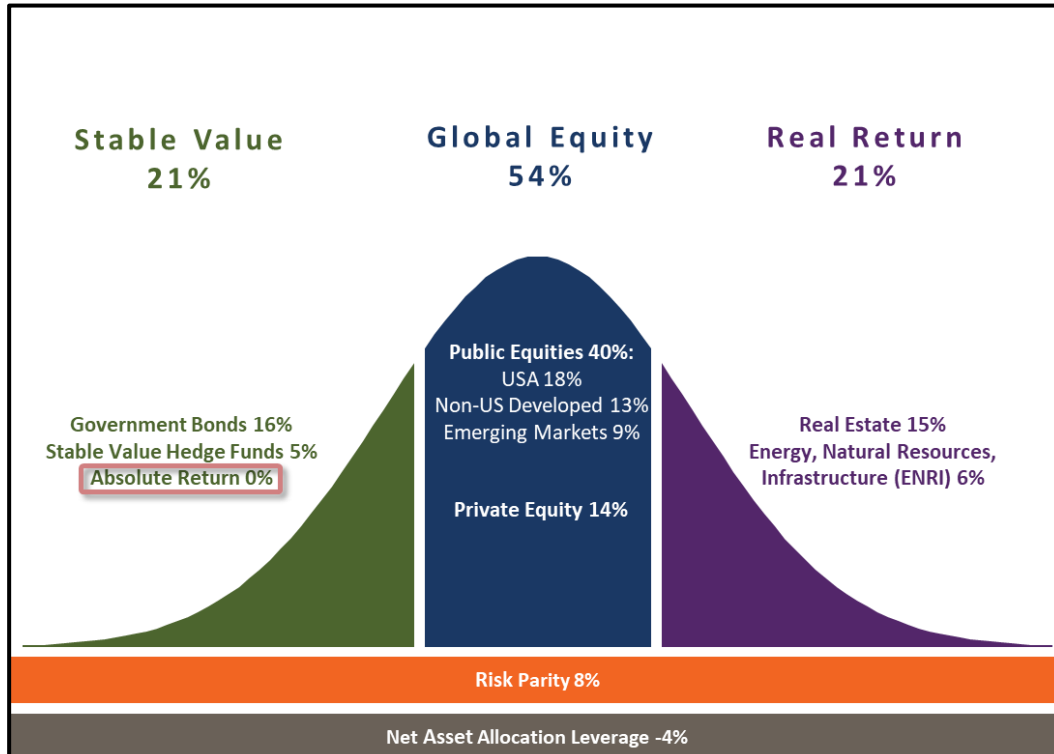
# Role in the Trust

## Absolute Return (AR)

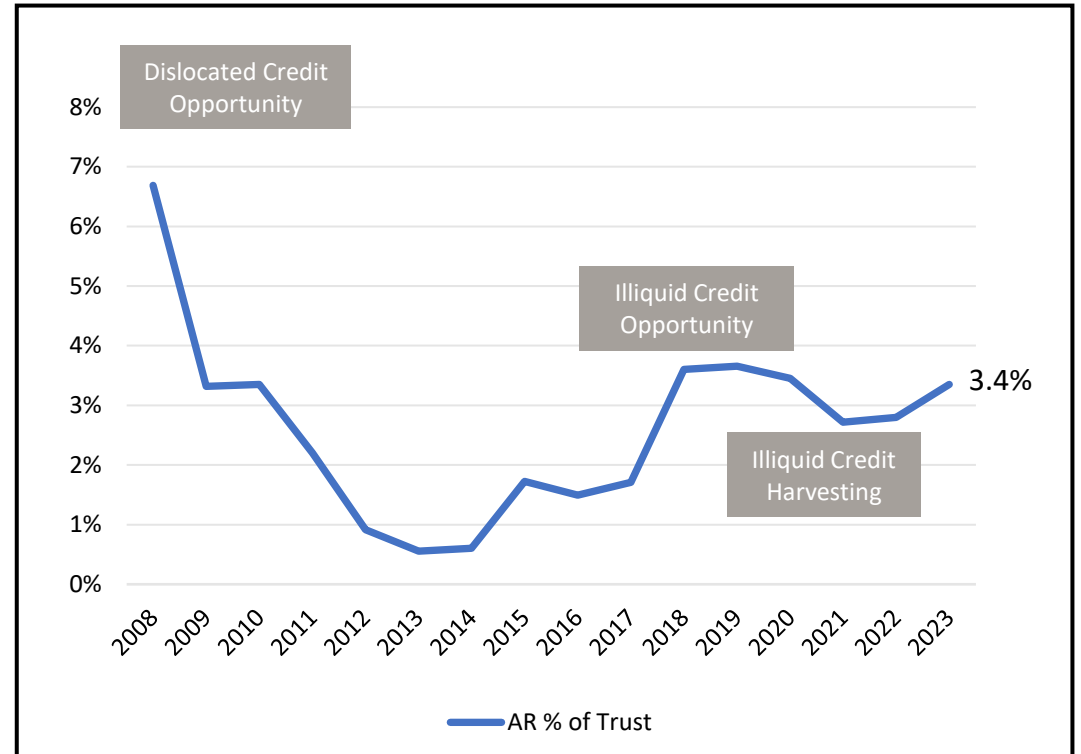
Absolute Return (“AR”) is “a broad category that includes all assets that have a high probability of generating a positive absolute return regardless of market conditions over a one- to three-year period”

- Policy range of 0-20% with a target of 0%
- Actual size depends on the opportunities available

### AR TARGET % OF TRUST



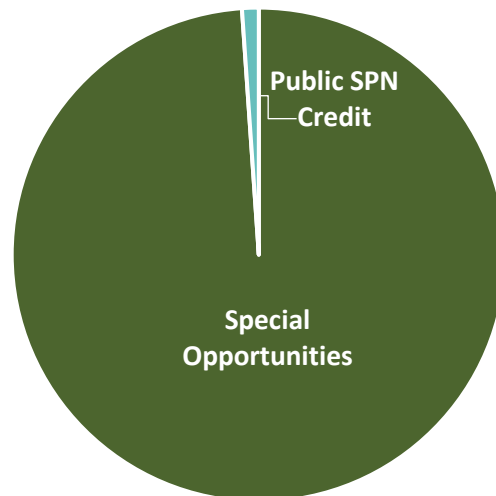
### HISTORICAL TRUST ALLOCATION



# Absolute Return Portfolio Summary

- Absolute Return represents 3.4% of the Trust, composed of:
  - <0.1% Public Strategic Partnership Network (“SPN”) Credit Assets
  - 3.4% Special Opportunities (“SO”)<sup>1</sup>
    - 2.4% in Illiquid Credit
    - 1.0% in Multi-Strategy

## MARKET VALUE BY STRATEGY



Market Value \$6.5B as of 12/31/23

## Special Opportunities Portfolio Goals

Deliver an 8% IRR over a 3-year basis

Scale portfolio up/down opportunistically

Capture unique and niche investments

Act as innovation agent for the IMD

- Special Opportunities Portfolio launched in 2013 and includes fund and principal investments
- Since inception, TRS has deployed over \$16B in these opportunities, resulting in a 16.2% return and a 10.2% IRR
- SO manages the portfolio to a maximum weight of 5% during normal environments, although it will often be well below that level

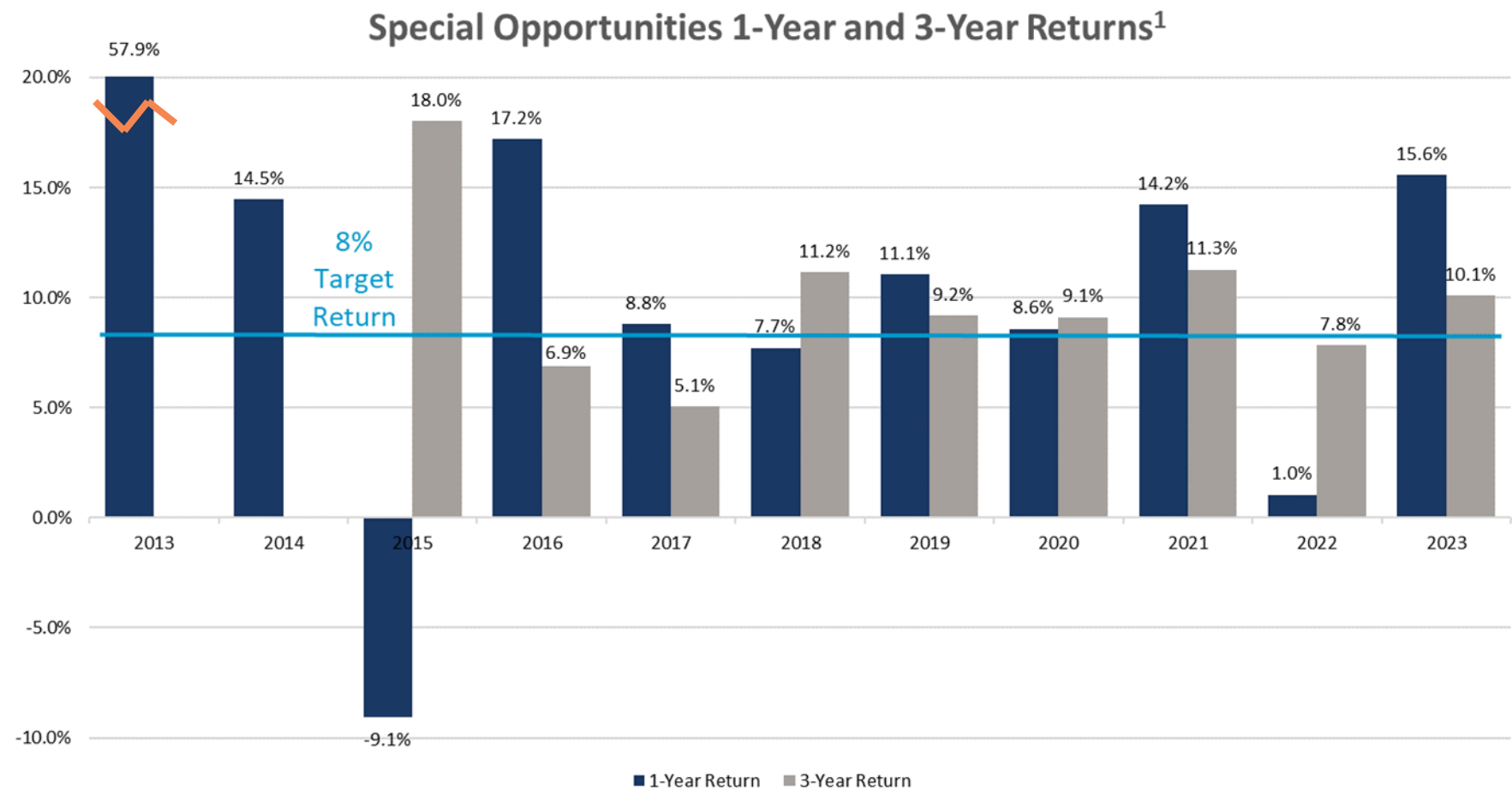
<sup>1</sup> Special Opportunities has positions held in Global Equities (\$96M as of 12/31/2023) which are not included in the Absolute Return portfolio

Source: State Street, TRS IMD

# Special Opportunities Portfolio Return

As of 12/31 each year

- The Special Opportunities team targets an 8% return over a 1- to 3-year basis
- Since inception Special Opportunities has exceeded this target return on a 1-year basis 8 out of 11 years and on a 3-year basis 6 of 9 periods



<sup>1</sup> Returns presented include Tactical Value from its inception in 2015. Special Opportunities began managing Tactical Value in March 2020.  
Source: State Street, TRS IMD

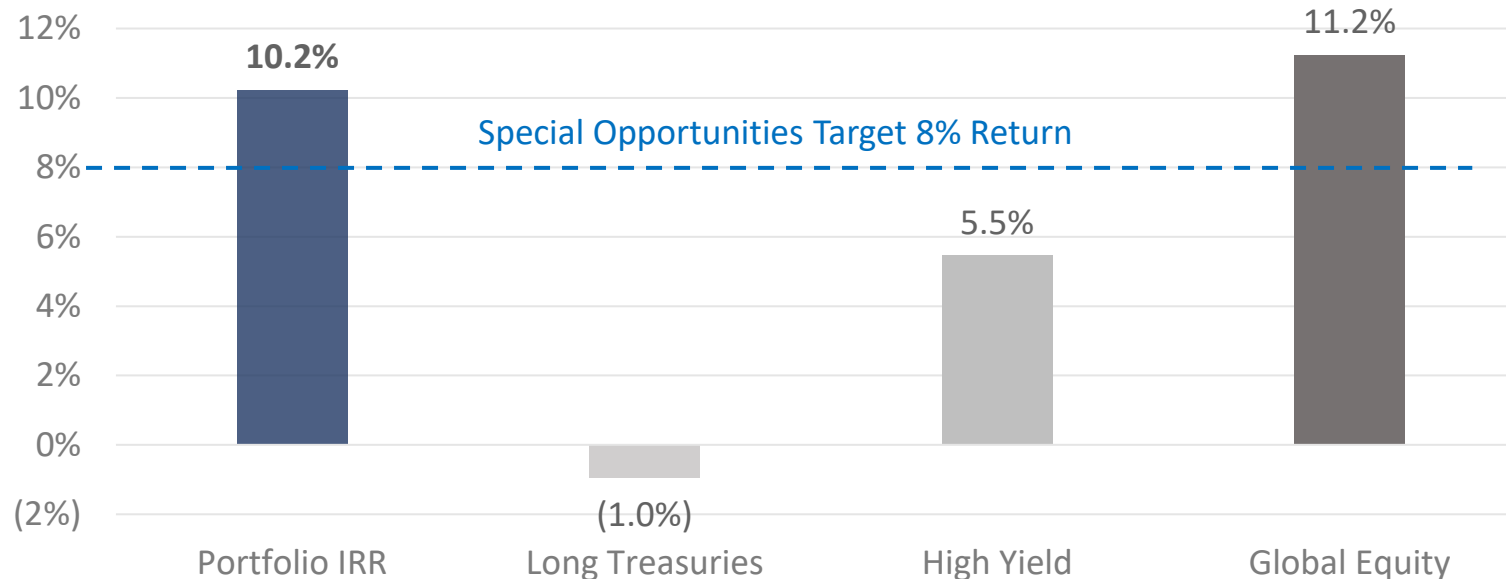
# Special Opportunities Performance Summary

\$ in Millions

## PORTFOLIO INVESTMENTS PERFORMANCE as of 12/31/23

Portfolio	Market Value	Total Exposure	% of Exposure	Time Weighted Return				Internal Rate of Return			
				1-Year	3-Year	5-Year	Since Incept.	1-Year	3-Year	5-Year	Since Incept.
Funds	\$4,477	\$7,097	75%	13.5%	10.4%	9.9%	9.5%	12.7%	9.9%	10.1%	10.1%
Principal Investments	\$2,019	\$2,418	25%	21.7%	8.4%	10.1%	15.9%	22.5%	9.5%	10.5%	10.6%
<b>Special Opportunities Assets</b>	<b>\$6,496</b>	<b>\$9,515</b>	<b>100%</b>	<b>15.6%</b>	<b>10.1%</b>	<b>10.0%</b>	<b>16.2%</b>	<b>15.2%</b>	<b>9.8%</b>	<b>10.2%</b>	<b>10.2%</b>

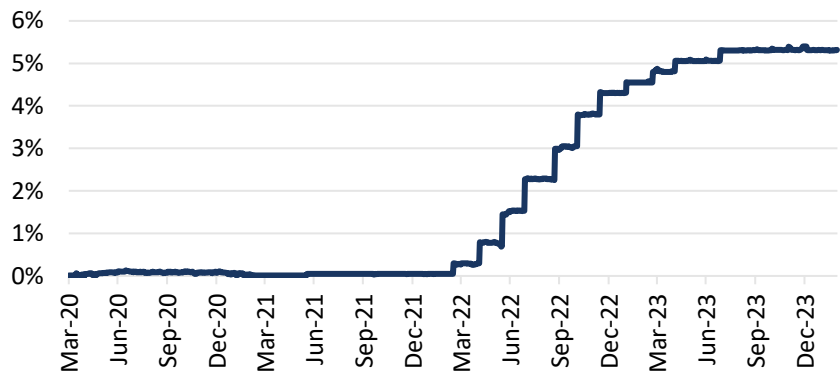
## Public Market Equivalent ("PME") Special Opportunities Benchmark Analysis Since Inception to 12/31/2023



# Tight Financial Conditions Driving Opportunity Set

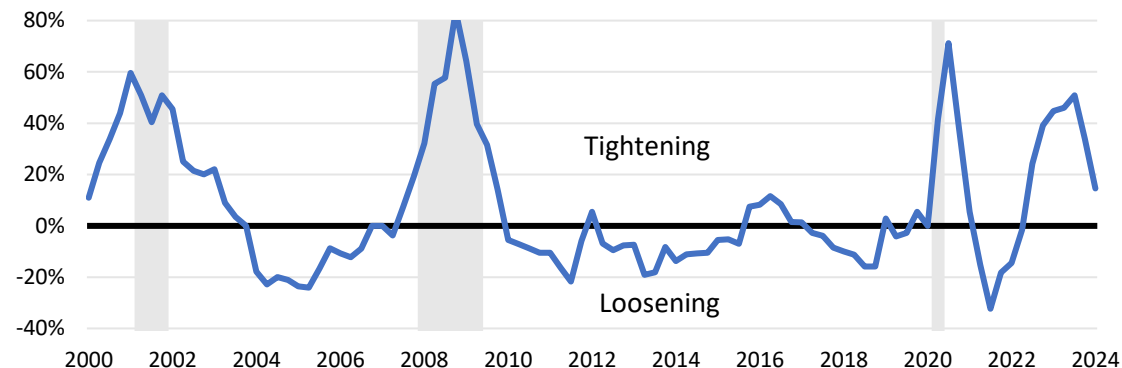
## Interest Rates Remain High

Secured Overnight Financing Rate (SOFR)



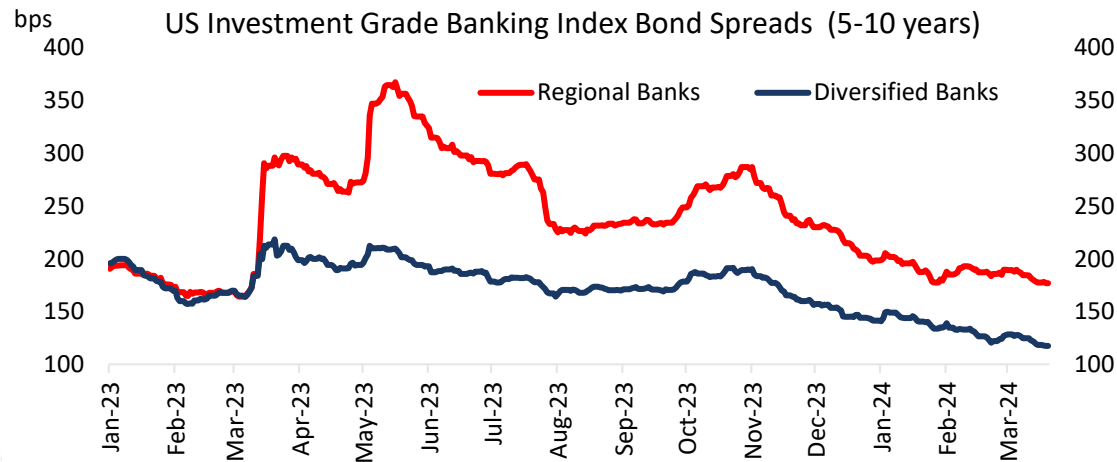
## Credit Standards Still Tight

Net Percentage of Domestic Banks Tightening Standards

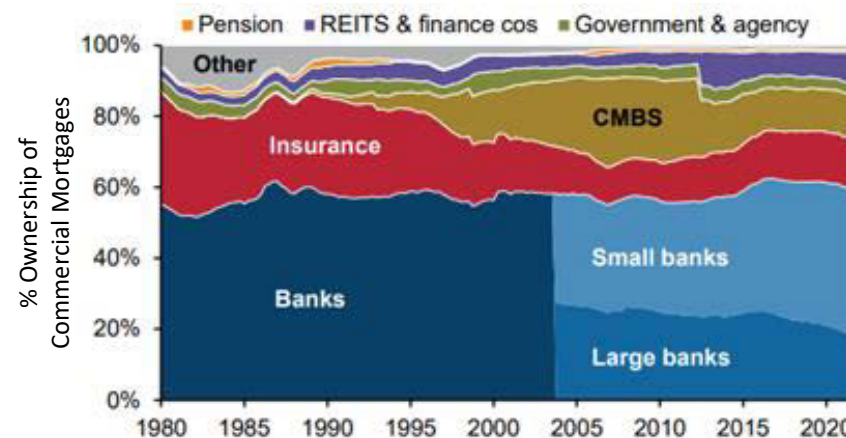


## Regional Bank Stress Remains

US Investment Grade Banking Index Bond Spreads (5-10 years)



## Small Bank Real Estate Holdings High



Source: Federal Reserve FRED for SOFR and Senior Loan Officer Survey, Apollo, JP Morgan

# Significant Risk Transfer (“SRT” or “Reg Cap”)

## What are SRTs?

- Investors like TRS provide insurance to a bank to cover losses on a pool of bank assets
- Bank assets span institutional or consumer banking activities, such as
  - Institutional: Investment grade revolvers, high yield loans, fund subscription lines, commercial real estate mortgages, small business loans
  - Consumer: Residential mortgages, student loans, auto lending, credit cards

*Over 50 global institutions are issuers of SRT transactions*



Source: TRS IMD

## TRS SRT Investments

- SO has been investing in SRT since 2018
- Performance has met underwritten expectations of 9-12% IRR
- TRS is an attractive counterparty for banks
- SRT investments are increasingly attractive given bank demand and high returns available; however, there is also increasing competition

*As of 12/31/2023*

Vintage Year	Capital Invested	1Y IRR	3Y IRR	SI IRR
2018	330	13.9%	12.2%	9.3%
2019	80	16.5%	14.4%	10.0%
2020	40	16.9%	12.7%	13.2%
2021	99	23.5%		13.5%
2022	45	4.3%		7.0%
2023	288			27.0%
<b>Total</b>	<b>883</b>	<b>18.1%</b>	<b>13.8%</b>	<b>11.2%</b>

# Summary: Special Opportunities Portfolio Assessment

Portfolio Goal		Status (12/31/23)
<input checked="" type="checkbox"/> Deliver an 8% IRR over a 3-year basis	➔	<ul style="list-style-type: none"><li>Exceeded return target 6 out of 9 periods since inception</li><li>Since inception IRR 10.2%</li></ul>
<input checked="" type="checkbox"/> Scale portfolio up/down opportunistically	➔	<ul style="list-style-type: none"><li>Deployed \$16.5B with NAV of \$6.5B</li><li>Significant capital returned</li><li>Designed capacity structures to be ready to invest when compelling (\$4.3B dry powder available)</li></ul>
<input checked="" type="checkbox"/> Capture unique and niche investments	➔	<ul style="list-style-type: none"><li>Deployed into direct lending, SRT, hedge fund co-investments, appraisal rights, real estate construction loans</li></ul>
<input checked="" type="checkbox"/> Act as innovation agent for the IMD	➔	<ul style="list-style-type: none"><li>Implemented TRS custom funds</li><li>Formed TRS standard structure &amp; terms for co-investing</li><li>Created CLO platform</li><li>Established warehousing relationships</li><li>Sourced investments resulting in over \$1.5B invested by other IMD teams</li></ul>



# APPENDIX

# Special Opportunities Team

and Advisory Committee



**Ashley Baum, CFA, CPA**  
Managing Director  
*Head of Special Opportunities*  
MPA, UT Austin



**Michael Phillips, CFA**  
Director  
*Head of Credit for Special Opportunities*  
MA, Cambridge



**Dylan Campbell, CFA**  
Investment Manager  
MA, Claremont McKenna




**Holly Poole**  
Senior Associate  
MA, Claremont McKenna



**David Seremek**  
Associate  
BS, Indiana University  
Bloomington



**Carl Spansk, CFA, CAIA**  
Associate  
MS, UT Austin




**Jon Klekman**  
Shared Analyst  
Relationship Management  
BA, SUNY Binghamton


**TEAM EXPERIENCE SUMMARY**

- 4 CFA Charterholders
- 1 CPA Charterholder
- 1 CAIA Charterholders
- 5 Master's Degrees


## Advisors



**K.J. Van Ackeren, CFA**  
Managing Director  
*Head of Internal Fundamental*  
MBA, Texas Christian University



**Mohan Balachandran**  
Senior Managing Director  
*Head of Multi-Asset Strategies*  
PhD, Brown University



**Steven Wilson, CAIA**  
Director  
*External Public Markets*  
MBA, Rice University

Members of the Special Opportunities  
Investment Committee

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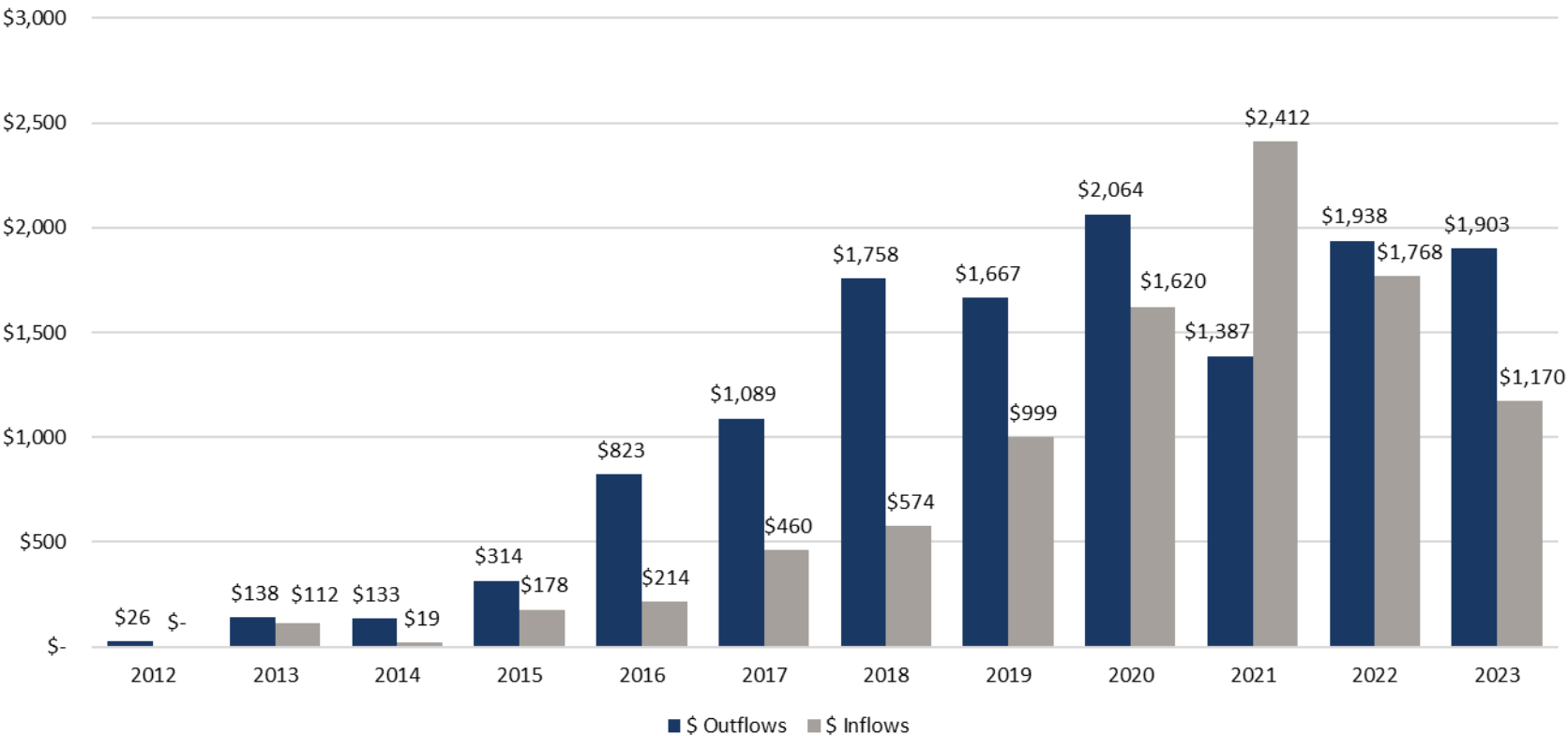
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# Opportunistic Deployment

## Net Cash Outflows and Inflows by Year

- SO does not deploy capital unless the opportunity set is compelling
- This opportunistic and variable deployment is unique in the Trust
- SO investments have a faster cash flow cycle than private markets generally
- SO total invested amount (\$16.5 billion) is much larger than current market value (\$6.5 billion)<sup>2</sup>

Historical Annual Cash Outflows and Inflows (\$ Millions)<sup>1</sup>



<sup>1</sup> Cash flows presented include Tactical Value from its inception in 2015. Special Opportunities began managing Tactical Value in March 2020. The chart shows cash flows netted at the transaction level to remove the impact of capital recycling. <sup>2</sup> Cumulative net outflows shown in chart equal \$13.2B; however total capital invested is \$16.5B as of 12/31/23 as it includes capital recycling.

# Semi-Annual Investment Risk Report and Review of Key SAA Risk Metrics

James Nield, Chief Risk Officer  
Stephen Kim, Director

May 2024



# All metrics in compliance

<u>Risk Metric</u>	<u>Value</u>	<u>In Compliance?</u>	<u>Page(s)</u>
<b>1. Drawdown Risk:</b> VaR estimate decreased	6.4% VaR	✓	5 - 8
<b>2. Liquidity:</b> Remained strong	6.1x Coverage Ratio	✓	9 - 12
<b>3. Asset Allocation (AA):</b> Overweight Stable Value	Overweight 3.4%	✓	13 - 16
<b>4. Tracking Error:</b> Forecasted Trust TE range bound	127 bp	✓	18 - 19
<b>5. Leverage:</b> Trust leverage decreased slightly	-5.0% Net	✓	20 - 22
<b>6. Counterparty Risk:</b> Within Policy limits	Lowest Rating: A-	✓	23
<b>7. Derivatives:</b> Gross notional exposure stable	21.6% Gross Notional	✓	24 - 25
<b>8. Securities Lending:</b> Earnings stable	11.0% Utilization	✓	26

Unless otherwise noted, data presented as of December 31, 2023



# SAA Risk Metrics fit into 4 main categories

## 1 Return Distribution

### Expected Return

Kurtosis  
Median Return  
Probability >7%  
Rolling Returns  
Skew

## 2 Stability of Returns

Asset Betas  
Cycle Analysis  
Diversification Index  
Environmental Analysis  
**Expected Volatility**  
Sharpe Ratio

## 3 Absolute Risk

Historical Scenarios  
Hypothetical Scenarios  
Median Drawdown  
**Drawdown**  
% Time in Drawdown  
Value at Risk (VaR)

## 4 Implementation

Operational  
**Liquidity**  
Counterparty  
Currency Exposure  
Derivative Usage  
  
Relative Risk  
Tracking Error  
Risk Contributions

# Key SAA Metrics

---

## Expected Return



1  
Deliver on Trust's  
return objective

## Expected Volatility



2  
Preserve assets  
over time

## Drawdown



3  
Compound returns  
effectively through time

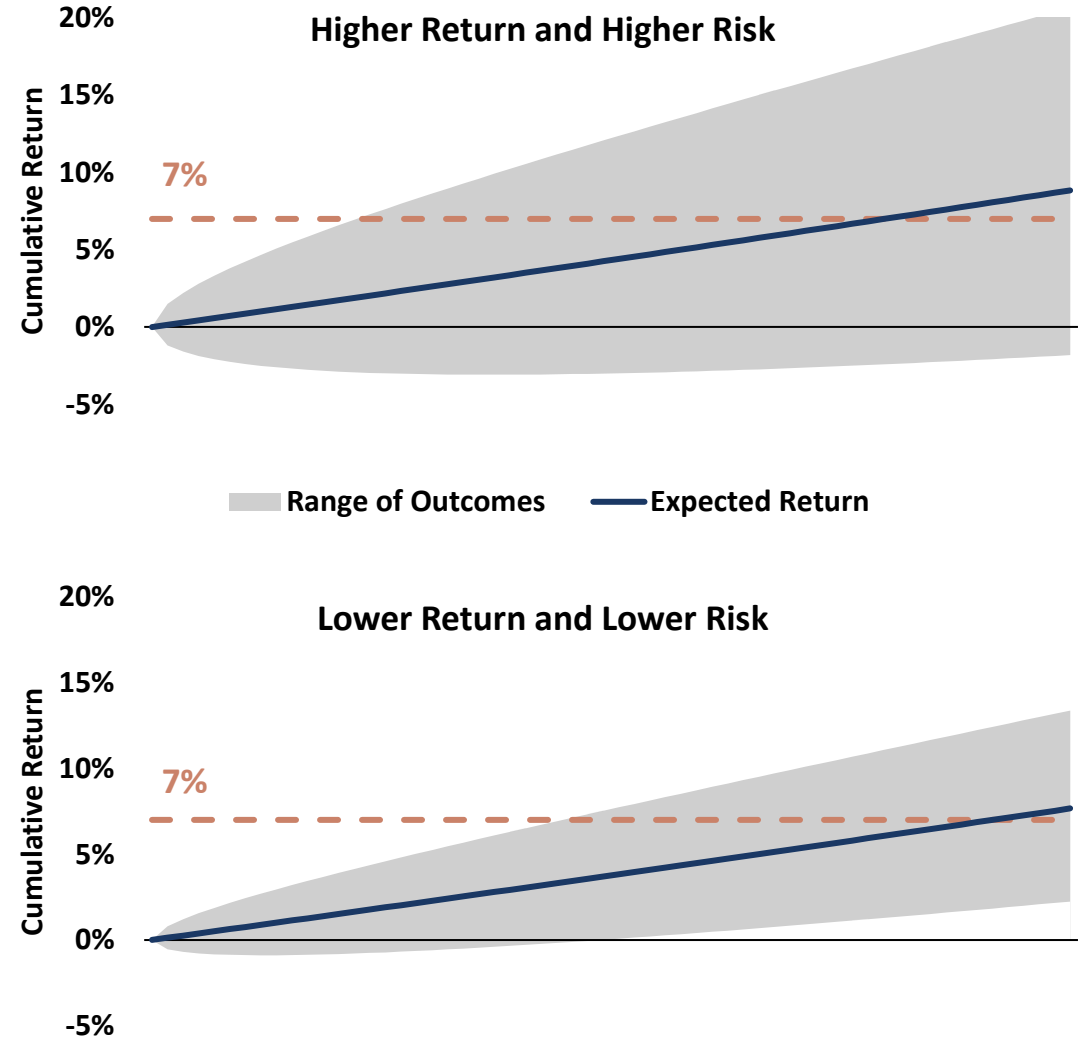
## Liquidity



4  
Maintain ability to  
provide benefits

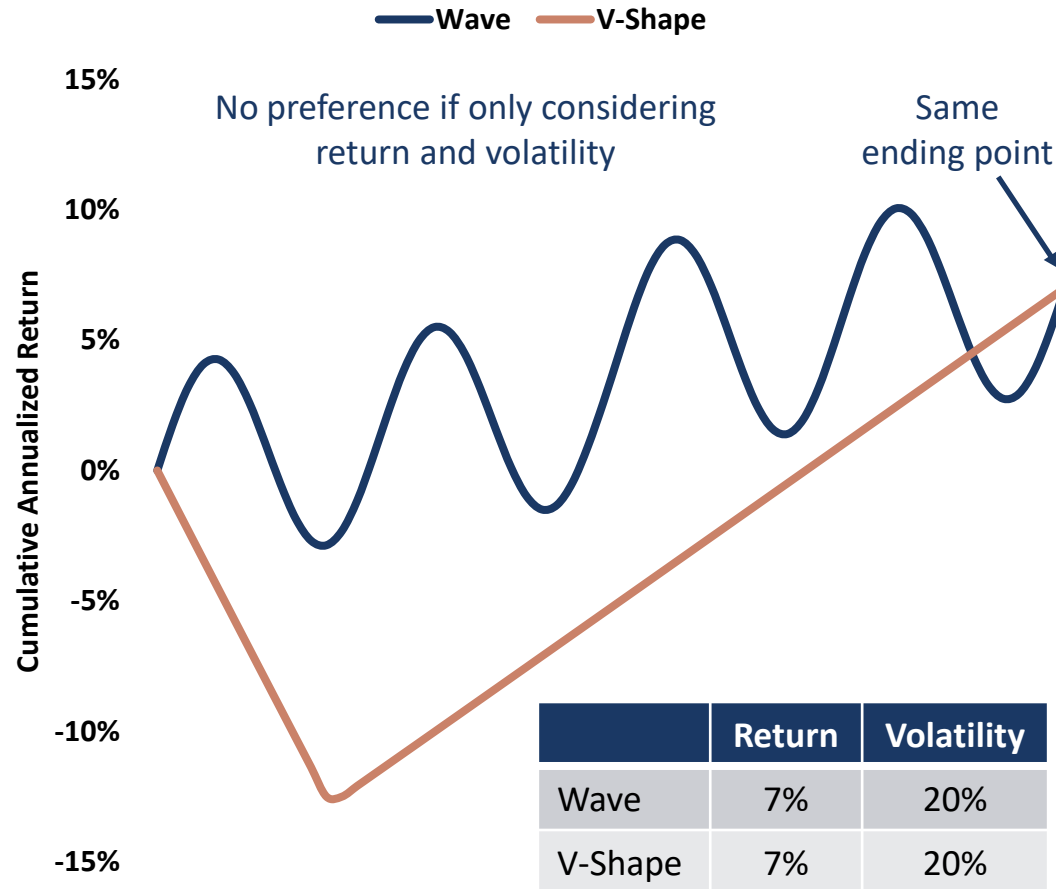
# Probability of earning 7% impacted by **Expected Return** and **Volatility**

## Distribution of Return Outcomes

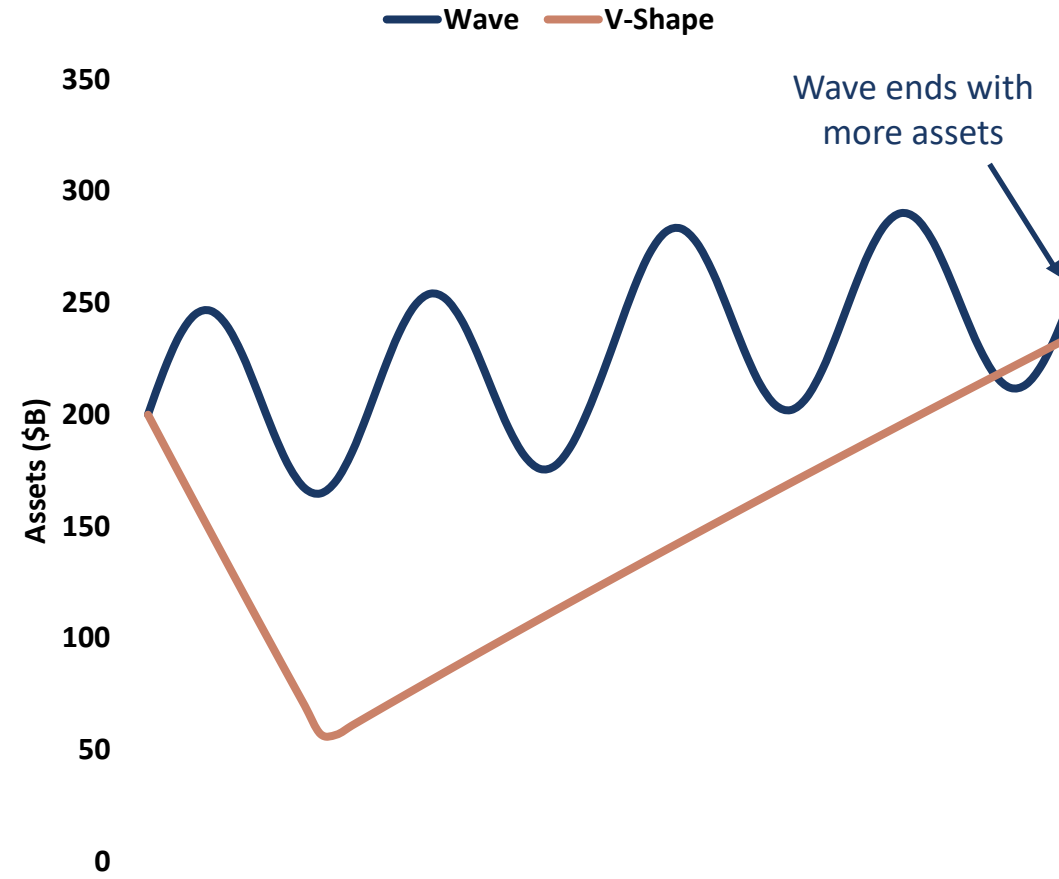


# Drawdown: The path we take matters

## Different path with same percentage return...



## ...but different asset value due to benefit payments

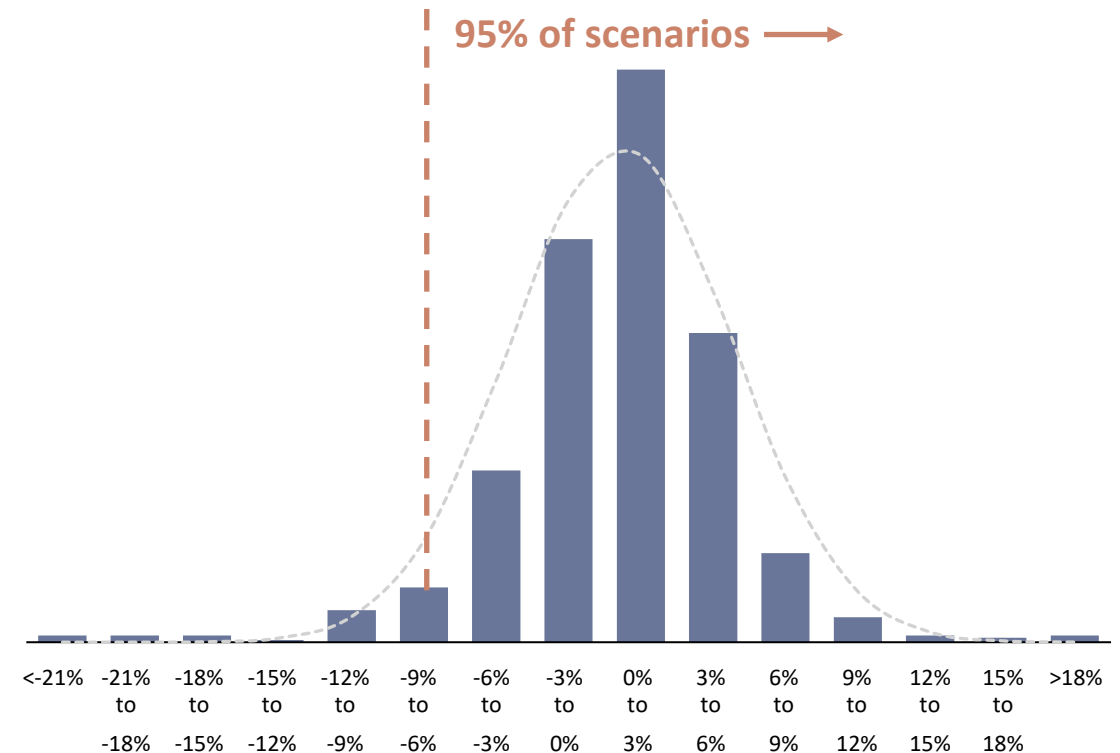


# Value-at-Risk is one way to measure Trust **Drawdown** risk

## Simulated TRS Monthly Returns (Current Holdings)

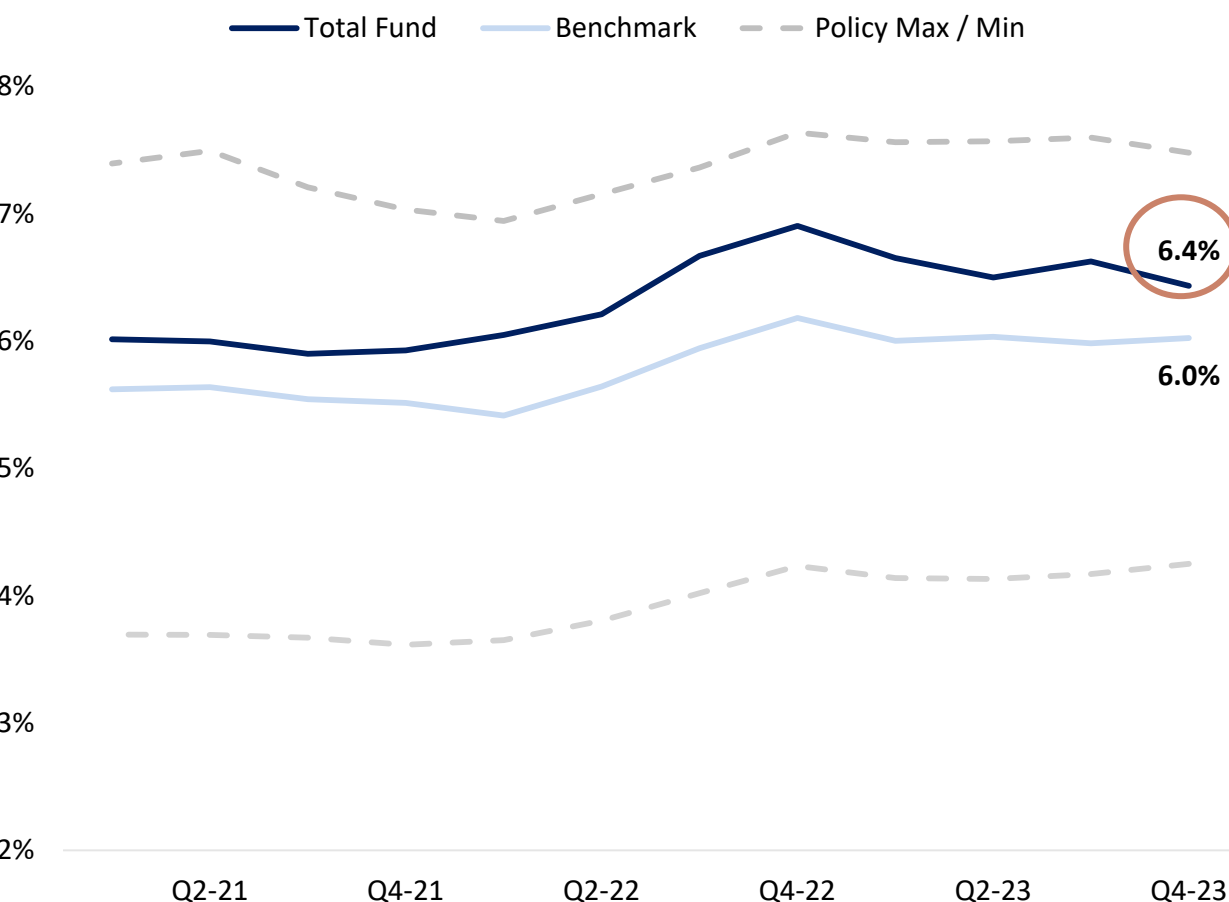
	Drawdown Observation Range	Avg Return
100%	October 2008	-21.5%
	March 2020	-20.6%
	April 2020	-15.4%
	November 2008	-15.3%
	March 2009	-12.6%
	September 2022	-10.5%
	September 2008	-10.1%
	October 2022	-9.8%
	...	
	October 2018	-6.9%
	May 2010	-6.8%
	September 2015	-6.5%
	June 2008	-6.5%
95%	<b>June 2012</b>	<b>-6.4%</b>

## Distribution of Simulated TRS Monthly Returns

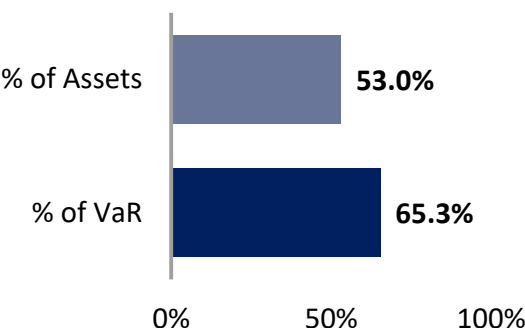


# Drawdown risk is currently 6.4% as measured by VaR

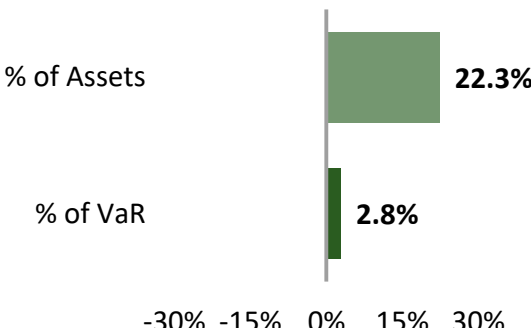
VaR History



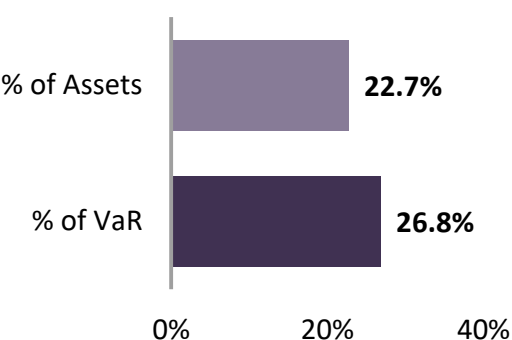
Global Equity



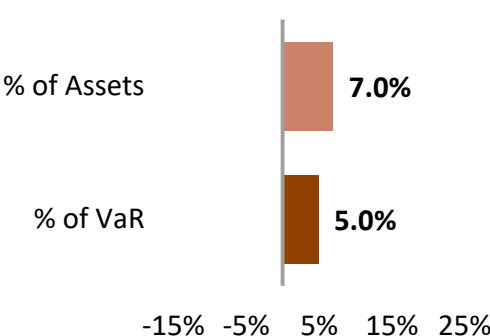
Stable Value



Real Return



Risk Parity



# Trust **Liquidity** measured through three different time horizons

1. Short Term: 1 to 30 Days	2. One Month	3. SAA: > 3 Years
Sources		
<ul style="list-style-type: none"><li>• Cash</li><li>• T-bills</li><li>• Repo</li><li>• Derivatives</li></ul>	<ul style="list-style-type: none"><li>• Treasuries</li><li>• Equities, Risk Parity</li><li>• Liquid fund redemptions</li><li>• Distributions</li></ul>	<ul style="list-style-type: none"><li>• Less liquid fund redemptions</li><li>• Policy change</li></ul>
Uses		
<ul style="list-style-type: none"><li>• Planned capital calls</li><li>• Potential margin calls</li><li>• Rebalancing</li></ul>	<ul style="list-style-type: none"><li>• Operational uses</li><li>• Stressed Securities Lending</li><li>• Stressed derivatives</li></ul>	<ul style="list-style-type: none"><li>• Unexpected capital calls</li><li>• Opportunistic capital</li><li>• Benefit payments</li></ul>

Sources and uses build on prior category

# Trust **Liquidity** ratio strong at 6.1x

Sources of Liquidity (\$, billions)	Market Value	Stressed Value
Internal Cash	\$ 4.5	\$ 4.3
Unencumbered Government Bonds	9.9	5.8
Risk Parity	14.0	8.9
Other Liquid Assets (Equity, Commodities)	38.4	20.6
<b>Total Sources of Liquidity</b>	<b>\$ 66.9</b>	<b>\$ 39.6</b>

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

	\$ 126.0	NA
--	----------	----

Uses of Liquidity (\$, billions)	Market Value	Stressed Value
Operational Uses of Liquidity		\$ (0.4)
Stressed Securities Lending		(0.7)
Stressed Derivatives		(4.9)
Stressed Private Markets		(0.5)
<b>Total Uses of Liquidity</b>	<b>\$ -</b>	<b>\$ (6.5)</b>

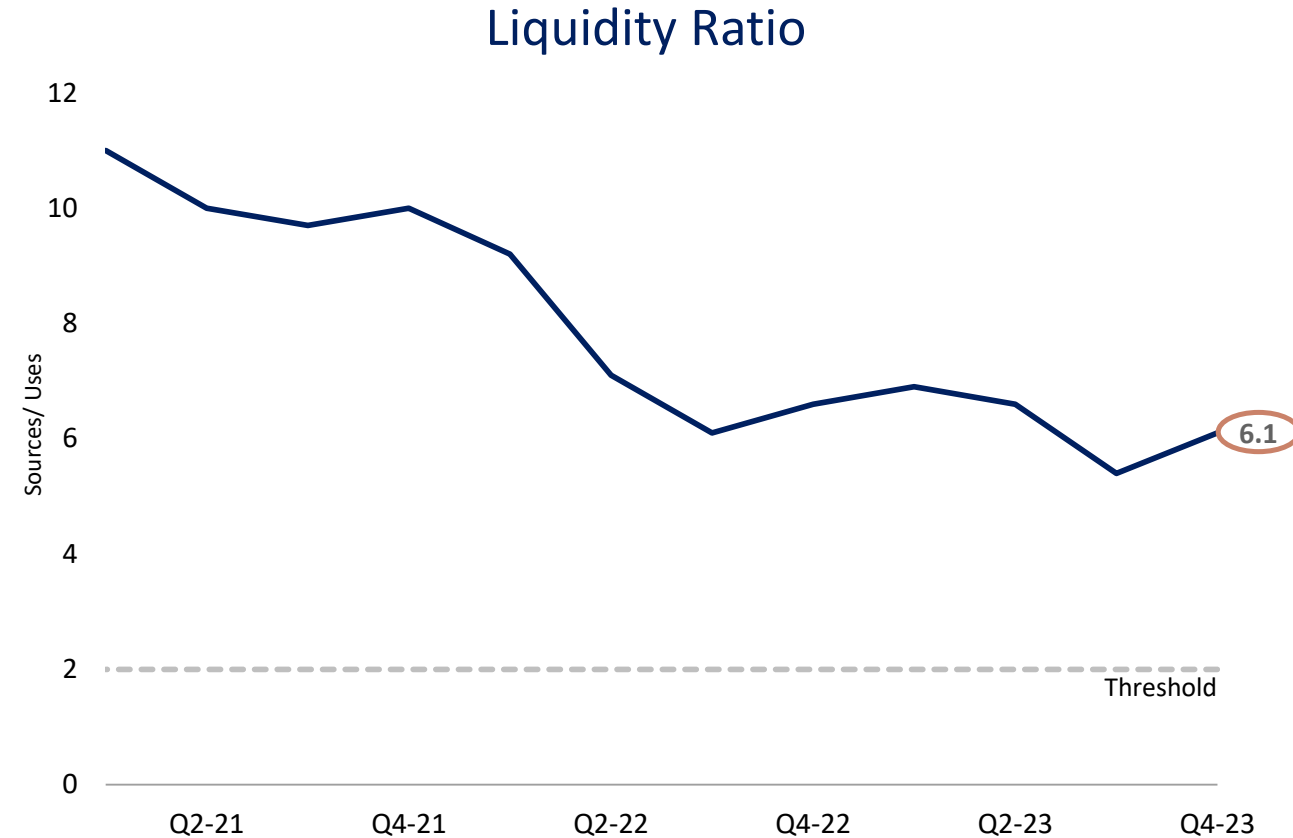
Liquidity Ratio	
<b>Ratio (Sources/Uses)</b>	<b>6.1</b>
Alert Threshold	2.0
<b>Test Result</b>	<b>Pass</b>

*Note: Net Stressed Liquidity (Sources less Uses)*

	\$ 33.1
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*Note: Past 12 Months of Benefit Payments*

	\$ 4.0
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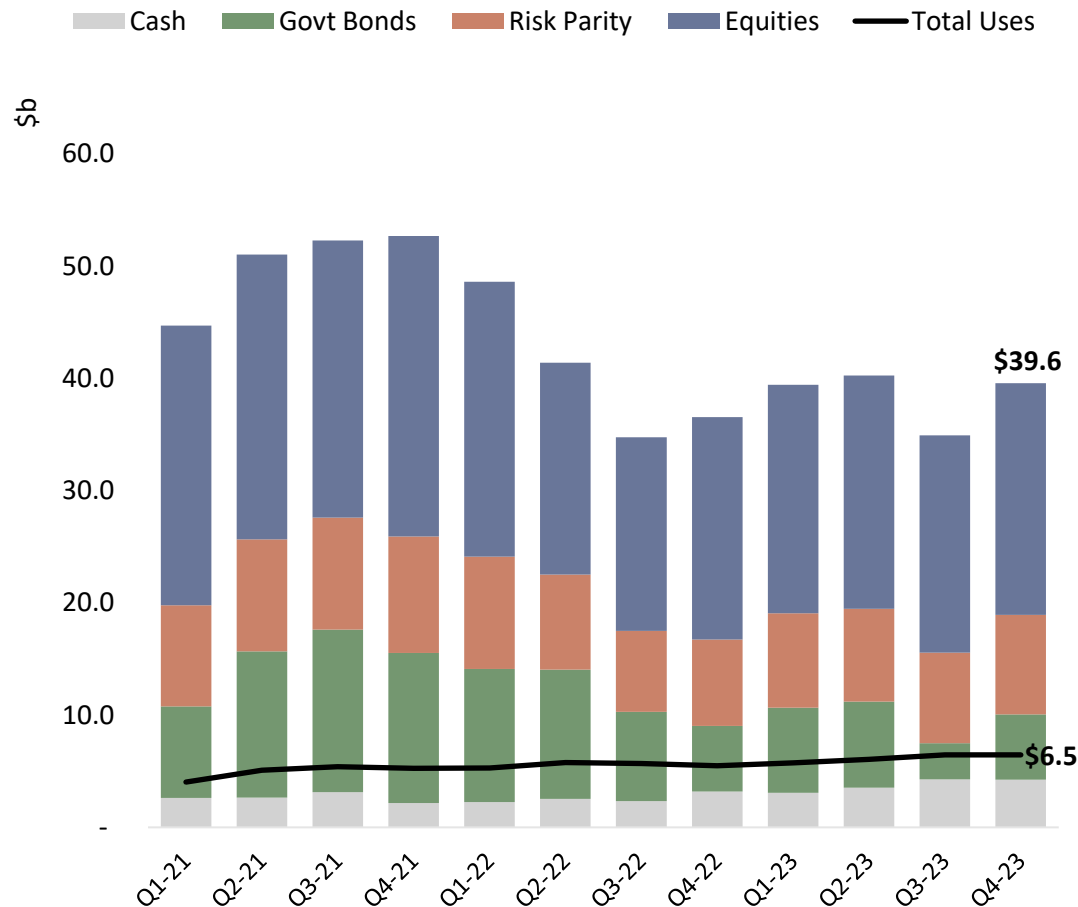
Source: State Street Bank, TRS IMD

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 derivatives reflect margin calls based on the same market stress applied to Liquid Assets. Private Market investments are assumed to experience capital calls equivalent to estimated unfunded commitments in equal installments over the next month.



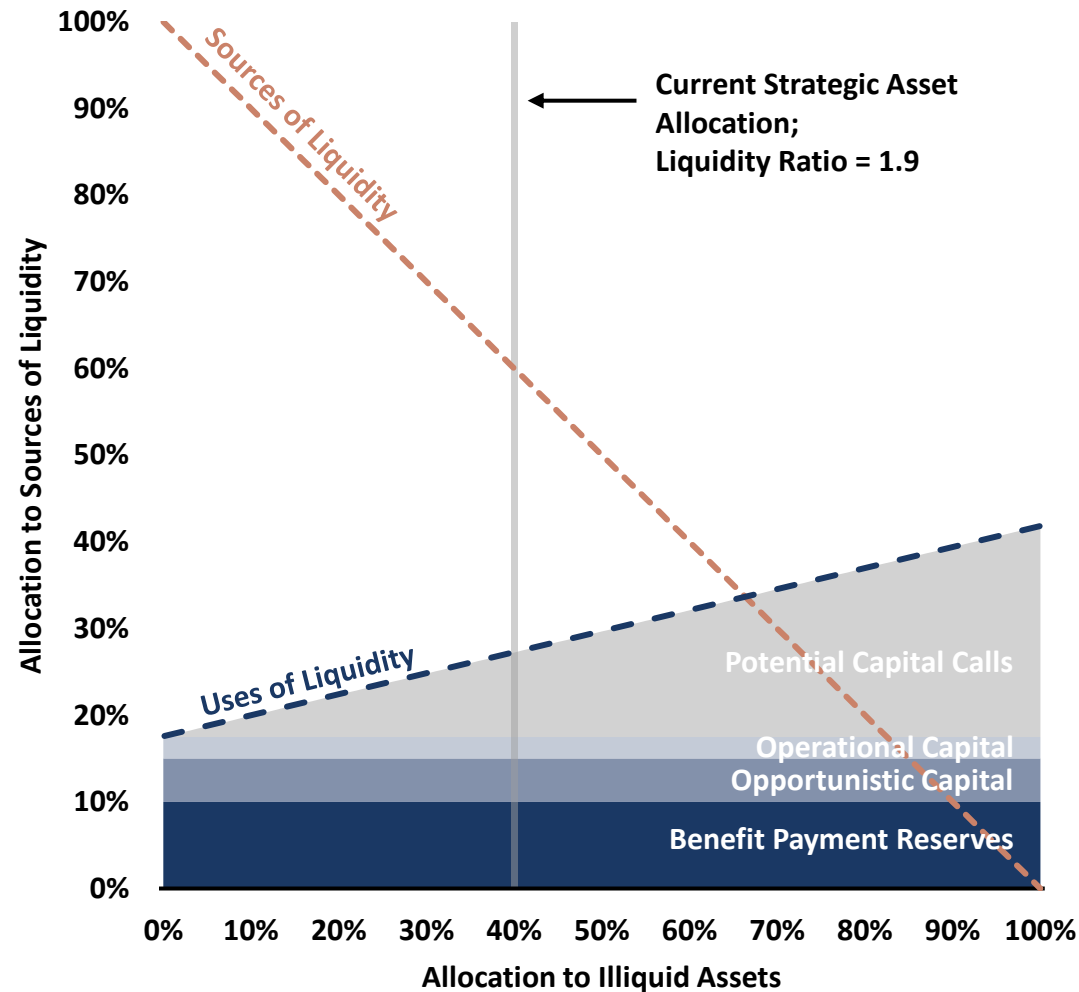
# Board report highlights the monthly **Liquidity** measurement period

## Post Stress Event Sources and Uses of Liquidity



- Using a hypothetical stress scenario approximately equal to 1.5x March 2020 drawdown:
  - Trust sources of liquidity would decline from \$66.9b to \$39.6b
- In this scenario, Trust is estimated to have liquidity sources 6.1 times greater than needed liquidity uses
  - Sources: \$39.6b
  - Uses: \$6.5b
  - Ratio =  $\$39.6 / \$6.5$  or **6.1x**
- Stressed uses of liquidity include:
  - Operational uses (benefit payment)
  - Securities Lending (losses on investments)
  - Derivatives (margin calls)
  - Private Markets (capital calls)

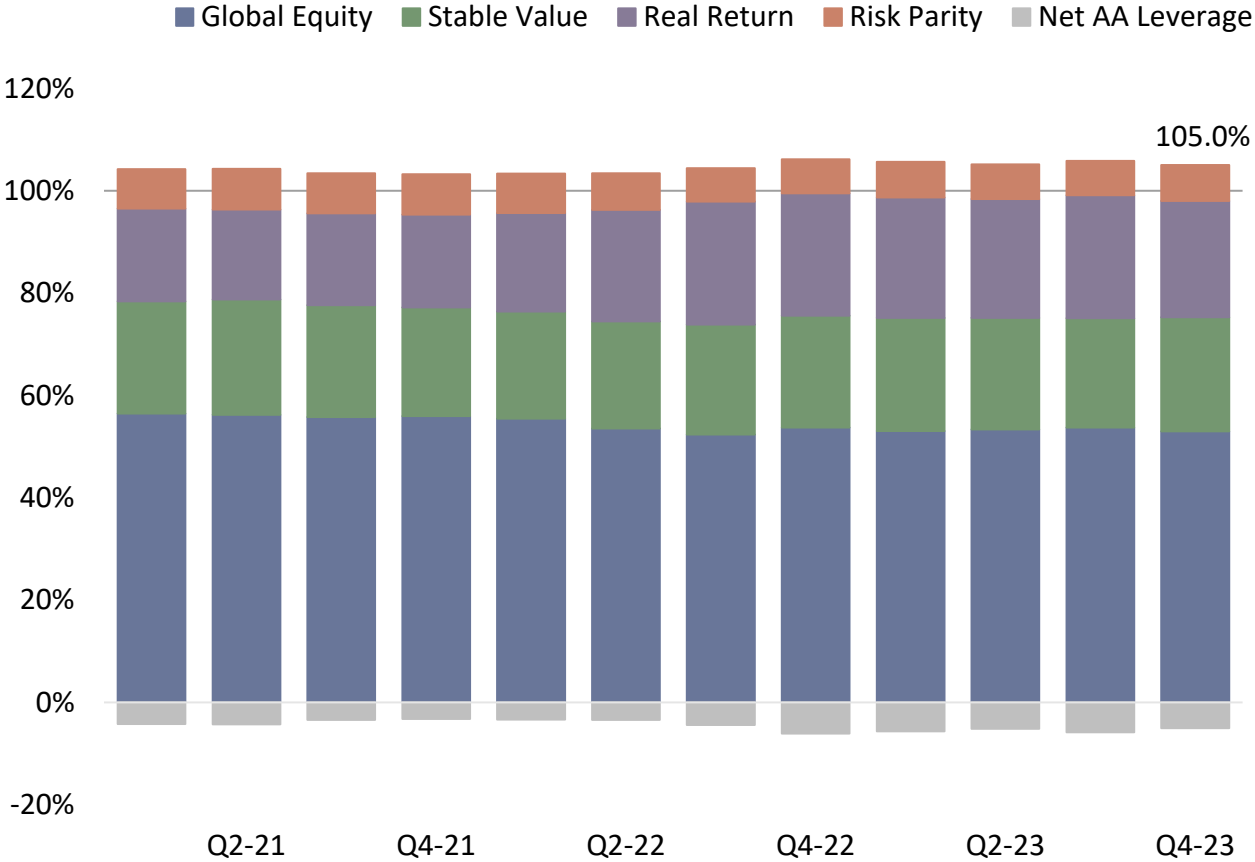
# Managing Trust Liquidity – SAA framework



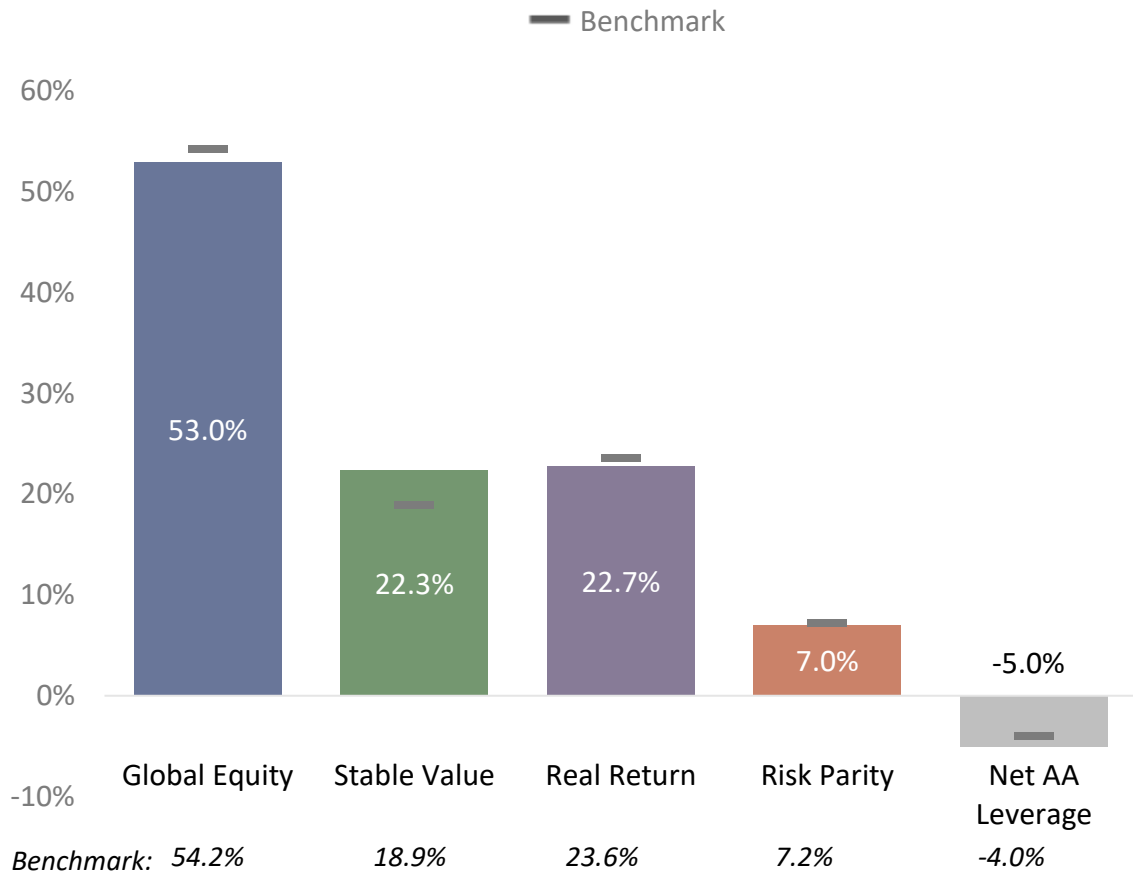
- **Sources** of liquidity must be **greater** than **uses** of liquidity
  - Uses of liquidity increase (sources decrease) as the allocation to illiquid assets increase
  - Actual liquidity in a crisis will likely vary from forecast
- **Sources** of liquidity dependent upon conditions
  - There are fewer buyers of liquid assets in a stress event which will impact pricing
  - TRS may be forced to sell at depressed prices
- **Uses** can be difficult to forecast given:
  - Depth of drawdown
  - Potential capital calls from external managers
  - Internal use of derivatives varies through time

# Trust overweight investment exposure primarily due to Stable Value

Asset Class Weights Trend



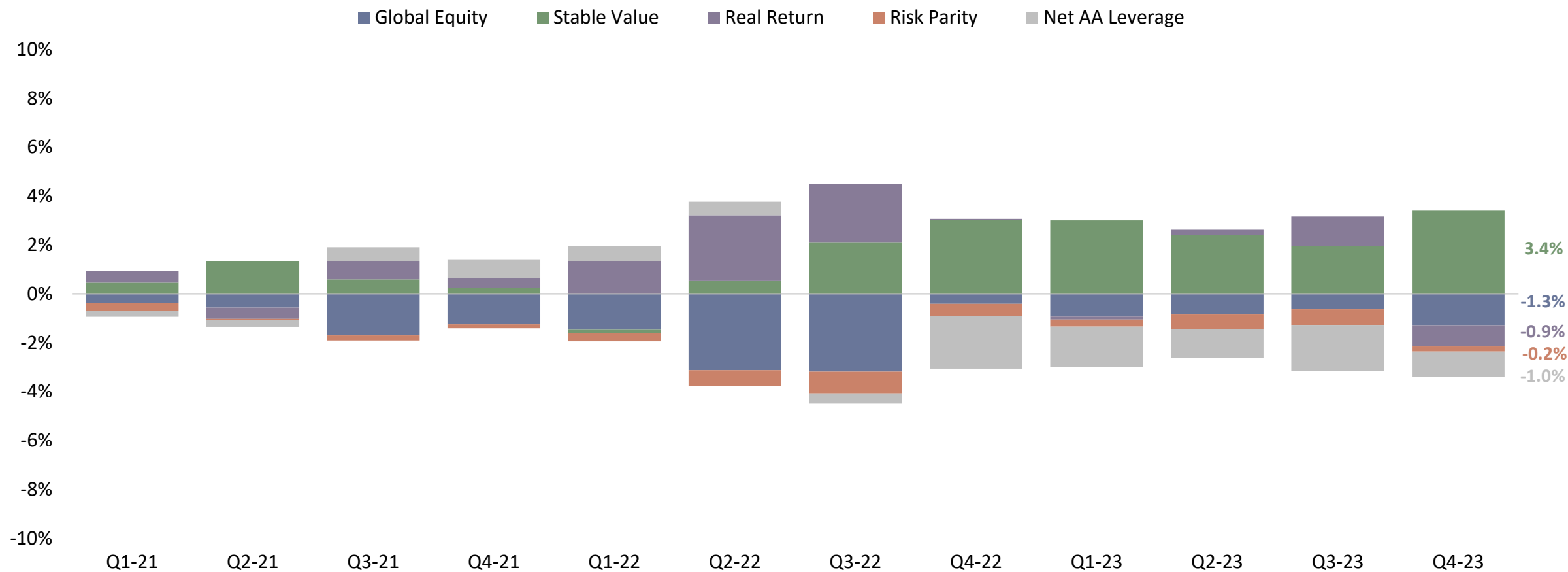
Asset Class Weights



Source: State Street Bank; note: Net AA leverage is -5.0%, which indicates the Trust is levered by 5.0%

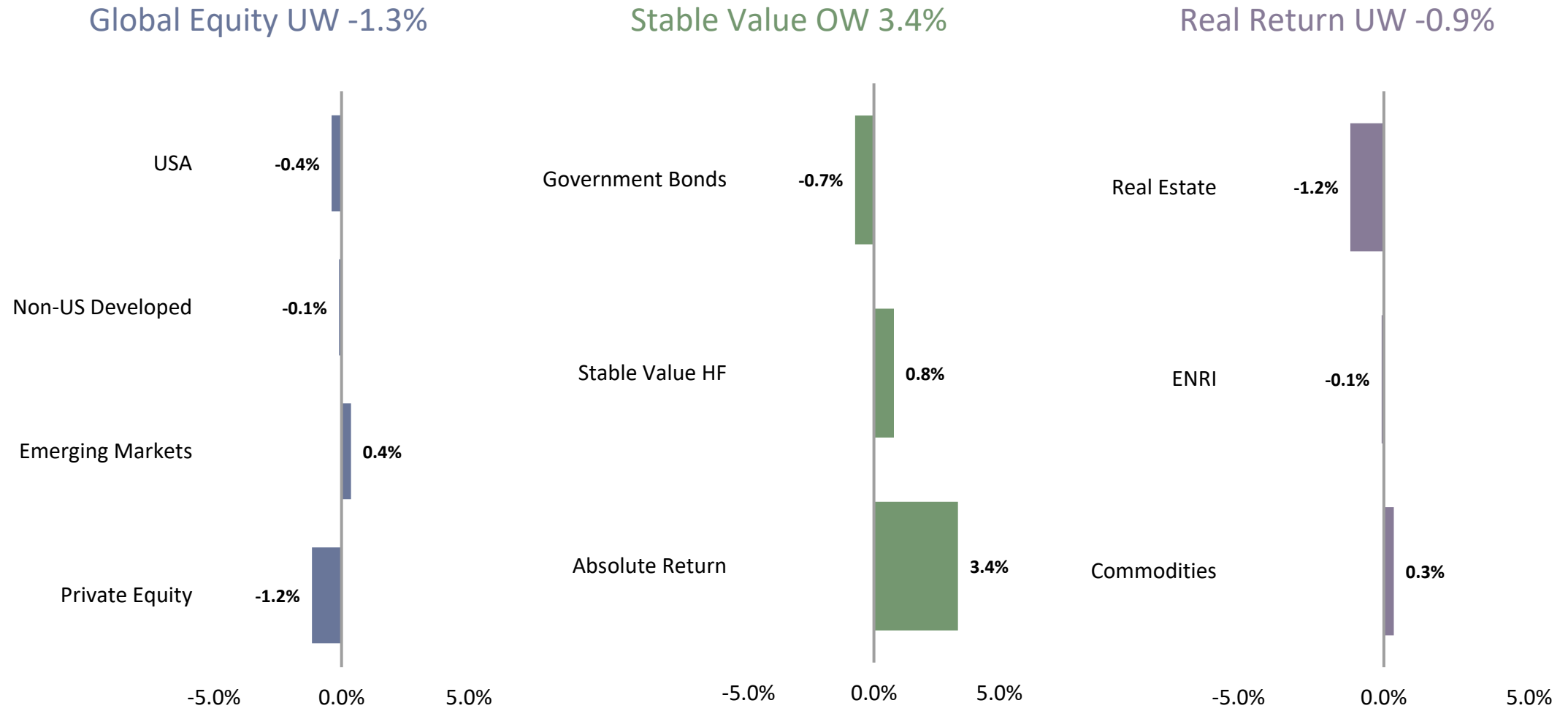
# Stable Value overweight partially offset by Global Equity and Real Return

Relative Asset Class Positions Through Time

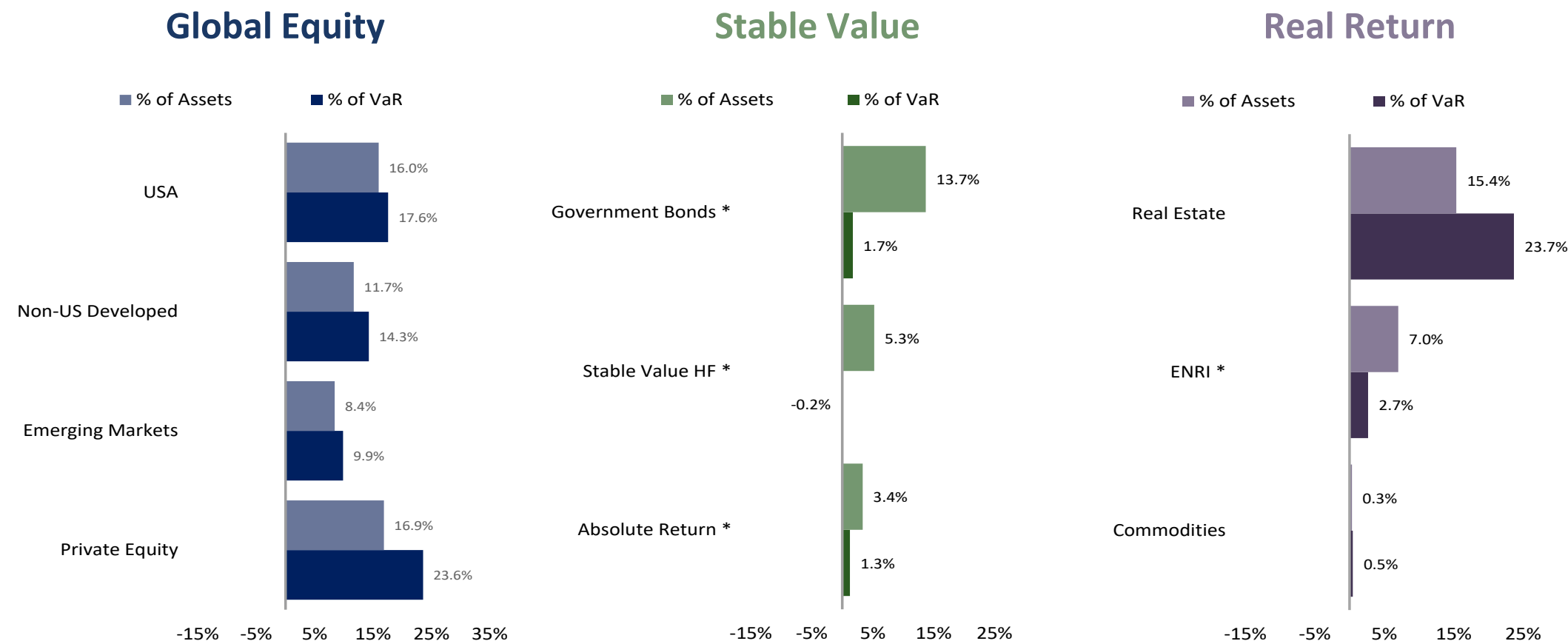


Source: State Street Bank  
Relative positions shown in comparison to quarter-end Trust benchmark weights as defined in policy

# Private Equity and Real Estate underweight due to public market returns

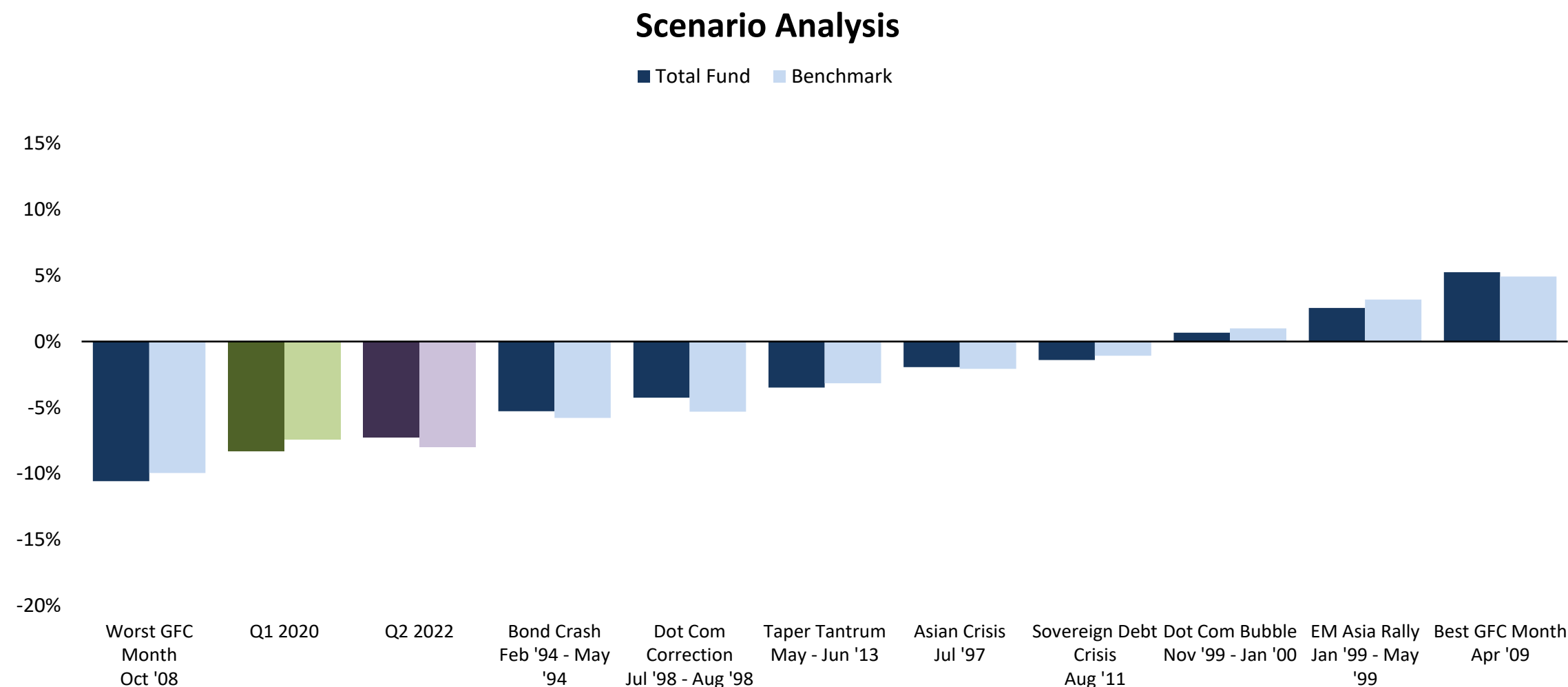


# Stable Value assets remain a key source of diversification

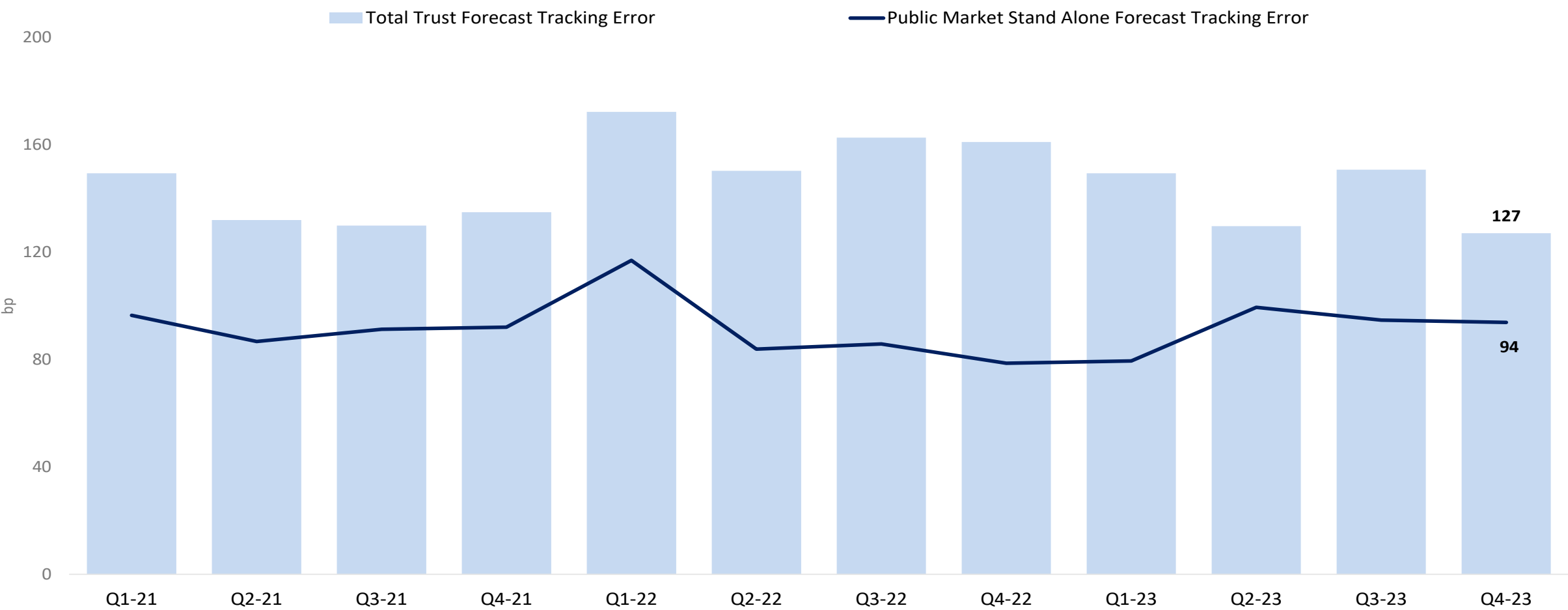


\* These assets contribute less risk than their dollar allocation

# Predicted Trust drawdown scenarios in line with benchmark

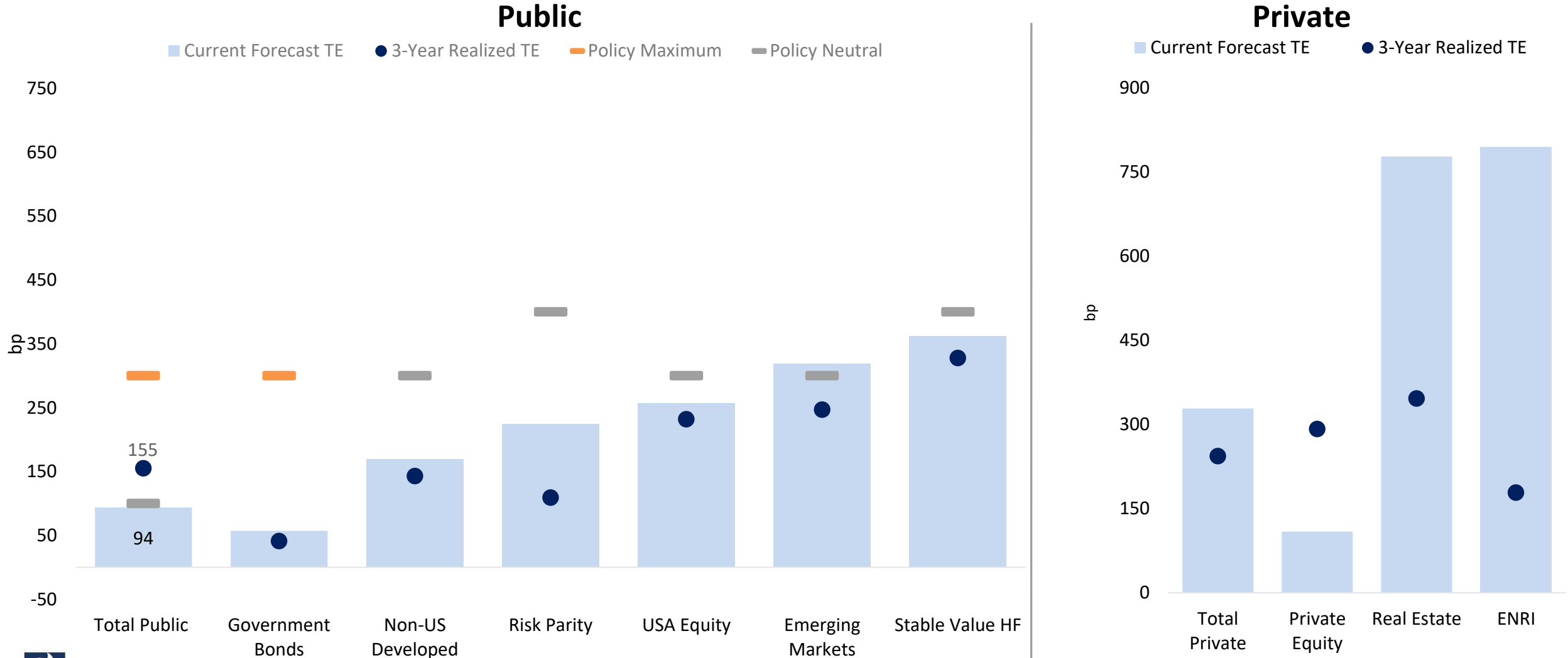


# Forecasted Trust tracking error remains range bound



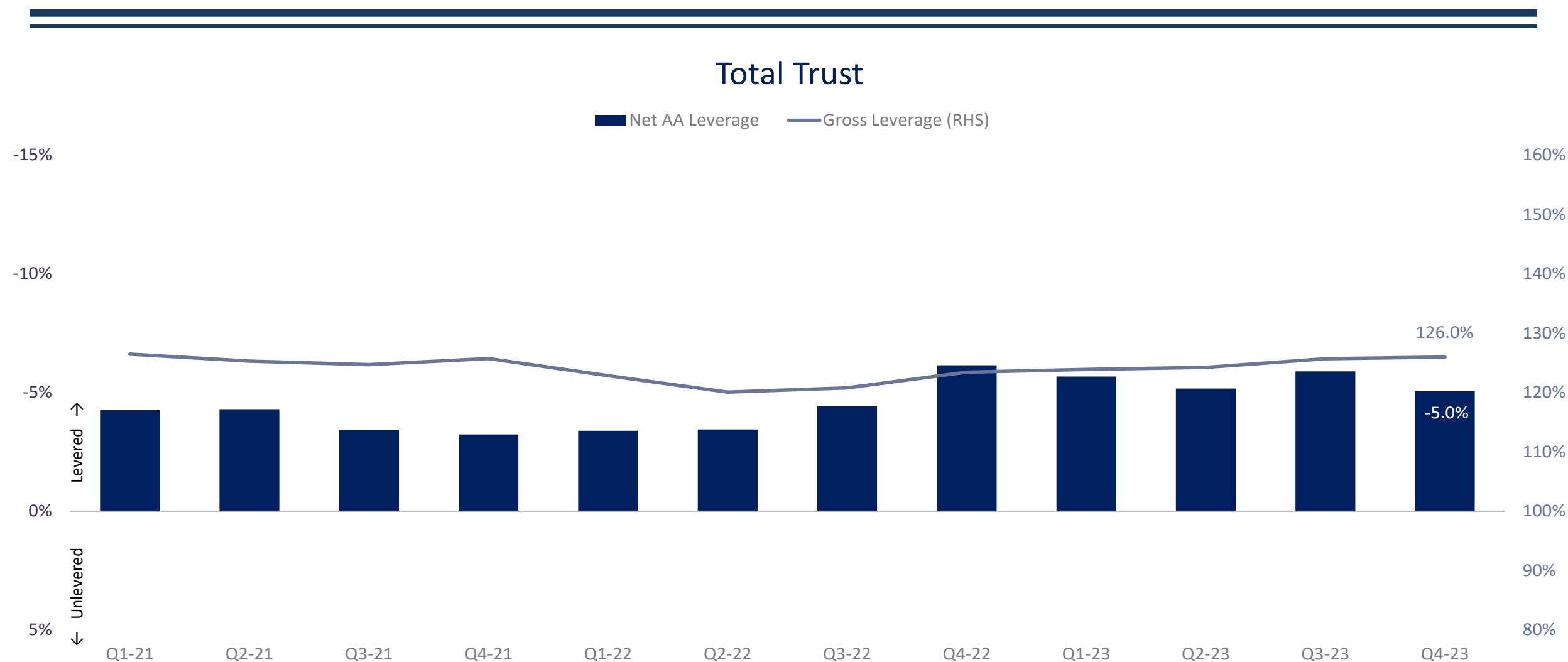


# Forecasted tracking error near historical norms



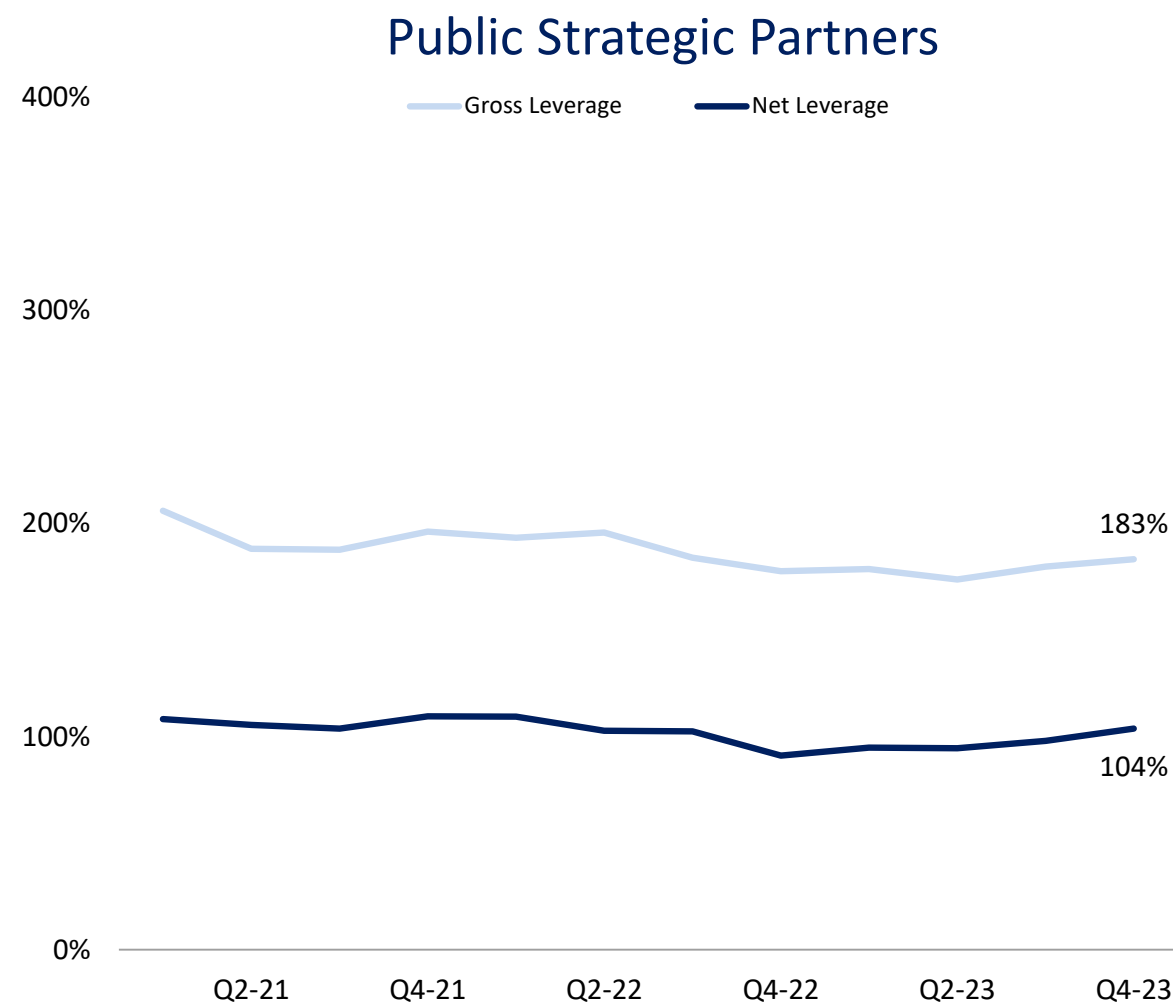
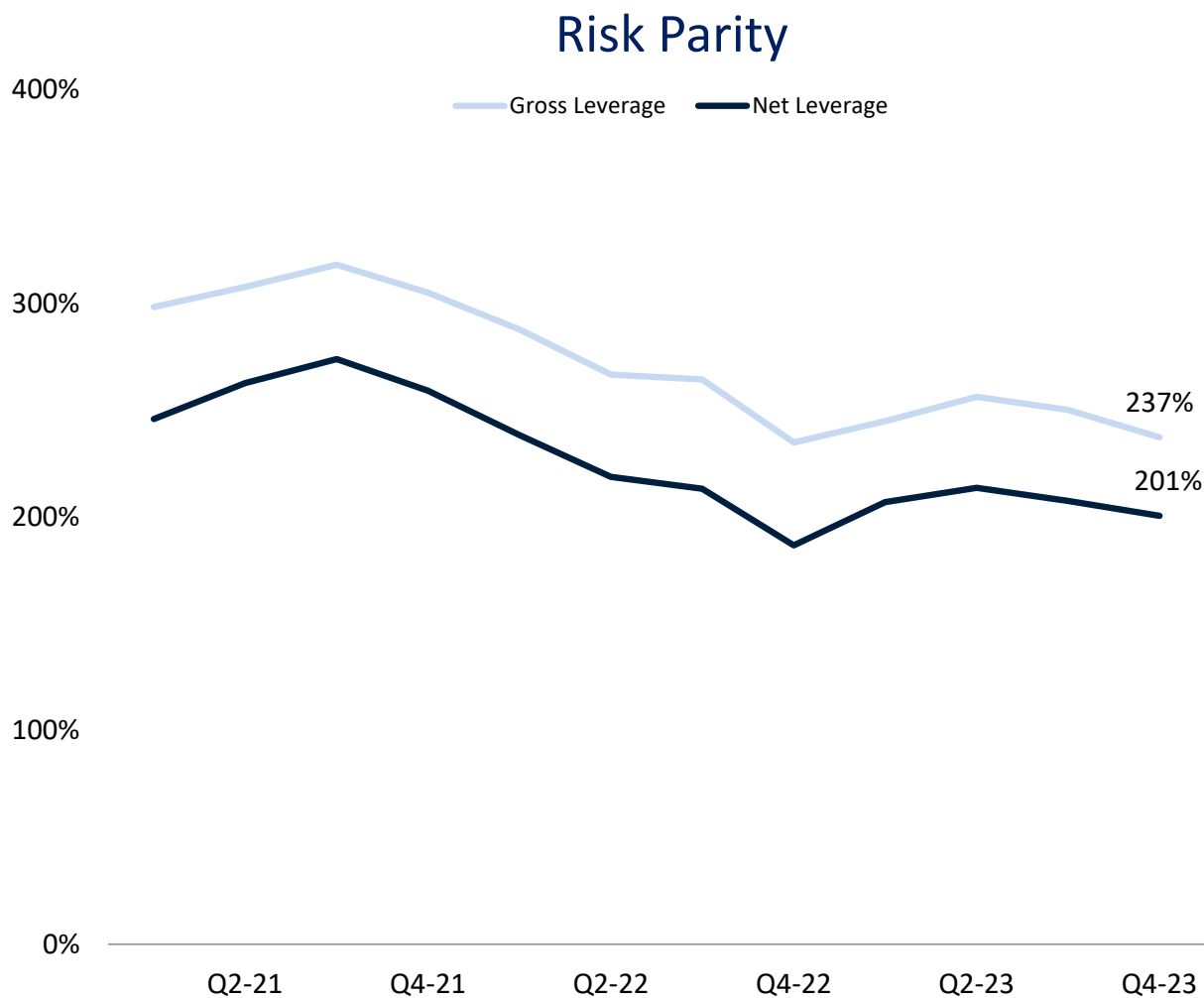
Source: State Street Bank; note: current forecast tracking error uses past experiences from January 1, 2008 to December 31, 2023 and therefore includes the effects of the Global Financial Crisis; External World Equity had tracking error of 295 bp realized, 243 bp forecasted with a policy neutral of 300

# Gross AA Leverage remained stable

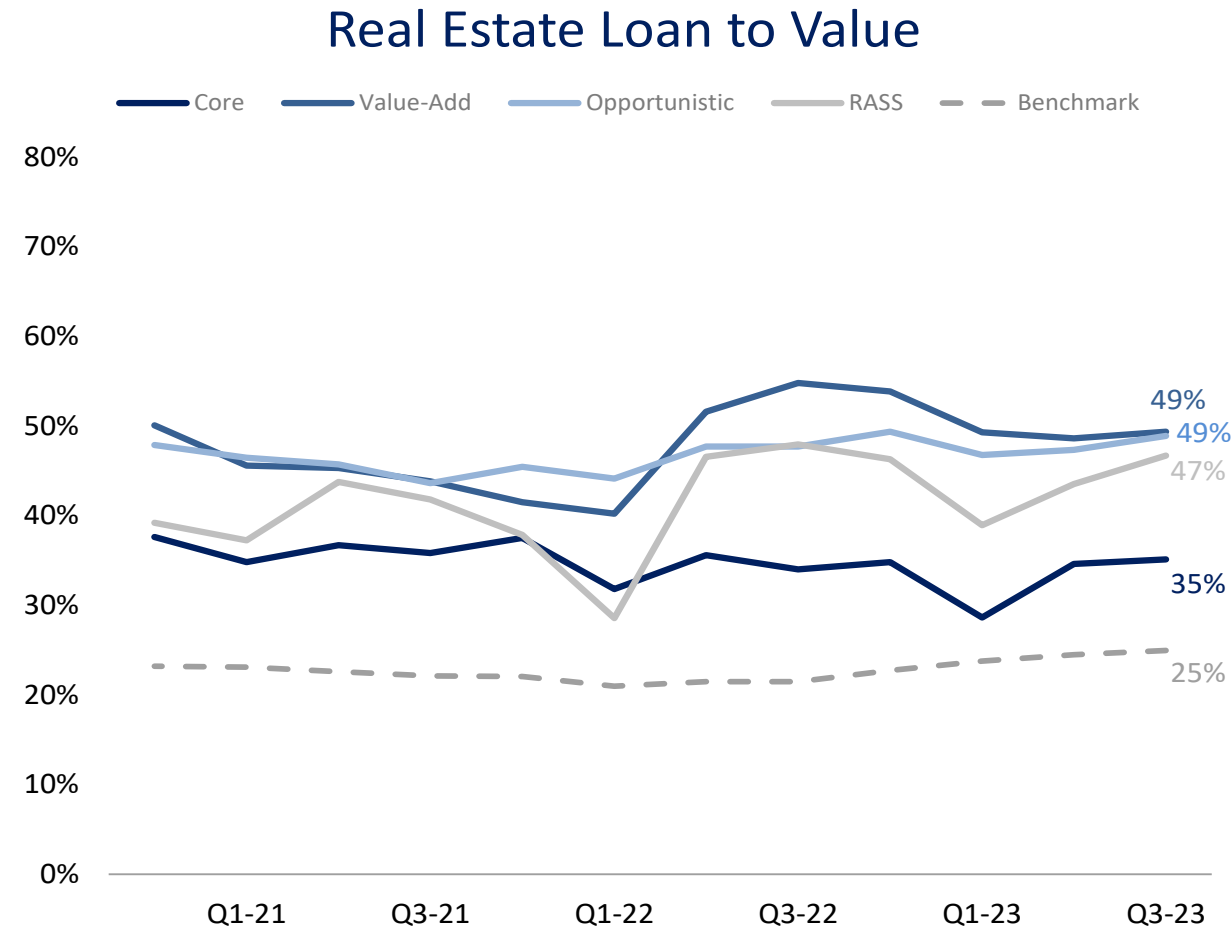
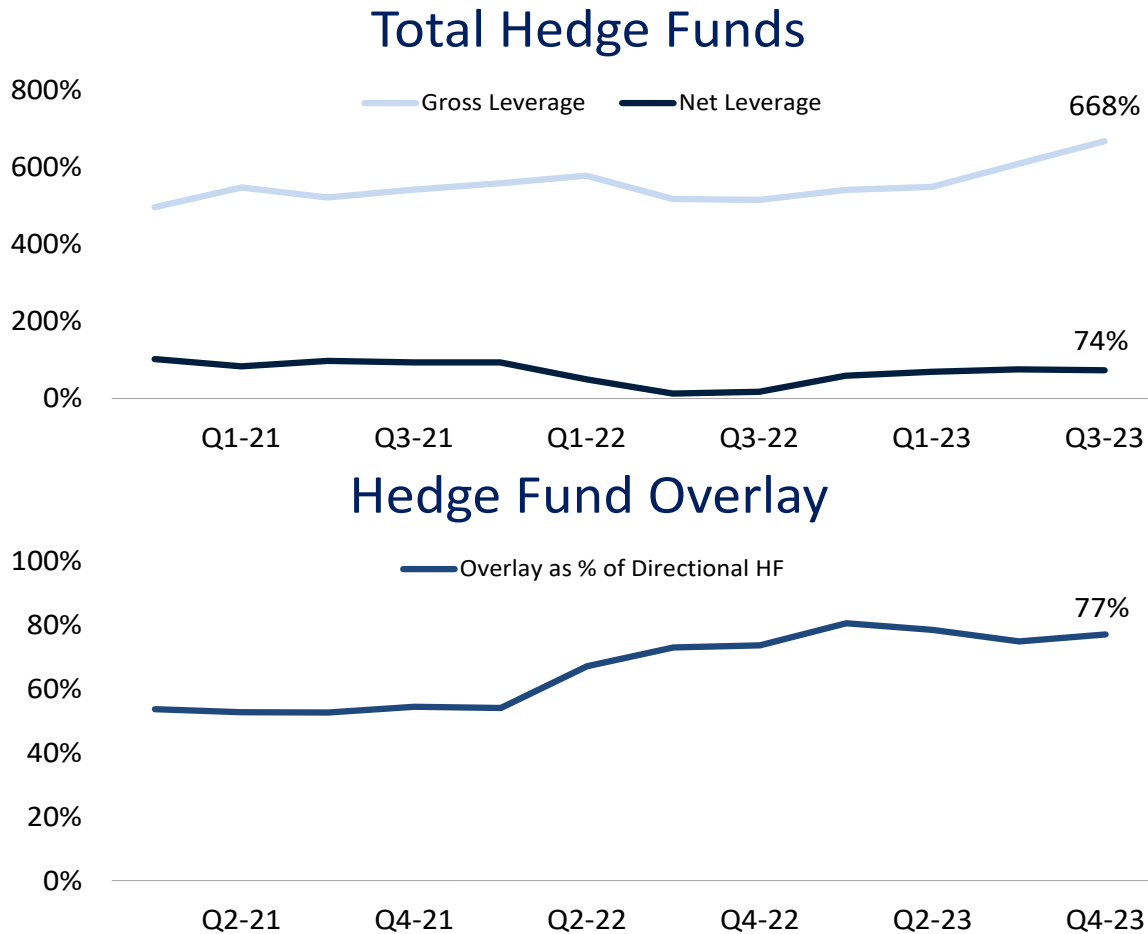


Source: State Street Bank  
Note: Total Trust leverage excludes securities lending which is reported separately; Net AA Leverage includes adjustments for delta-notionalization of options and exclusion of FX forwards of 30 days or less

# Risk Parity leverage decreased



# Hedge Fund Overlay increased to complement lower Hedge Fund beta

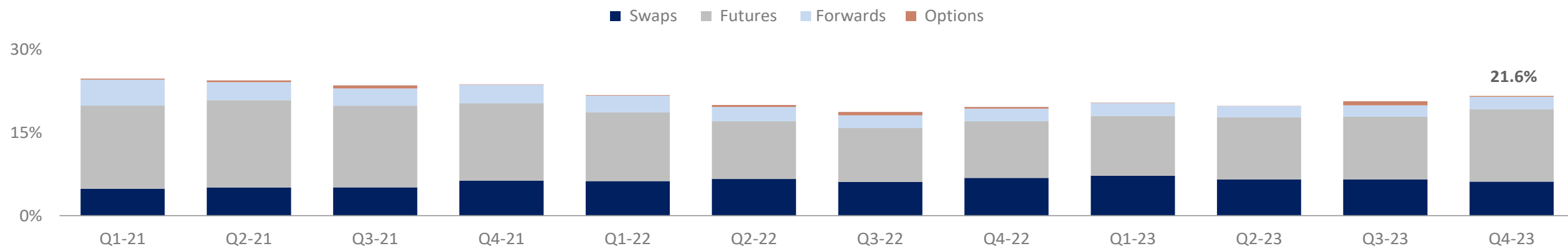


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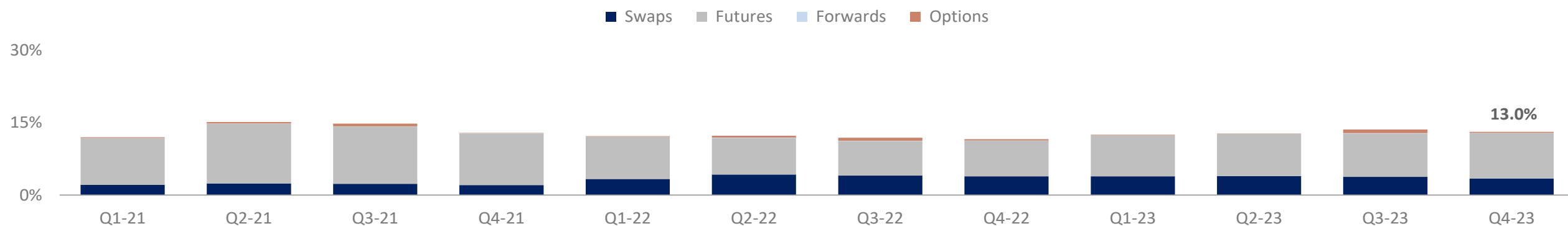
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# Derivative gross and net notional remained stable

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

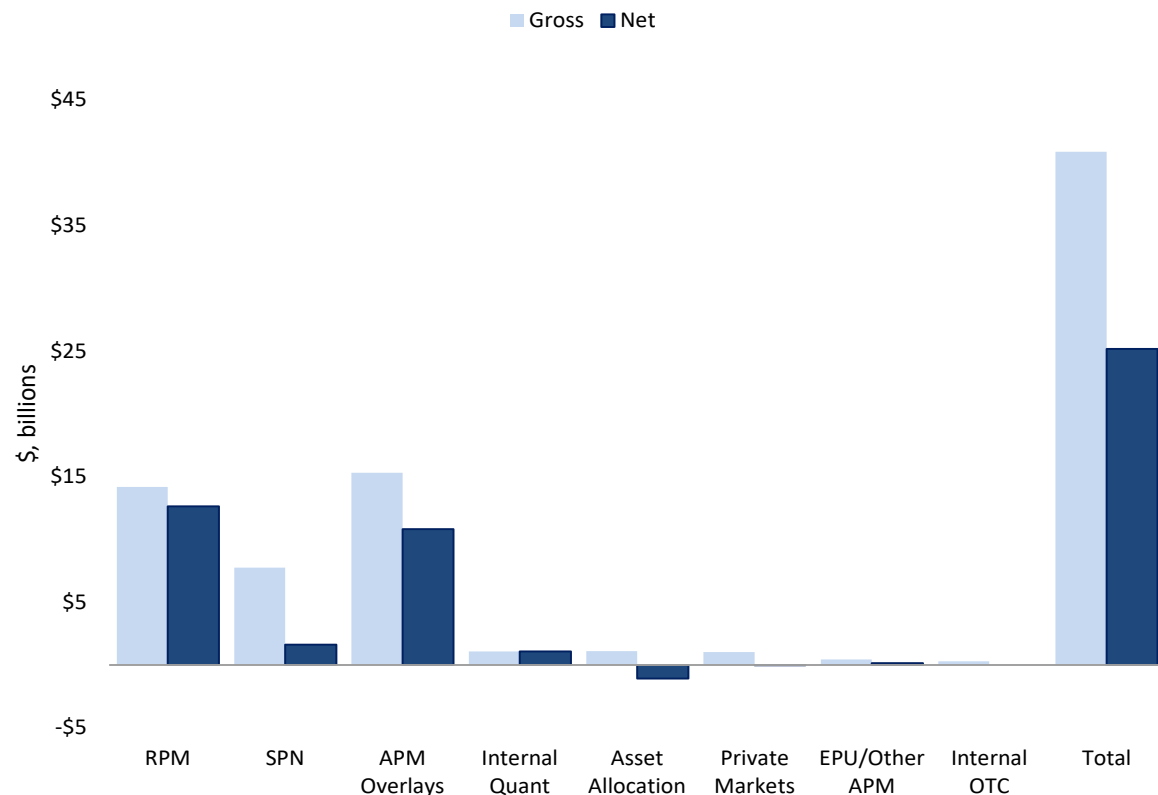


## Net Notional by Instrument (% of Total Trust)



# Derivatives contributed small portion of drawdown risk

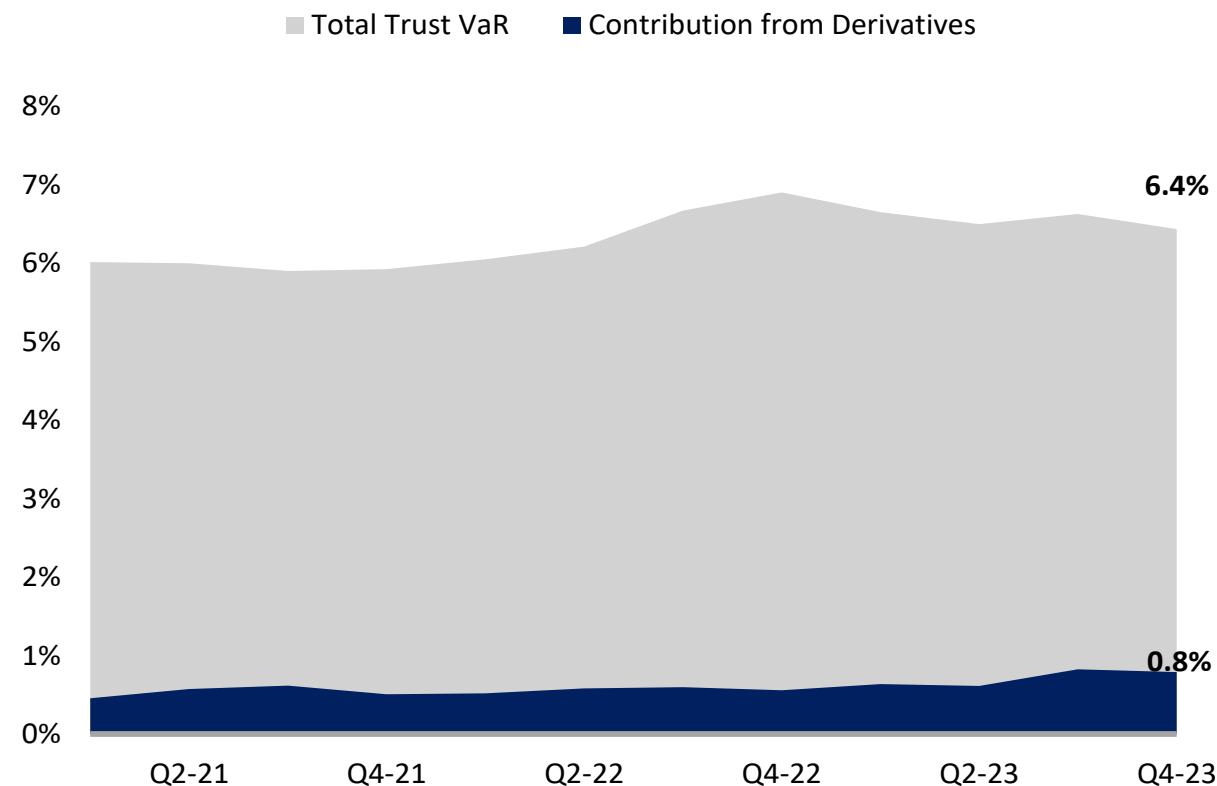
## Gross vs Net Derivatives Notional by Portfolio



● Total Gross = \$40.8b

● Total Net = \$25.1b

## VaR Contribution from Derivatives



Source: State Street Bank

Note: 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. Internal OTC represents trades done between profit centers at a quoted mid price from market brokers. As of 12/31/23, there were two internal OTC trades with gross notional of \$0.3b.

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## In conclusion, key points are the following:

---

- A suite of risk metrics will be reviewed to assess alternative strategic asset allocations
- **Drawdown** risk estimates potential downside events
  - Current expectation is for Trust to experience a monthly decline of -6.4% or worse five percent of the time
- Trust **Liquidity** is viewed through three different lenses
  - Trust currently holds 6.1x liquidity needed to navigate a severe monthly drawdown
- **All metrics remain in compliance**



# Strategic Asset Allocation (SAA) Study Alternative Allocations

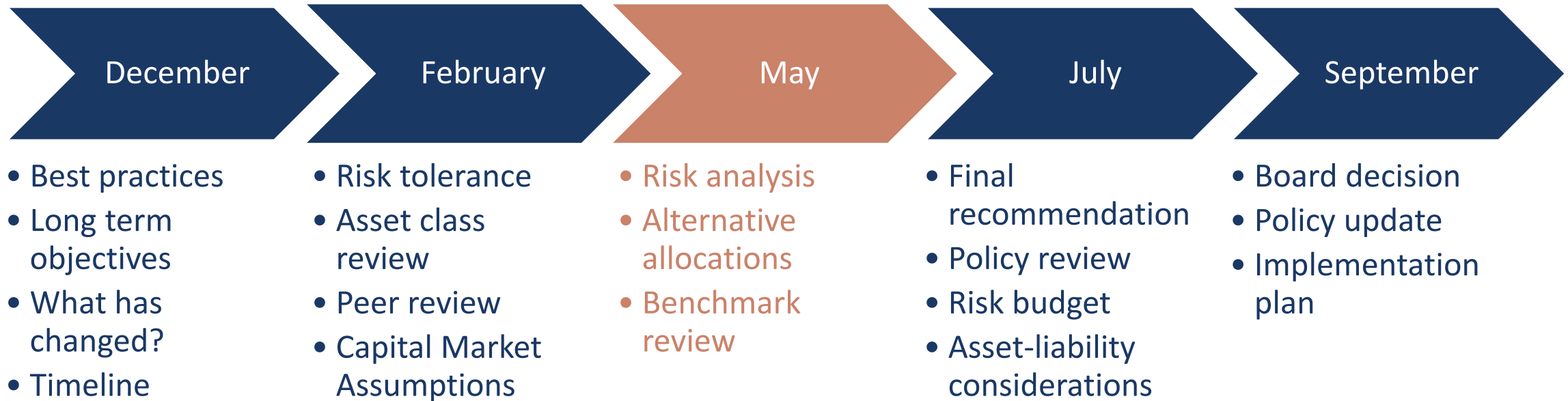
Mike Simmons, Director  
Risk and Portfolio Management

May 2024



# Proposed Board Timeline

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# 2024 SAA Study key considerations

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## Public Equity

1

Assess regional public equity mix

## Private Equity

2

Evaluate if Private Equity will outperform Public Equity

## Government Bonds

3

Weigh diversification benefit versus expected return

## Total Risk

4

Consider how much risk the Trust should take

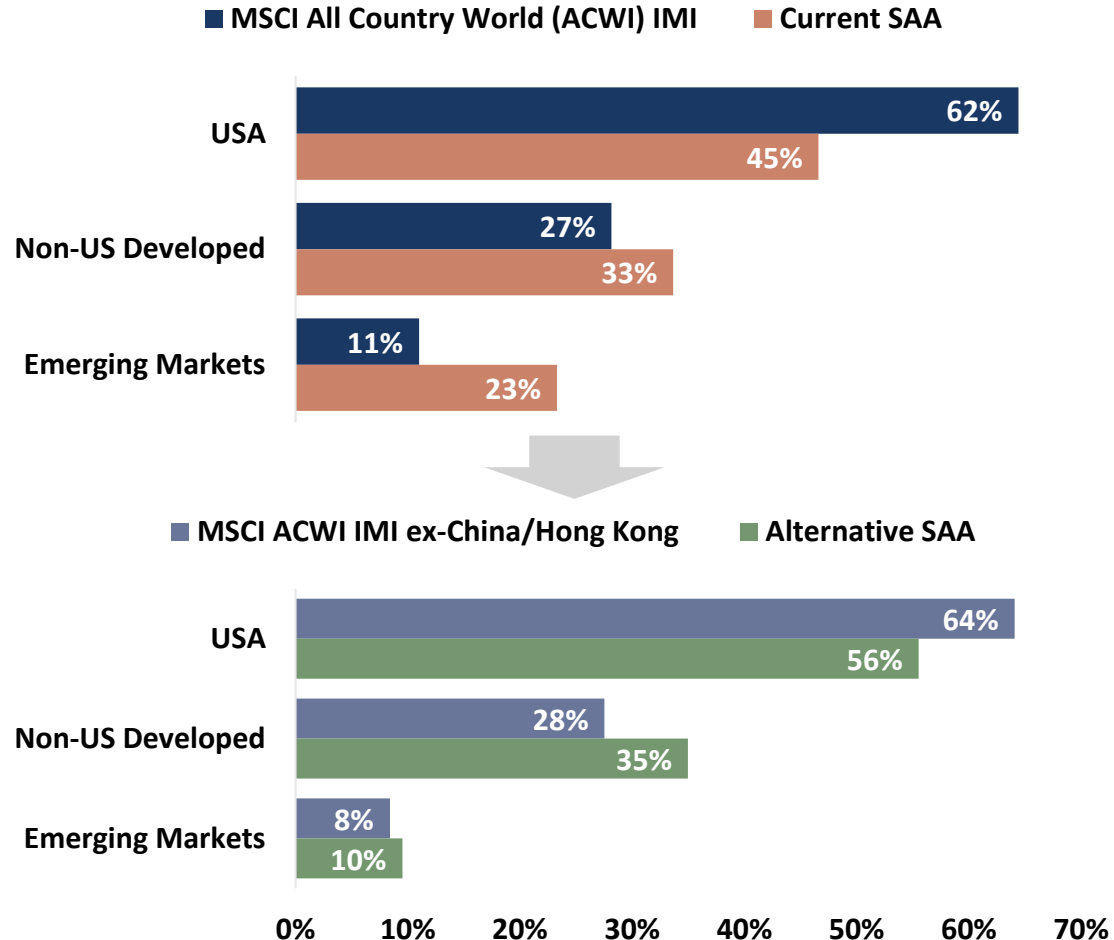
# Turning considerations into an allocation

	Current SAA	1. Public Equity	2. Private Equity	3. Gov't Bonds	4. Total Risk	Alternative SAA
USA	18%	-18%				
Non-US Developed	13%	-8%				5%
Emerging Markets	9%	-8%				1%
All Country		+33%	+3%		+3%	39%
Private Equity	14%		-2%			12%
Government Bonds - Nominal	16%			-6%		10%
Government Bonds - Real				+6%		6%
Absolute Return						
Stable Value Hedge Funds	5%					5%
Real Estate	15%					15%
ENRI	6%					6%
Commodities						
Risk Parity	8%				-3%	5%
Cash	2%					2%
Asset Allocation Leverage	-6%	+1%	-1%			-6%

- Public Equity:** Add 'All Country' line item to move closer to market capitalization weights
- Private Equity:** Reduce Private Equity allocation in favor of public equity
- Government Bonds:** Shorten and diversify duration to decrease inflation sensitivity
- Total Risk:** Shift from Risk Parity to public equity to better match long-term investment horizon

# Move closer to the market portfolio within Public Equity

## Public Equity Regional Weights



## Remove China and Hong Kong from benchmarks

### 1. Economic weakness

- Limits to investment led growth
- Real estate distress
- Demographics

### 2. Political environment

- Prioritization of social stability over profitability
- Regulatory environment

### 3. Geopolitical concerns

- China listed on the USA foreign adversaries list

# SAA considerations have a modest impact

	Current SAA	1. Public Equity	2. Private Equity	3. Gov't Bonds	4. Total Risk	Alternative SAA
USA	18%	-18%				
Non-US Developed	13%	-8%				5%
Emerging Markets	9%	-8%				1%
All Country		+33%	+3%		+3%	39%
Private Equity	14%		-2%			12%
Government Bonds - Nominal	16%			-6%		10%
Government Bonds - Real				+6%		6%
Absolute Return						
Stable Value Hedge Funds	5%					5%
Real Estate	15%					15%
ENRI	6%					6%
Commodities						
Risk Parity	8%				-3%	5%
Cash	2%					2%
Asset Allocation Leverage	-6%	+1%	-1%			-6%
Long-Term Expected Return	7.8%	-0.1%	0.0%	0.0%	0.0%	7.7%
Long-Term Expected Volatility	11.7%	-0.2%	+0.1%	+0.2%	+0.2%	12.0%
Max Historical Drawdown	-26.1%	+0.1%	-1.1%	-0.7%	-0.9%	-28.7%
SAA Liquidity Ratio	1.9	+0.0	+0.1	0.0	-0.0	1.9
Trust Duration (Years)	3.2	0.0	0.0	-0.5	-0.3	2.4

- Shift from Emerging to Developed Markets lowers expected return and risk
  - Reduces tail risk associated with investing in Emerging Markets
- Less Private Equity increases historical drawdown
  - Competition expected to weigh on Private Equity returns
- Reduced duration increases volatility
  - Less sensitivity to inflation risk
- Move to public equity from Risk Parity increases volatility
  - Better capture potential upside from economic growth through equities



# Higher expected asset returns mean more viable options

	Option 1 Current SAA	Option 2 Alternative SAA	Option 3 Less Risk	Option 4 More Risk	Average US Pension	70/30
USA	18%					
Non-US Developed	13%	5%	5%	1%		
Emerging Markets	9%	1%	1%	5%		
All Country		39%	34%	42%	42%	70%
Private Equity	14%	12%	12%	12%	13%	
Government Bonds - Nominal	16%	10%	12%	8%	16%	30%
Government Bonds - Real		6%	3%	8%	2%	
Absolute Return					8%	
Stable Value Hedge Funds	5%	5%	5%	5%	3%	
Real Estate	15%	15%	15%	15%	10%	
ENRI	6%	6%	5%	6%	3%	
Commodities						
Risk Parity	8%	5%	5%	8%	1%	
Cash	2%	2%	3%	2%	1%	3%
Asset Allocation Leverage	-6%	-6%		-12%	-1%	-3%
Long-Term Expected Return	7.8%	7.7%	7.5%	7.9%	7.4%	6.5%
Long-Term Expected Volatility	11.7%	12.0%	11.0%	13.0%	11.3%	11.6%
Max Historical Drawdown	-26.1%	-28.7%	-25.9%	-31.0%	-27.4%	-32.6%
SAA Liquidity Ratio	1.9	1.9	2.2	1.8	2.1	4.5
Trust Duration (Years)	3.2	2.4	2.5	2.5	1.8	2.2

## Option 1: Current SAA

- Current policy is a well-balanced portfolio expected to meet the actuarial rate of return

## Option 2: Alternative SAA

- Make the portfolio more resilient to potential downside scenarios

## Option 3: Less Risk

- Reduce investment exposure while still expecting to exceed the actuarial rate of return

## Option 4: More Risk

- Increase investment exposure and public equities while maintaining balance

# Bringing it all together

	Option 1 Current SAA	Option 2 Alternative SAA	Option 3 Less Risk	Option 4 More Risk	Average US Pension	70/30
Total Global Equity	54%	57%	52%	60%	56%	70%
Total Stable Value	21%	21%	20%	21%	29%	30%
Total Real Return	21%	21%	20%	21%	14%	
Total Risk Parity	8%	5%	5%	8%	1%	
Net Asset Allocation Leverage	-4%	-4%	3%	-10%	0%	0%
Total Public	69%	71%	65%	77%	73%	100%
Total Private	35%	33%	32%	33%	26%	
Long-Term Expected Return	7.8%	7.7%	7.5%	7.9%	7.4%	6.5%
Long-Term Expected Volatility	11.7%	12.0%	11.0%	13.0%	11.3%	11.6%
Max Historical Drawdown	-26.1%	-28.7%	-25.9%	-31.0%	-27.4%	-32.6%
SAA Liquidity Ratio	1.9	1.9	2.2	1.8	2.1	4.5
Trust Duration (Years)	3.2	2.4	2.5	2.5	1.8	2.2
Long-Term Expected Sharpe	0.4	0.4	0.4	0.3	0.4	0.3

Two main differentiators across the various options:

1. Equity allocation
2. Net Asset Allocation Leverage

All Options:

- Maintain balance between Stable Value and Real Return
- Expected to generate returns above the actuarial rate of return
- Have a similar Sharpe ratio

# Key Takeaways and Next Steps

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- Current SAA is well-balanced and expected to return above the actuarial rate of return
- The alternative allocations improve portfolio resiliency with limited impact to forward-looking returns or risk
- The SAA Team will continue to explore these alternatives, stress-test various scenarios and incorporate feedback from the Board and their advisors
- Final recommendation will be proposed at the July Board meeting for consideration in September

# Appendix

# 2024 Capital Market Assumptions Survey Results

## Long-Term Expected

Return Volatility

USA	6.8%	16.6%
Non-US Developed	6.6%	17.6%
Emerging Markets	7.6%	21.1%
All Country	7.0%	16.7%
Private Equity	9.1%	20.1%

Government Bonds - Nominal	4.3%	12.4%
Government Bonds - Real	4.6%	5.8%
Stable Value Hedge Funds	5.4%	5.2%
Absolute Return	6.4%	8.4%

Real Estate	9.0%	15.3%
ENRI	8.0%	11.2%
Commodities	4.9%	18.0%

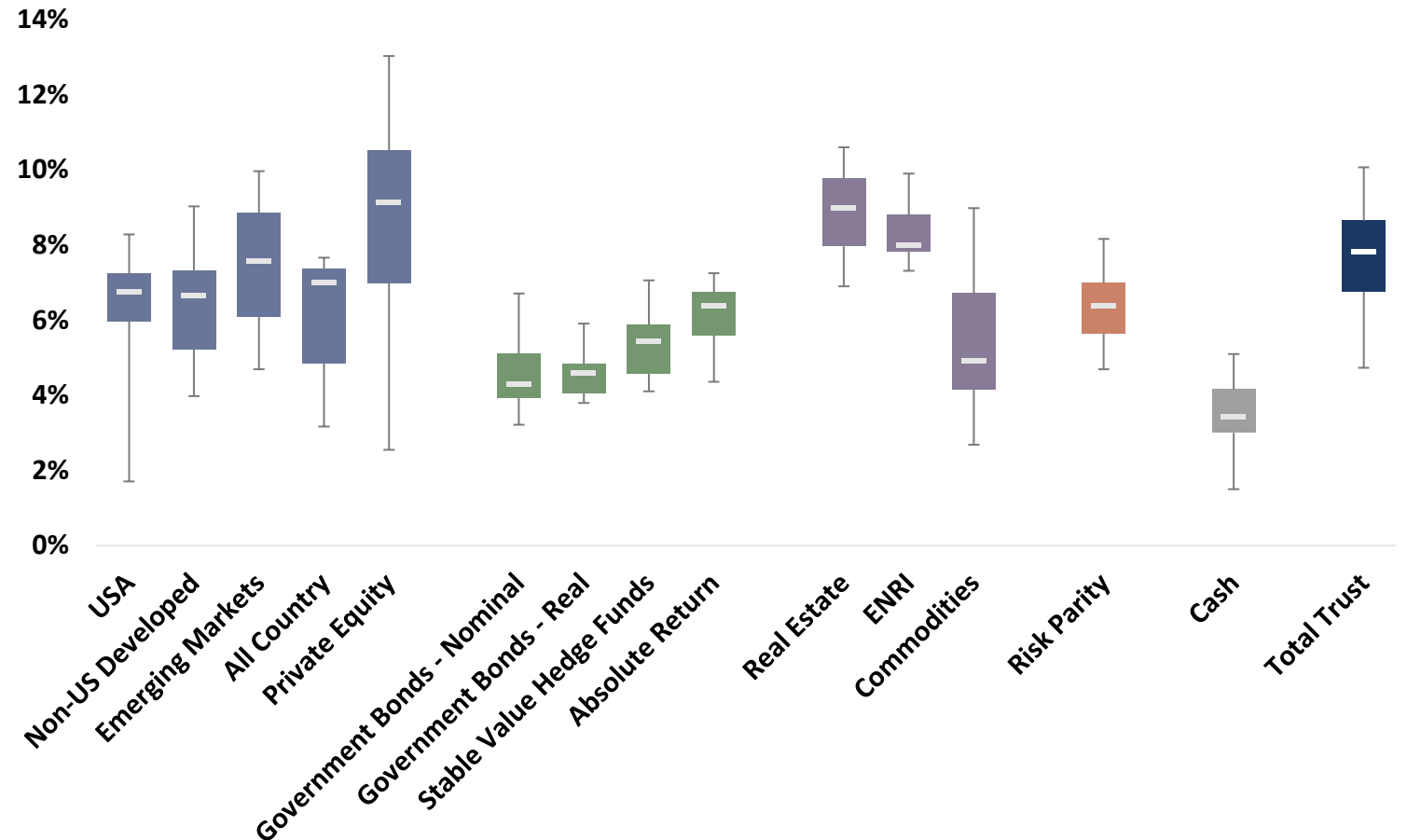
Risk Parity	6.4%	11.5%
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Cash	3.4%	0.6%
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Total Trust	7.8%	11.7%
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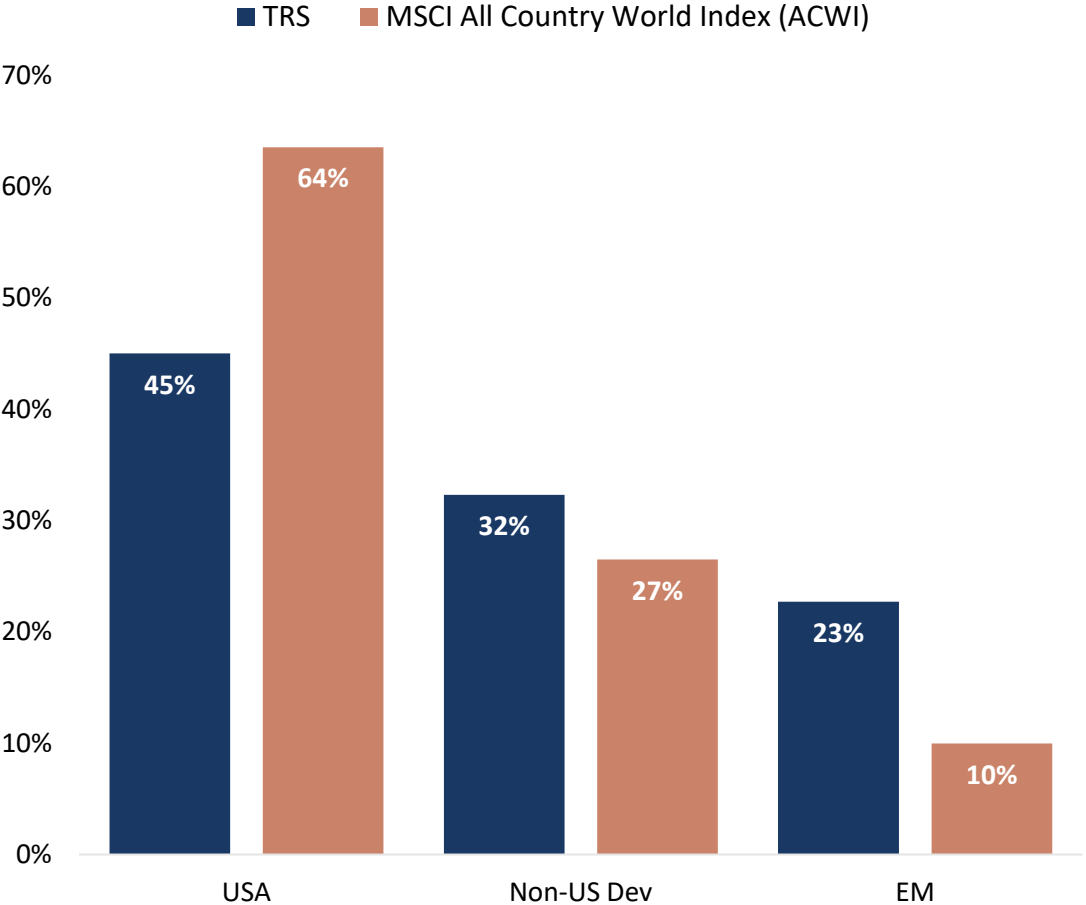
## 2024 Expected Return Forecasts

■ 75%/25% — Median

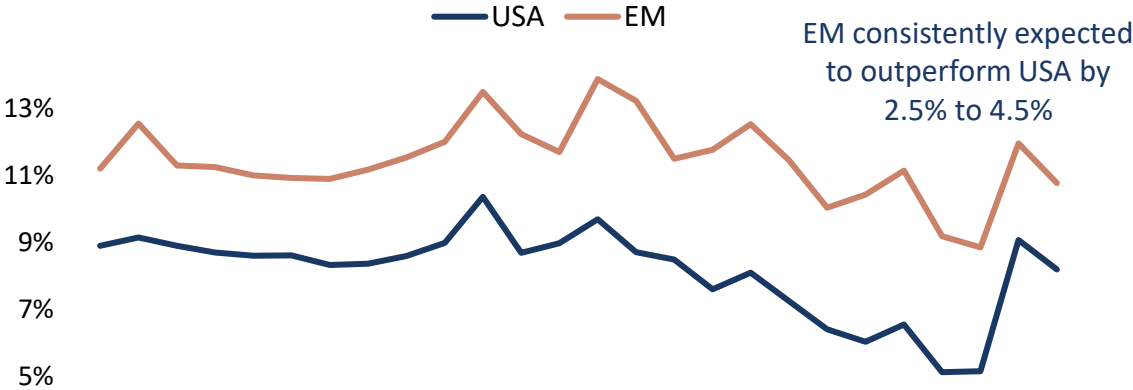


# 1. Public Equities: TRS has higher weight to EM equities, but will they outperform?

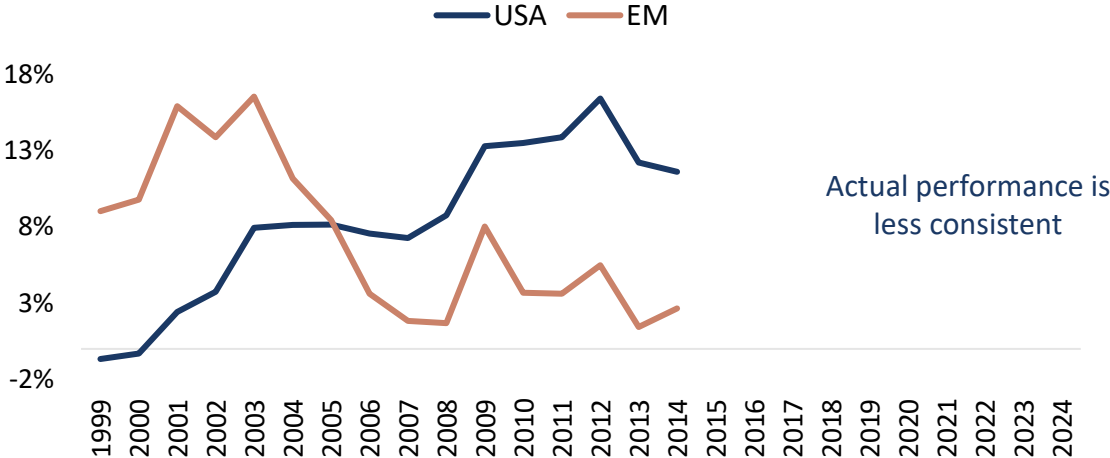
## Public Equity Regional Weights



## Expected Return

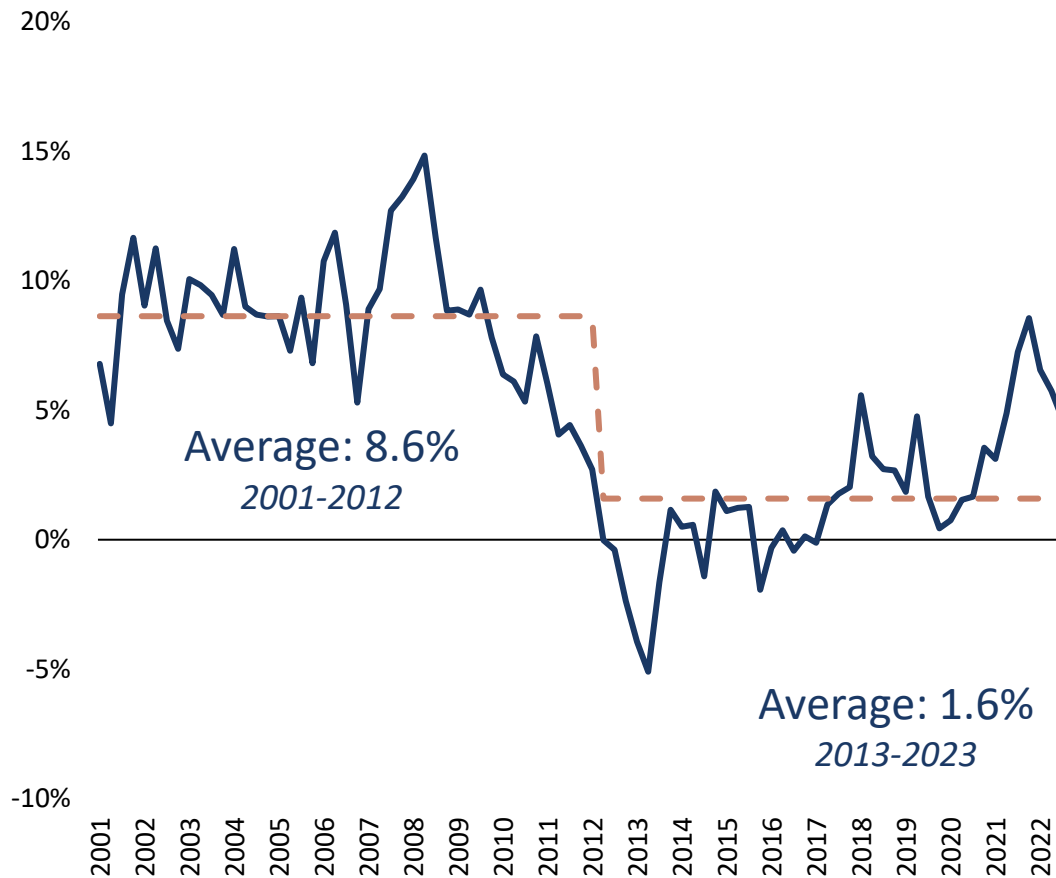


## Actual Return: Next 10-Years



## 2. Private Equity: Spreads have compressed but opportunities remain

Rolling 5-year Spread vs. Public



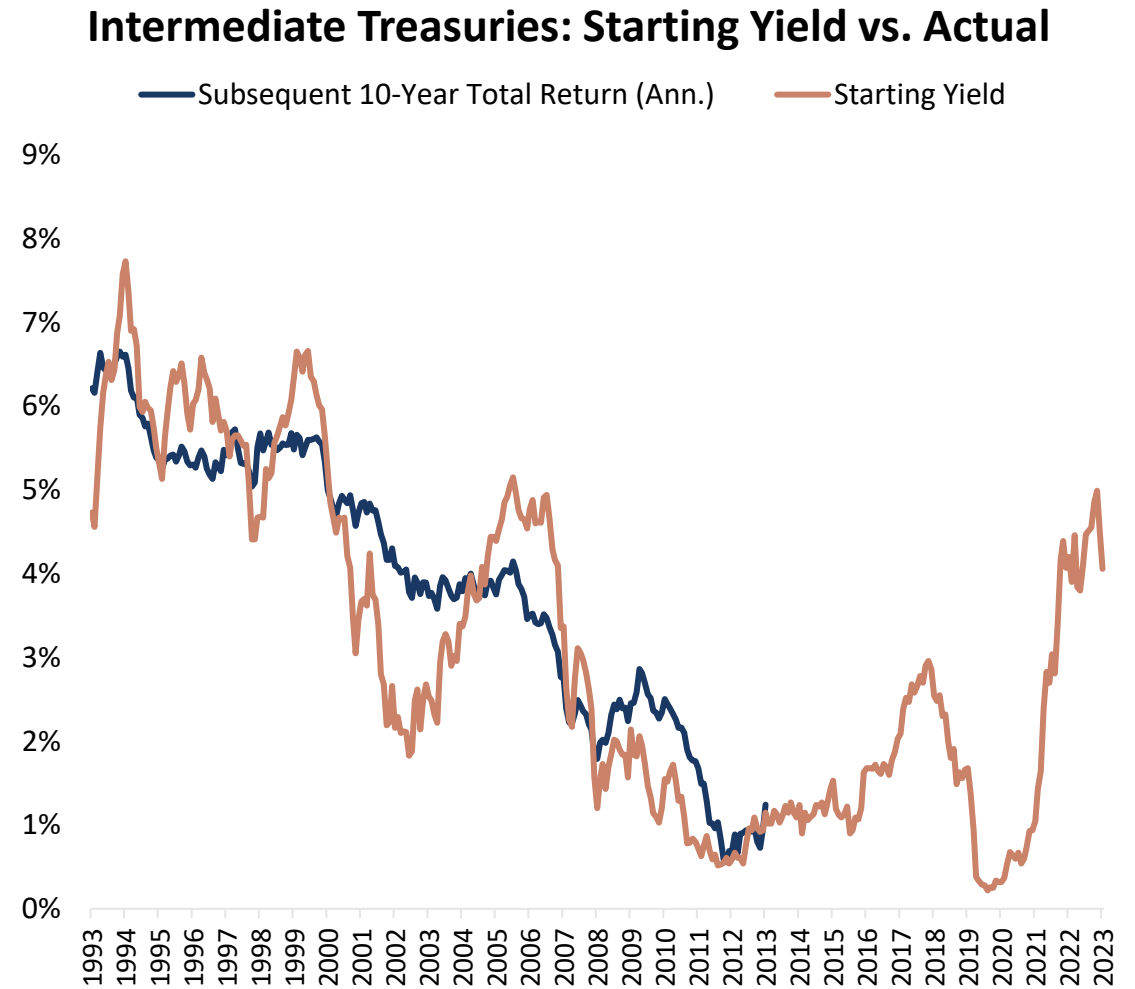
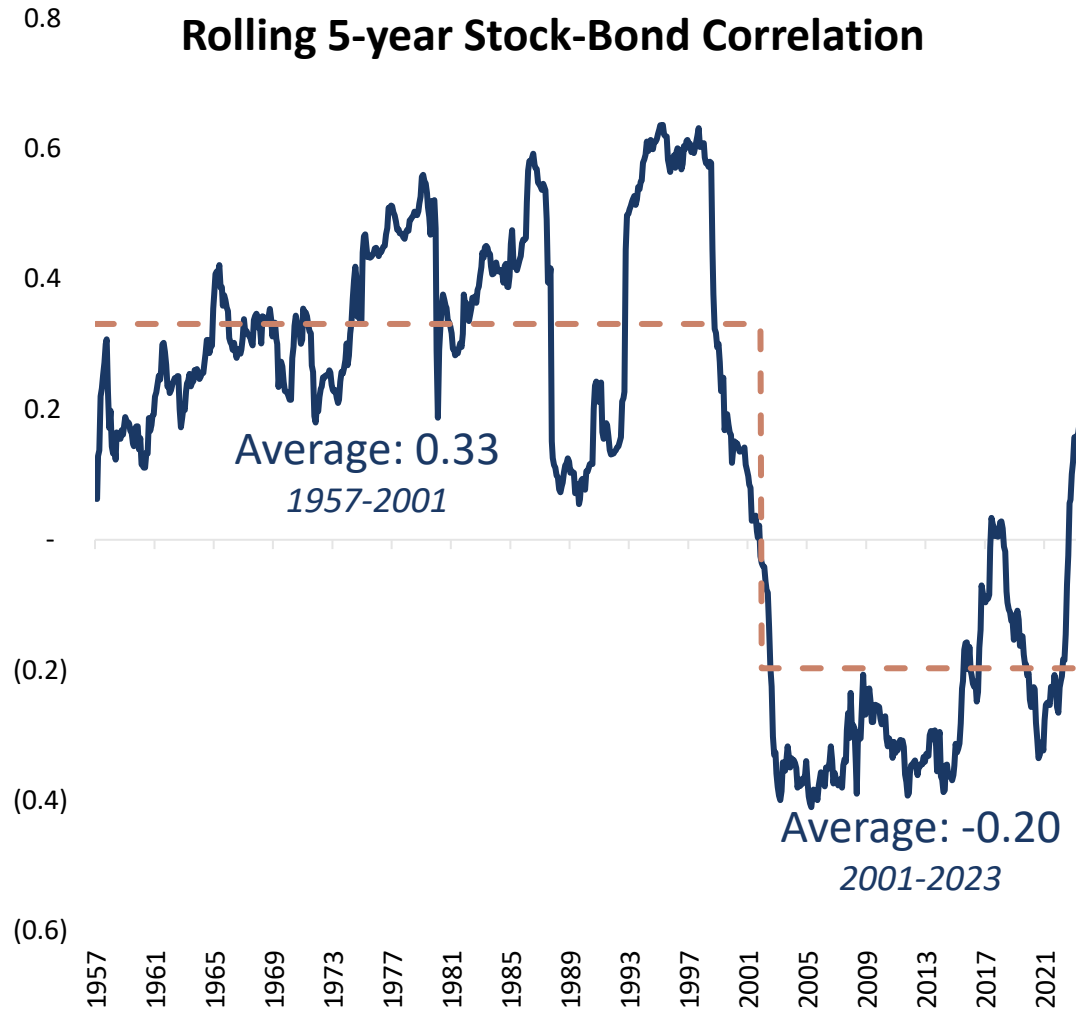
### • Positives

- Historically, Private Equity has a positive premium versus public 87% of the time
- Some LPs may be over-allocated to Private Equity – it could be an attractive time to invest
- “Private Equity Toolkit” has added value over time
- Diversification through exposure to newer and smaller companies

### • Negatives

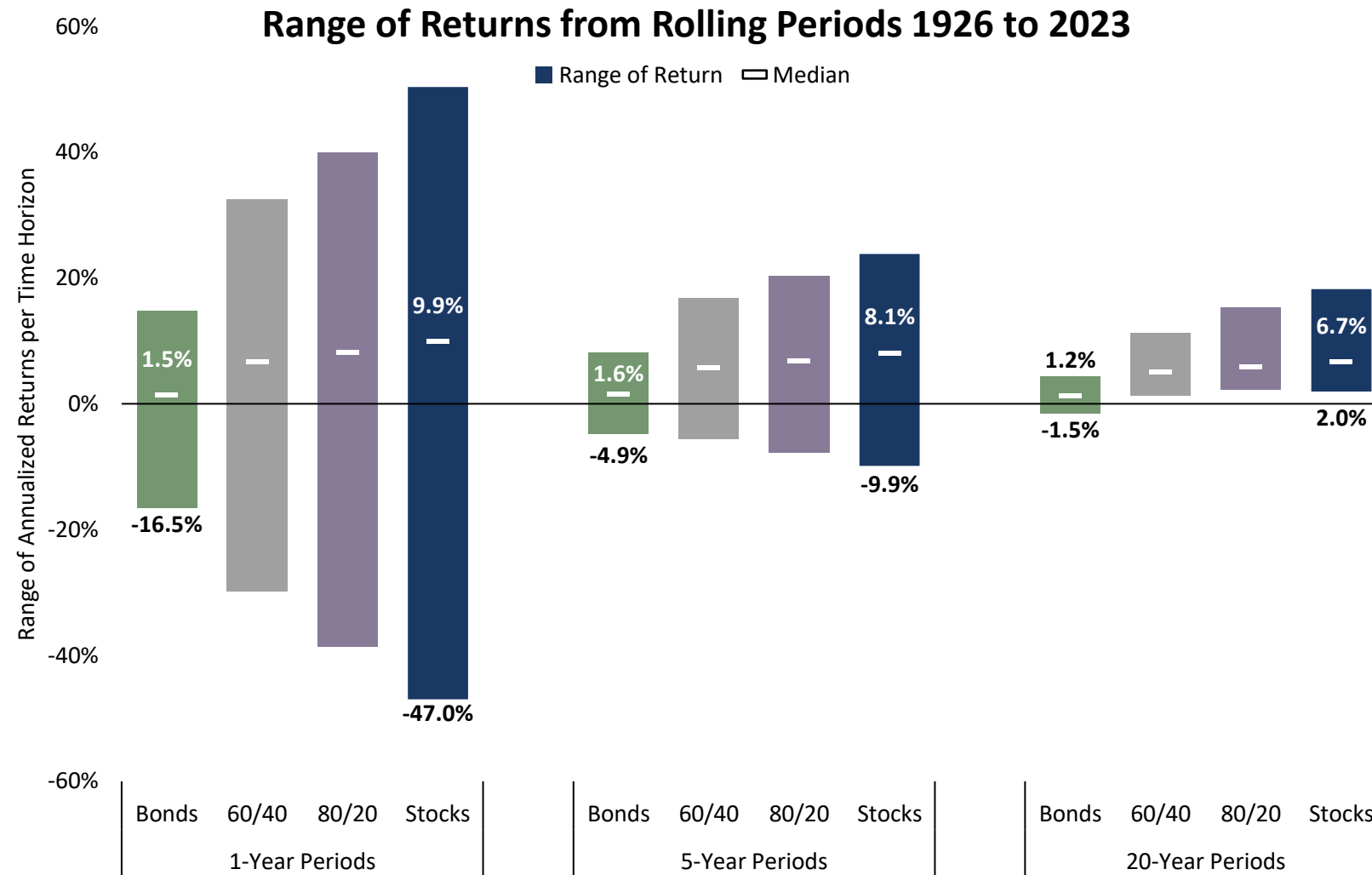
- Large amount of existing dry powder
- Higher interest rates make leverage, an important PE tool, less attractive
- Many new managers have formed and competition for cheap and inefficient targets has increased
- Exits are difficult with IPO market sluggish and strategic buyers facing a higher cost of capital

### 3. Bonds: Potentially less diversifying but improved expected returns





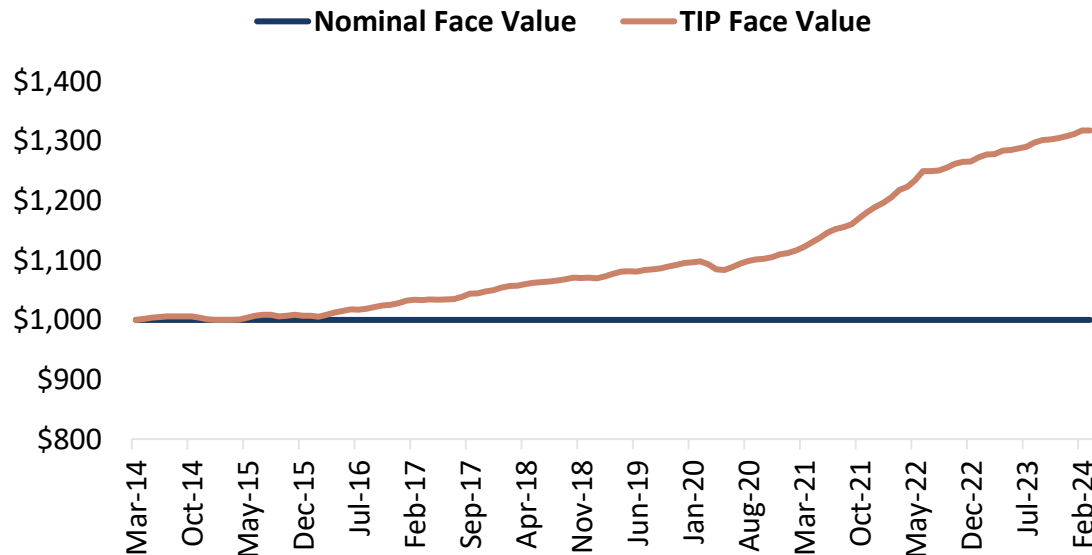
## 4. Total Risk: Long time horizons usually diversify risk



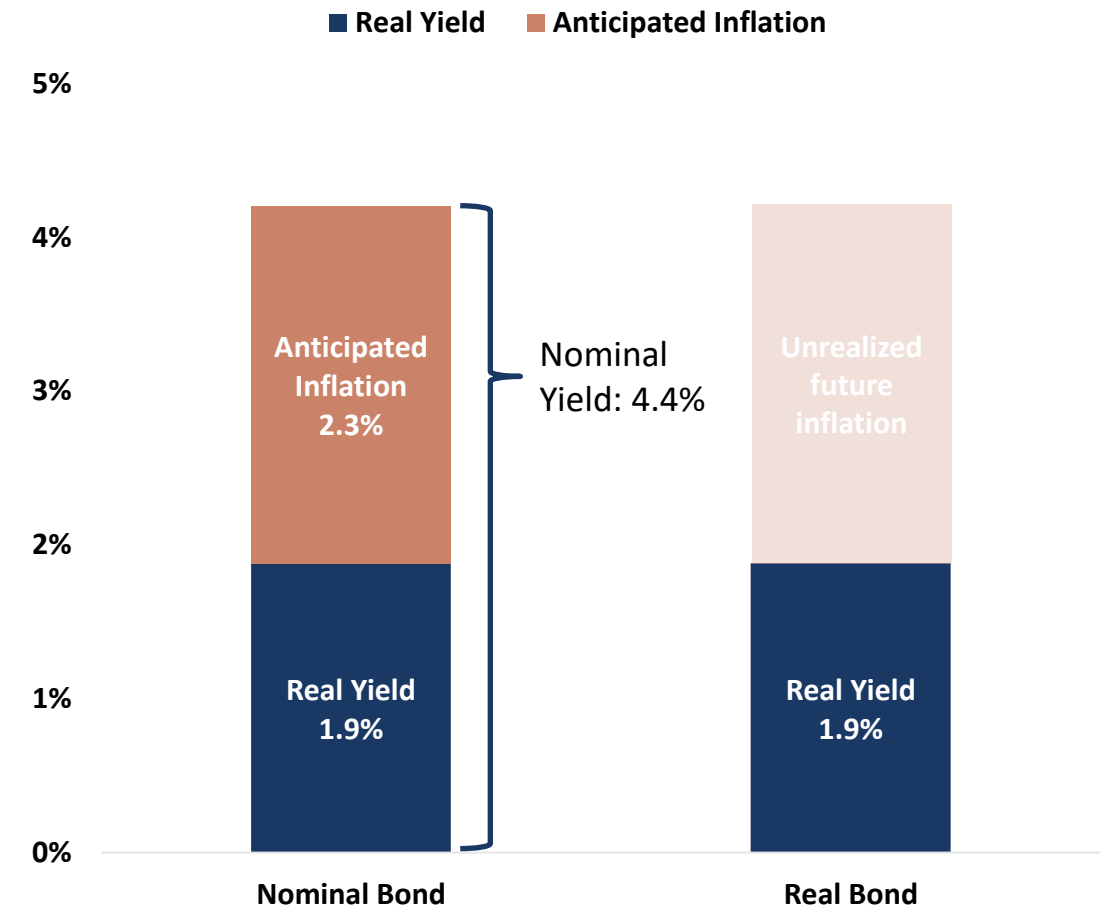
- **1-Year:** Stocks outperform bonds but at higher risk as measured by worst drawdown
- **20-Year:** Stocks outperform bonds in both return **AND** worst drawdown

# Treasury Inflation-Protected Securities (TIPS) Primer - Gov. Bonds Real

- **Treasury Inflation-Protected Securities (TIPS)** protect against inflation by linking bond face value to CPI (consumer price index)
  - Investors receive inflation-adjusted cash flows (principal and interest); thus, cash flows increase (decrease) as inflation rises (falls)
  - Deflation cannot reduce an investor's principal



## Nominal Bonds vs. Real Bonds (TIPS)



Source: PIMCO – Understanding Treasury Inflation-Protected Securities (TIPS), Bloomberg: 10-year yields and Anticipated Inflation (10-year Breakeven Inflation) as of March 31<sup>st</sup>, 2024 (righthand chart)



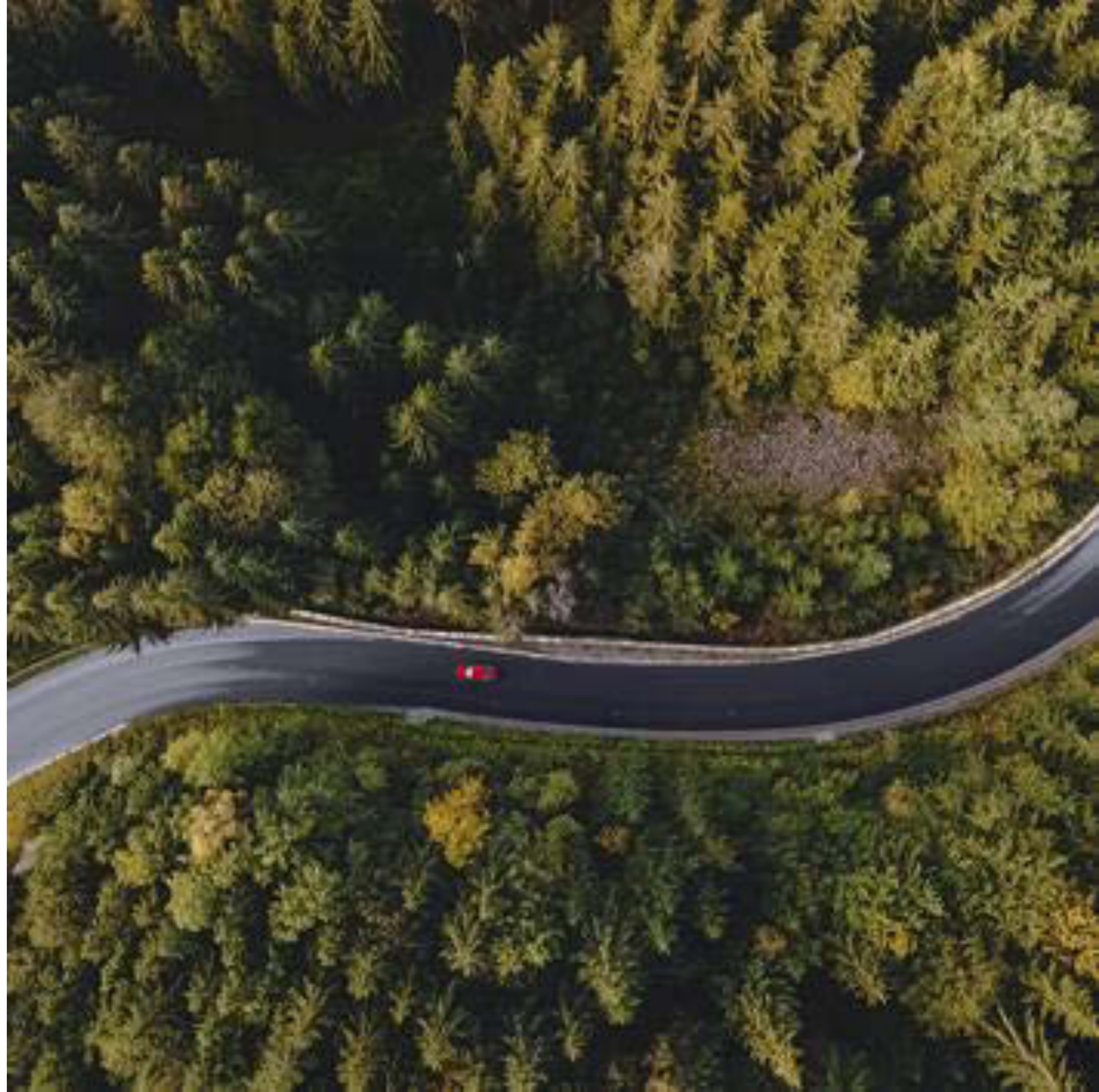


# Benchmark Discussion

## Teacher Retirement System of Texas

May 2024

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Benchmarking  
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Considerations

## Section 4

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# 1

## Benchmarking Overview





# Purpose & Types of Benchmarks

- Benchmarks are used to measure the performance of the Total Fund, asset classes, and individual managers over various time periods and across methodologies to determine the effectiveness of implementation of an investment program
- Benchmarks are Board approved, and form an important backbone of the incentive compensation program
- There are many types of benchmarks that can be used to analyze relative performance of an investment
  - Broad market (MSCI ACWI IMI Index)
  - Style-specific (S&P 500 Value Index)
  - Risk adjusted returns (vs. benchmark Sharpe ratio)
  - Absolute return metric (i.e. 7% return target)
  - Real return target (i.e. CPI + 3%)
  - Peer universe (i.e. Corporate Plans >\$1 billion)
- Careful attention should be paid to appropriateness when selecting the benchmark for a given asset class, manager, or strategy

# Properties of a Valid Benchmark<sup>12</sup>

- **Specified in advance** The benchmark is specified prior to the start of an evaluation period and known to all interested parties
- **Appropriate** The benchmark is consistent with the manager's investment style or area of expertise
- **Measurable** The benchmark's return is readily calculable on a reasonably frequent basis
- **Unambiguous** The identities and weights of securities constituting the benchmark are clearly defined
- **Reflective of current investment opinions** The manager has current knowledge of the securities or factor exposures within the benchmark
- **Accountable** The manager is aware of and accepts accountability for the constituents and performance of the benchmark
- **Investable** It is possible to forgo active management and simply hold the benchmark

<sup>1</sup> As per CFA Institute's **SAMURAI** characteristics. The criteria commonly referenced as industry standard is based on research conducted by Jeffrey Bailey and others. Mr. Bailey published an initial paper titled "Are Manager Universes Acceptable Performance Benchmarks?" in the May-June, 1992, edition of the *Financial Analysts Journal*.

<sup>2</sup> The criteria listed above mostly apply to publicly traded asset classes. Existing benchmarks for private assets (private equity, private real estate, hedge funds, etc.) lack the attributes of good benchmarks due to the inherent nature of these assets

# Benchmarking Principles

- Aon Investments USA (AIUSA) benchmarking philosophy is **built on research** conducted by Sharpe and others and is **consistent with Modern Portfolio Theory** which identifies the market portfolio as the most efficient portfolio to own
- We believe the benchmark for any asset class or strategy should include all, or substantially all, the investment opportunities in that particular market and be **constructed without bias**
- Investors should stray away from the market portfolio only when they believe they are compensated to do so
- It is important to note that there are certain markets, mainly the private markets, where broad published benchmarks either do not exist or are of limited value
  - In these markets, appropriate benchmarks would represent the opportunity cost of the allocation or mode of implementation



# Total Fund Benchmarking

- We believe the best Total Fund Policy Benchmark should be a passive representation of the broad asset classes included in the established asset allocation policy
- We believe that all benchmarks and policy allocations should be determined in advance
  - Asset transition timelines and weights should be determined in advance
  - If an investor decides to deviate from the policy allocation, the effect of maintaining an asset allocation which deviates from policy should be measured and reported (i.e. measure whether being overweight public equities detracted or added to overall performance for the Total Fund relative to the Policy Benchmark)
  - If the policy allocation is determined to be no longer appropriate, the policy should be amended in advance of the change
  - Changes to the asset class benchmarks should flow through to the Total Fund Policy Benchmark
- Other Total Fund Benchmarks (mainly used for long-term periods: 20+ years)
  - Absolute Return Target (i.e. Actuarial Assumed Rate of Return)
  - Liability Return
  - Real Return Target
  - Opportunity Cost Benchmark (e.g. mix of public stocks and bonds)

# Trends In Benchmarking

## Transitioning to Broader Investment Mandates

- All cap investment mandates within U.S. and non-U.S. equity (MSCI Investable Market Index)
- Global equity mandate as opposed to separate U.S. equity and non-U.S. equity components

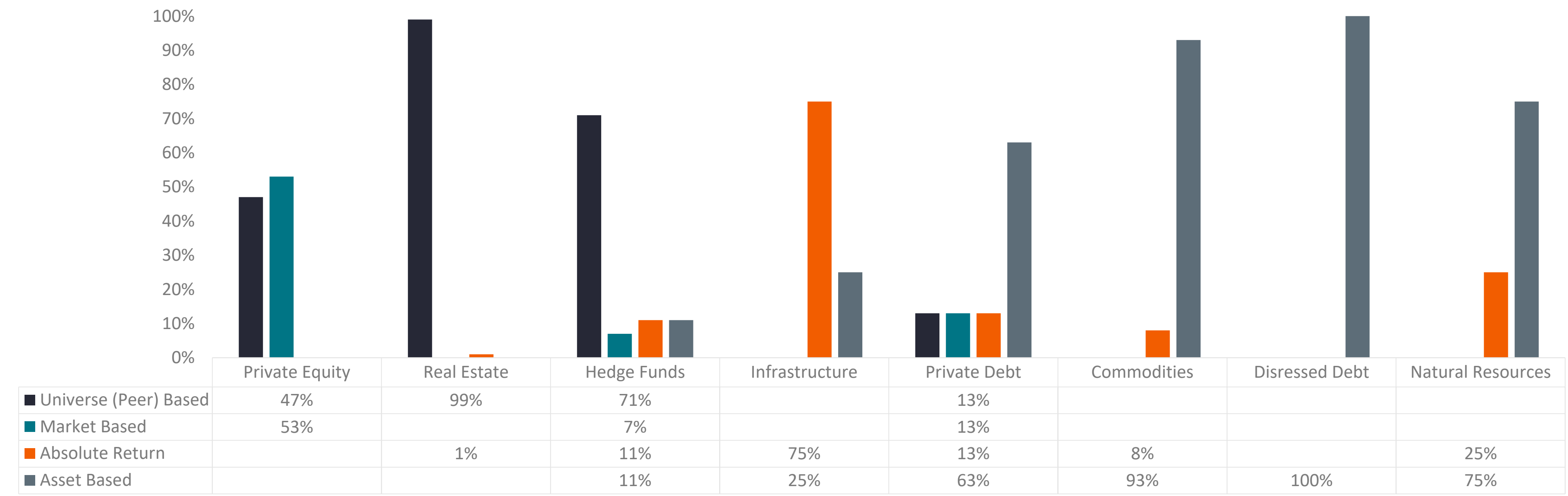
## Private Equity

- Use of peer benchmarks
- Reduced premium over public equity “opportunity cost” index (from 5% to 3%)
  - And utilization of a global equity index (i.e. U.S. & Non-U.S. benchmark) vs. U.S. equity index (i.e. Russell 3000 Index) as “opportunity cost” index

## Private Real Estate

- Use of the NCREIF ODCI (vs. NPI) to benchmark core real estate exposure
- NCREIF ODCI + premium for non-core real estate

# Alternative Investments Benchmarking in Practice



- **Universe (Peer) Based** A benchmarked comprised of peer asset class portfolios (SSPEI) or peer group of investment strategies (NCREIF ODCE, HFR, Burgiss)
- **Market Based** A broad public market index with or without a premium (Russell 3000 + 3%)
- **Absolute Return** A stated nominal return or inflation target plus a premium (CPI + 3%)
- **Asset Based** A publicly traded index that is reflective of the underlying asset class (REITs or Commodities)

Source: State Street Global Services, Alternative Benchmarking: The Choices and Challenges of Performance Measurement (July 2016). Based on a survey conducted by State Street among a subset of their asset-owner clients



# 2

TRS Current Benchmarks

December 2023





# TRS Benchmark Evaluation

Asset Class	Global Equity*				Stable Value			Real Return			Risk Parity	Cash	Leverage
Sub -Asset Class	U.S Equity	Non-U.S. Equity Developed	Non-U.S. Equity Emerging	Private Equity	U.S. Treasuries	Stable Value HF's	Absolute Return	Real Estate	Energy Nat. Res. Infra	Commodities	Risk Parity	Cash Equiv.	Asset Allocation Leverage
Benchmark	Custom MSCI U.S.A. IMI	Custom MSCI EAFE + Canada	Custom - 50% MSCI EM / 50% MSCI EM ex China	State Street Private Equity	Bloomberg Long-Term Treasury	HFRI Fund of Funds Conservative	SOFR + 4%	NCREIF ODCE (lagged)	80% Cambridge + 20% CPI (lagged)	GS Commodity	HFR Risk Parity Vol 12 Index	FTSE 3 Month Treasury Bill	SOFR + 26.161 bps
Long Term Target	18%	13%	9%	14%	16%	5%	0%	15%	6%	0%	8%	2%	-6%
Current Target	16%	12%	8%	18%	14%	4%	0%	17%	7%	0%	7%	2%	-6%
Specified in Advance													
Appropriate													
Measurable													
Unambiguous													
Reflective													
Accountable													
Investable													
Overall View													
AIUSA Comments	None	Consider adding small cap exposure	Consider adding small cap exposure	Consider upcoming refinements	None	Peer Universe has been shrinking	None	Portfolio includes non-core real estate	None	None	None	None	None
Benchmark for Consideration	Current	Current	Current	Current	Current	Current	Current	Consider Potential Return Premium	Current	Current	Current	Current	Current

- Property of the benchmark is **valid**
- Property of the benchmark is **nuanced**
- Property of the benchmark is **not valid**



\*Public equity benchmarks are customized to exclude restricted securities that TRS may not invest in



# 3

## Future Benchmark Considerations





# Potential Upcoming Portfolio and Benchmark Changes

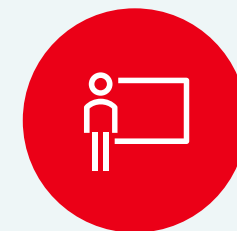
- The Strategic Asset Allocation review may result in changes to the portfolio and benchmarks
  - Potential changes being discussed later in the process may include;

## All Country Equity Asset Class

The addition of a 4<sup>th</sup> public equity line item – “All Country Equity”

This would result in the TRS Public equity portfolio looking more like the investible public equity opportunity set

Proposed benchmark likely to be the MSCI ACWI IMI



## Stable Value Hedge Funds

The number of constituents within the peer benchmark has declined

Consider the use of an absolute return benchmark

Proposed benchmark likely to be SOFR + Premium



## Private Equity

Consider modifications to the current SSPEI benchmark

- 1) Weight by vintage year
- 2) Exclude funds smaller than \$1 billion





# 4

## Appendix



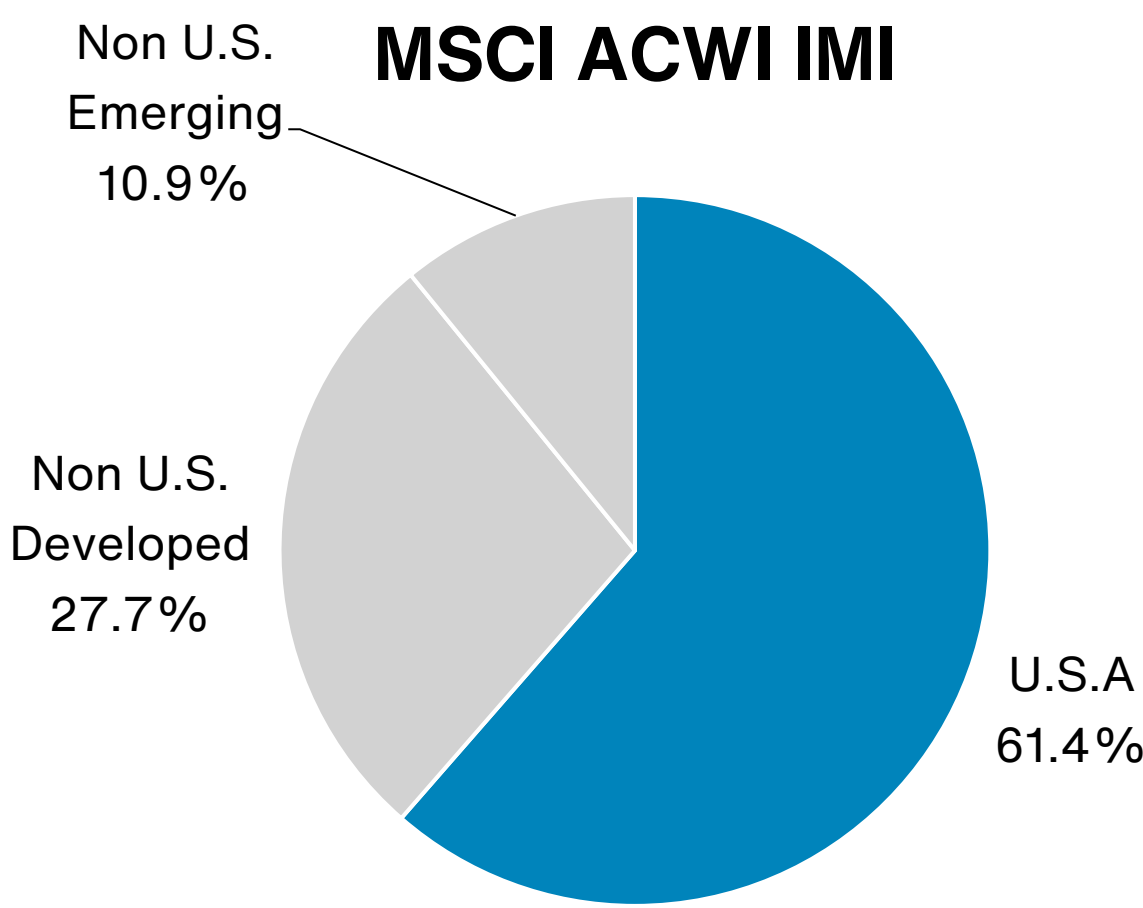


# U.S. Equity: Custom MSCI U.S.A. IMI\*

Asset Class	Global Equity
Sub -Asset Class	U.S Equity
Benchmark	Custom MSCI U.S.A. IMI
Long Term Target	18%
Current Target	16%
Specified in Advance	
Appropriate	
Measurable	
Unambiguous	
Reflective	
Accountable	
Investable	
Overall View	
AIUSA Comments	None
Benchmark for Consideration	Current

- Property of the benchmark is **valid**
- Property of the benchmark is **nuanced**
- Property of the benchmark is **not valid**

\*The global public equity benchmarks are customized to exclude restricted securities that TRS may not invest in



**Benchmark:**

Covers 2,400 securities of the large, mid, and small cap U.S. equity market, the index is customized to include only securities that are investable by TRS

**Pros:**

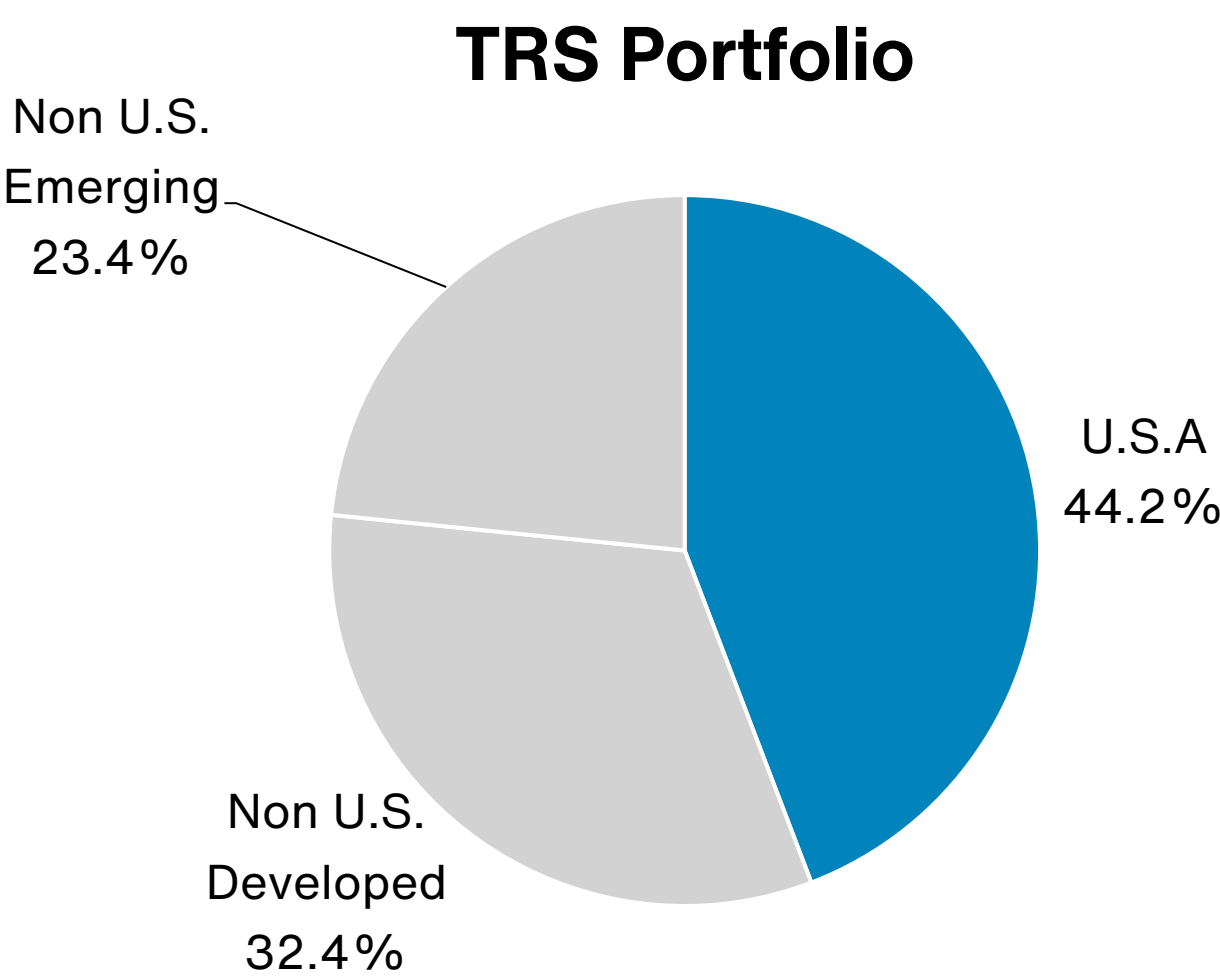
Broad diversified equity market coverage meeting the requirements of a valid benchmark

**Opinion:**

AHIC views the MSCI U.S.A IMI as the best available domestic equity benchmark

**Recommendation:**

Maintain the Custom MSCI U.S.A. IMI as the primary benchmark

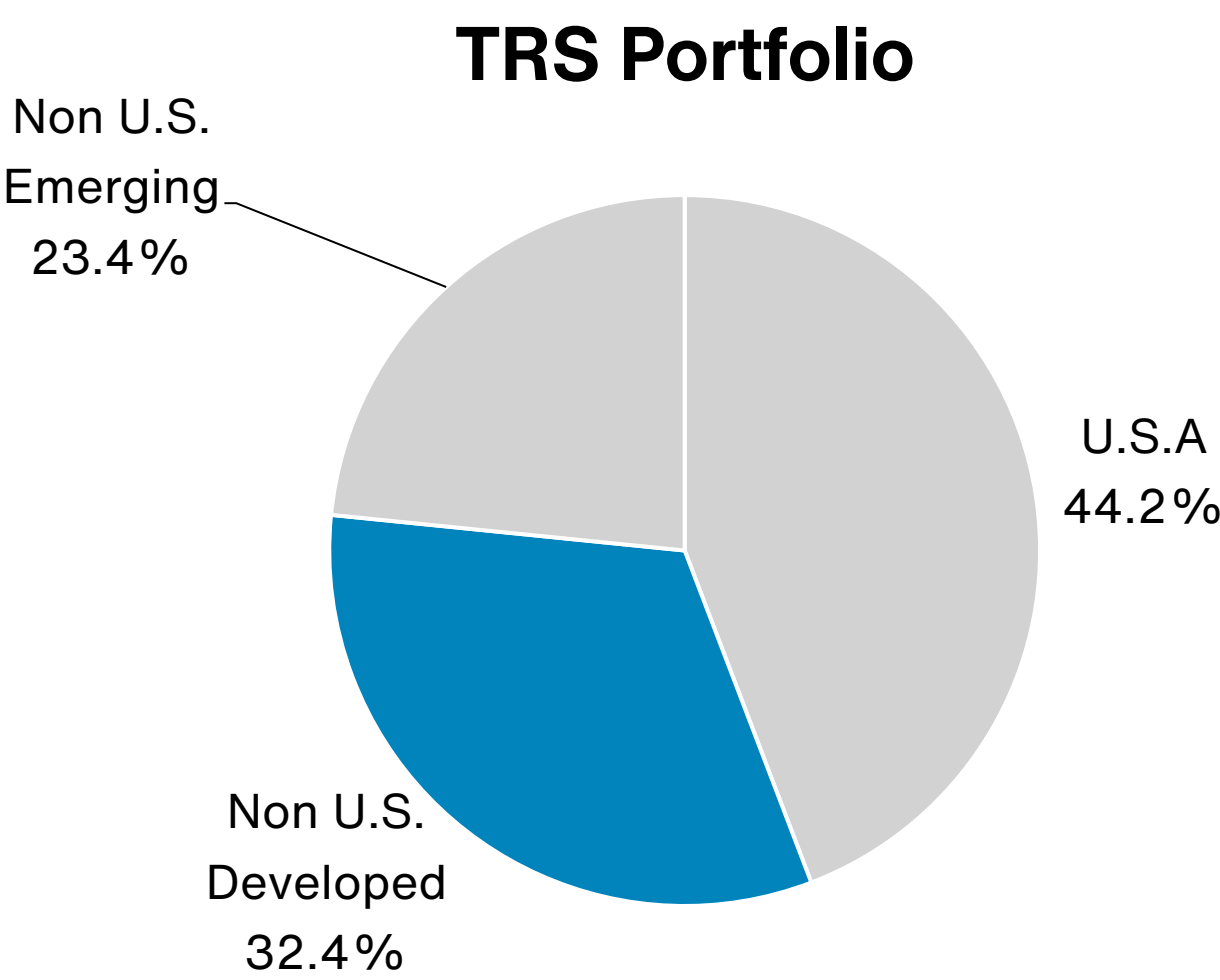
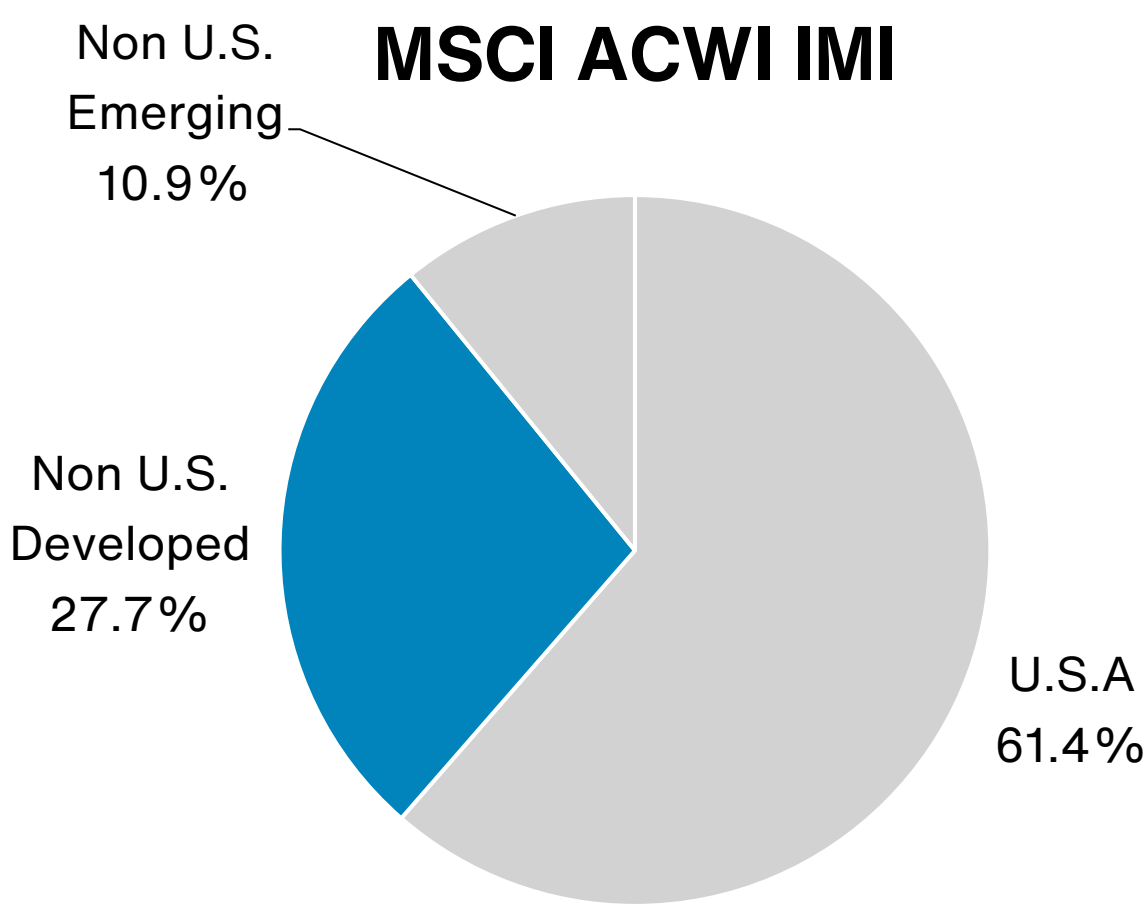


# Non-U.S. Developed Equity: Custom MSCI EAFE + Canada\*

Asset Class	Global Equity
Sub -Asset Class	Non-U.S. Equity Developed
Benchmark	Custom MSCI EAFE + Canada
Long Term Target	13%
Current Target	12%
Specified in Advance	
Appropriate	
Measurable	
Unambiguous	
Reflective	
Accountable	
Investable	
Overall View	
AIUSA Comments	Consider adding small cap exposure
Benchmark for Consideration	Current

	Property of the benchmark is <b>valid</b>
	Property of the benchmark is <b>nuanced</b>
	Property of the benchmark is <b>not valid</b>

\*The global public equity benchmarks are customized to exclude restricted securities that TRS may not invest in



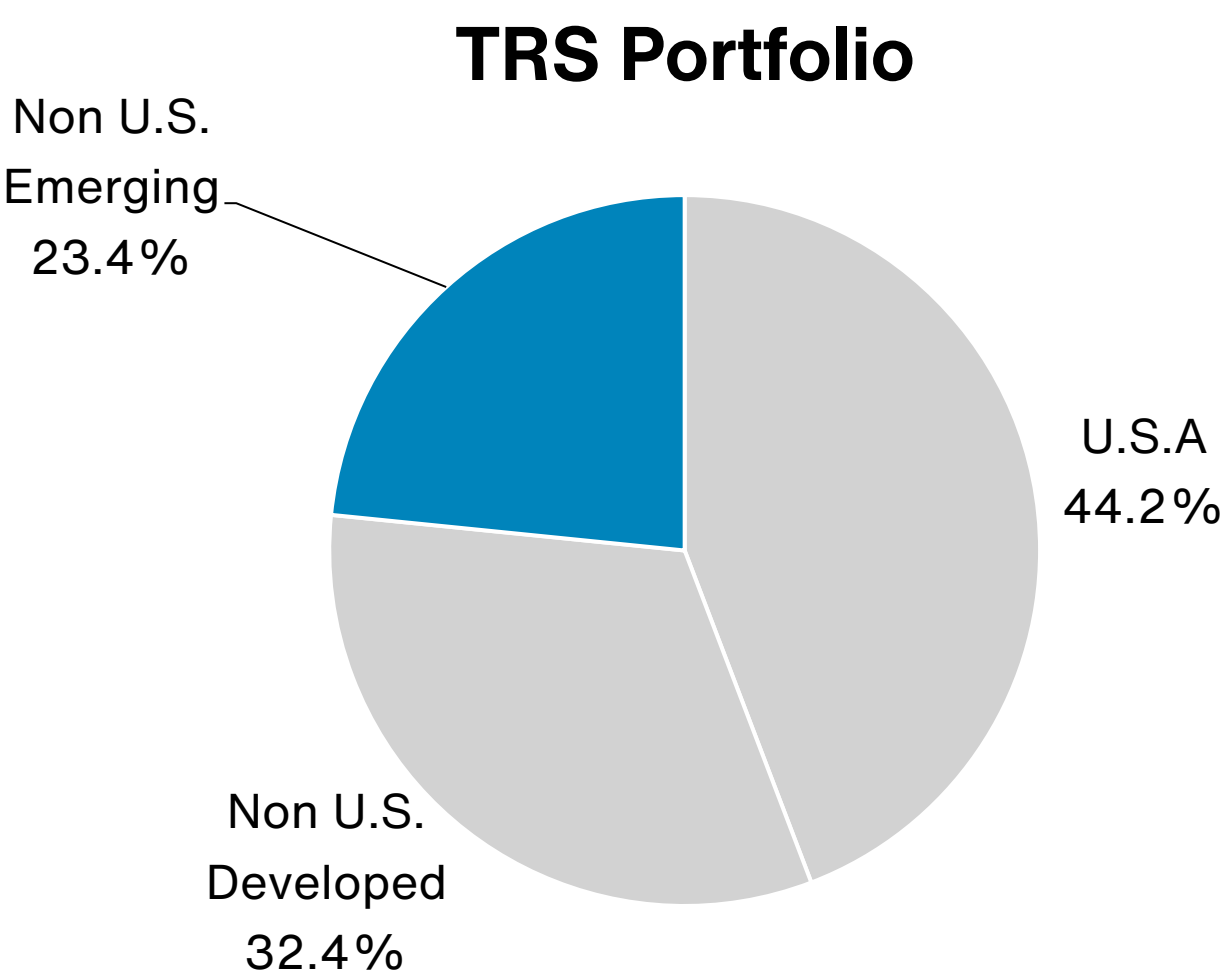
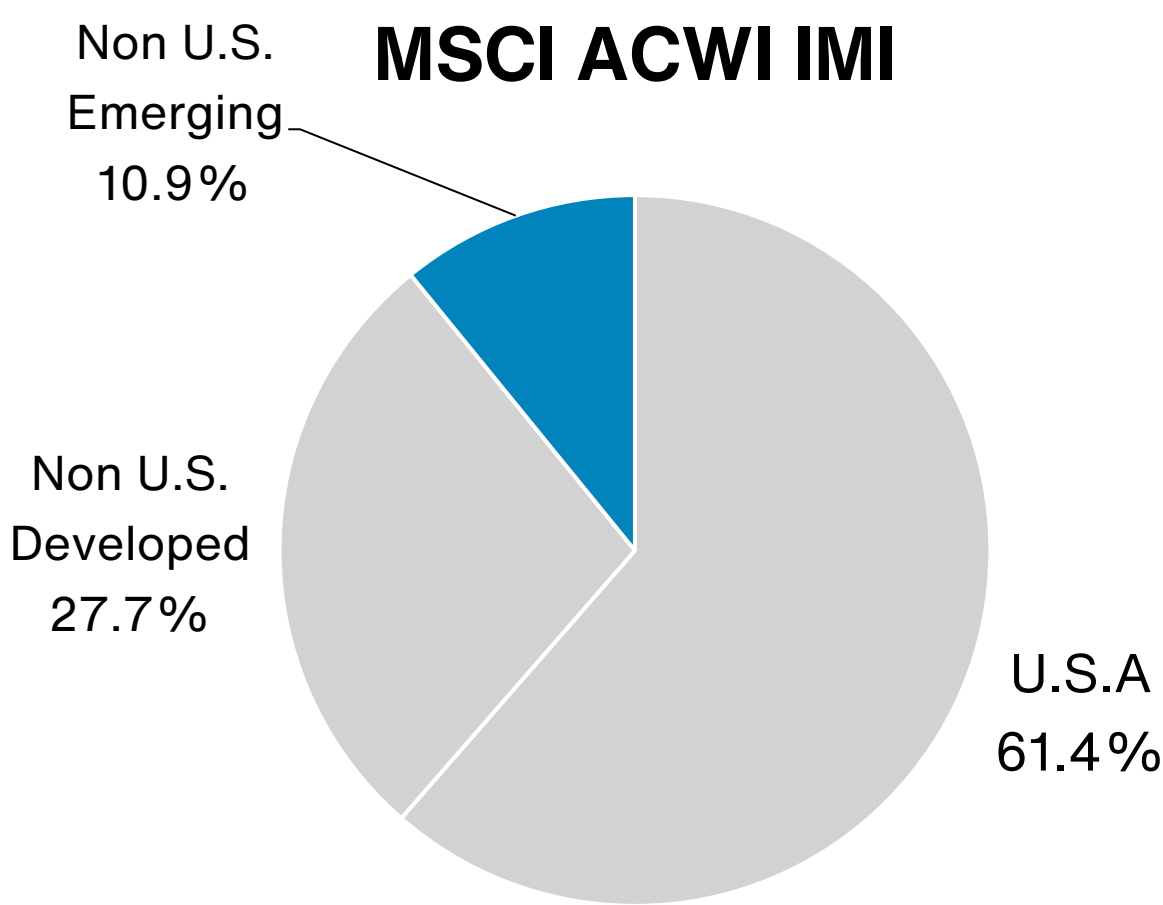
- Benchmark:** Includes 3,257 large and mid cap stocks across developed market countries including Canada, the index is customized to include only securities investable by TRS
- Pros:** Broad diversified non-U.S. developed market equity market coverage meeting the requirements of a valid benchmark
- Cons:** The index does not include small cap securities, which represent approximately 15% of the opportunity set
- Opinion:** Consider adding small cap exposure and moving to the IMI version of the benchmark
- Recommendation:** Maintain Custom MSCI EAFE + Canada as the primary benchmark

# Emerging Equity: Custom - 50% MSCI EM / 50% MSCI EM ex China\*

Asset Class	Global Equity
Sub -Asset Class	Non-U.S. Equity Emerging
Benchmark	Custom - 50% MSCI EM / 50% MSCI EM ex China
Long Term Target	9%
Current Target	8%
Specified in Advance	
Appropriate	
Measurable	
Unambiguous	
Reflective	
Accountable	
Investable	
Overall View	
AIUSA Comments	Consider adding small cap exposure
Benchmark for Consideration	Current

- Property of the benchmark is **valid**
- Property of the benchmark is **nuanced**
- Property of the benchmark is **not valid**

\*The global public equity benchmarks are customized to exclude restricted securities that TRS may not invest in

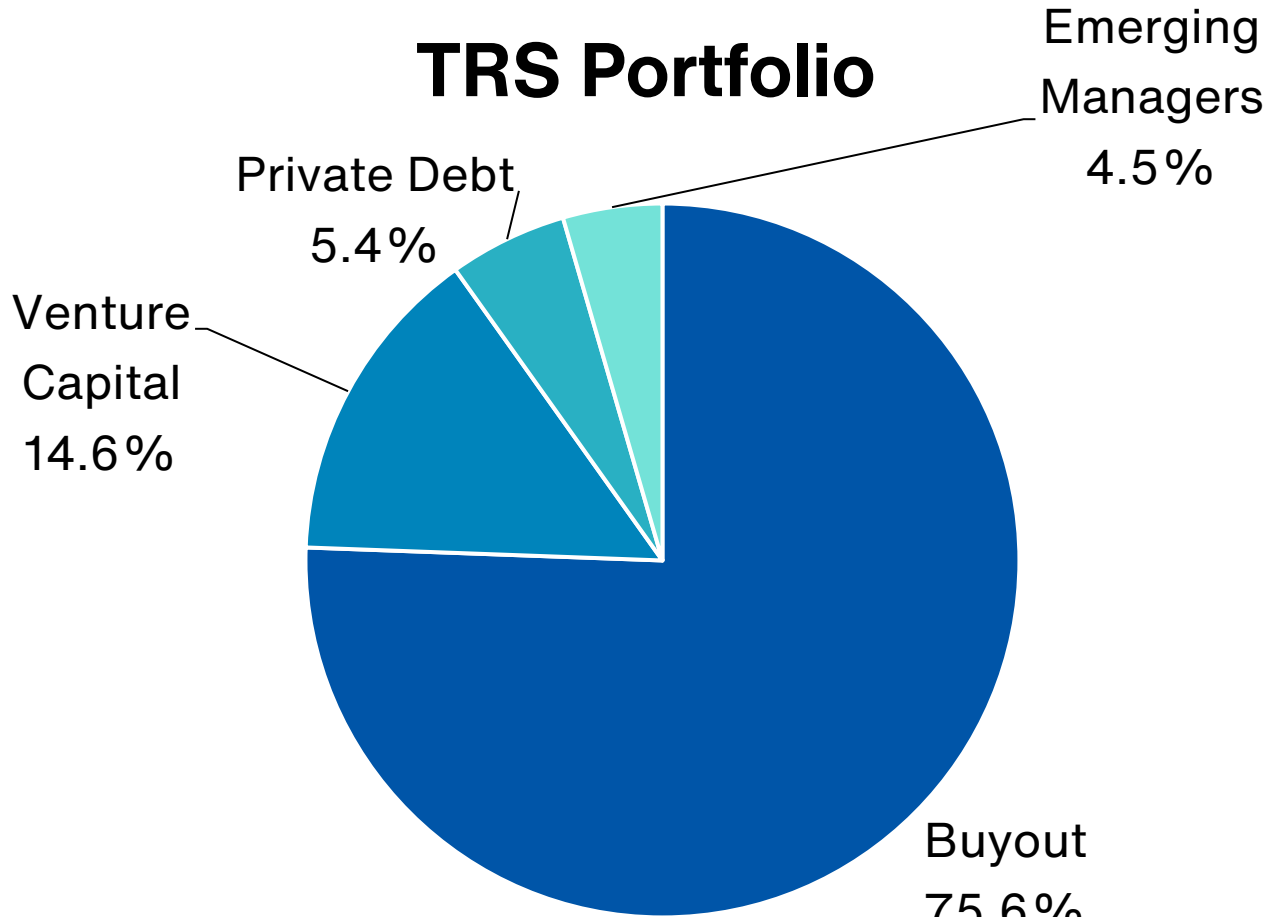
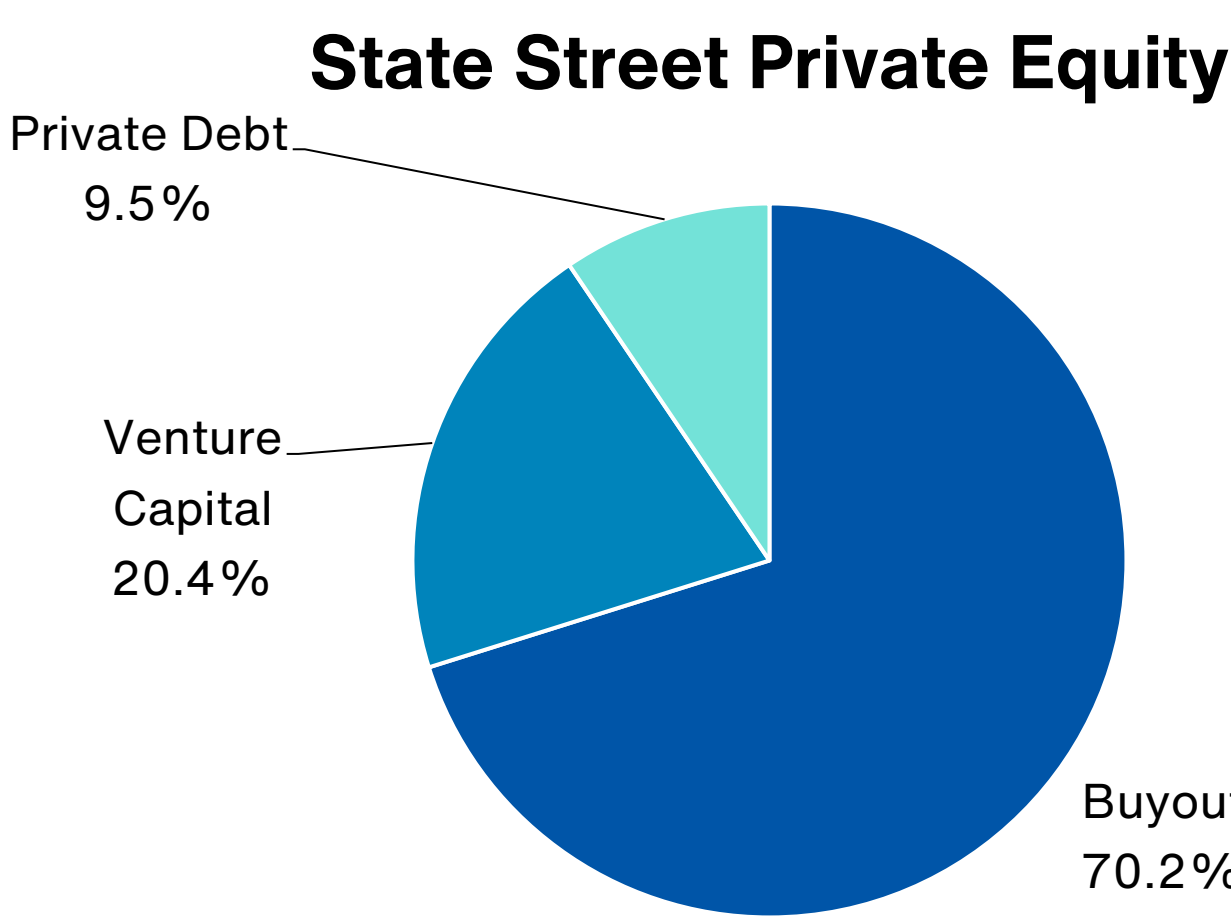


- Benchmark:** With 3,427 constituents, captures large and mid cap stocks across 24 Emerging Market countries, base index is customized to include only securities investable by TRS
- Pros:** Broad diversified emerging market equity market coverage meeting the requirements of a valid benchmark
- Cons:** The index does not include small cap securities, which represent approximately 15% of the opportunity set; Represents a strategic underweight to China
- Opinion:** Consider adding small cap exposure and moving to the IMI version of the benchmark
- Recommendation:** Maintain current primary benchmark

# Private Equity: Custom State Street Private Equity Index (SSPEI)

Asset Class	Global Equity
Sub -Asset Class	Private Equity
Benchmark	State Street Private Equity
Long Term Target	14%
Current Target	18%
Specified in Advance	
Appropriate	
Measurable	
Unambiguous	
Reflective	
Accountable	
Investable	
Overall View	
AIUSA Comments	Consider upcoming refinements
Benchmark for Consideration	Current

	Property of the benchmark is <b>valid</b>
	Property of the benchmark is <b>nuanced</b>
	Property of the benchmark is <b>not valid</b>



**Benchmark:**

Global composite index representing 3,936 private equity limited partnerships with over \$4.89 trillion in commitments

**Pros:**

Broadly diversified and specified in advance

**Cons:**

The index is not investable and may not be reflective of the opportunity set available to TRS

**Opinion:**

Aon cites several issues with SSPEI, but these are also found in other composite indices designed to measure the performance of these investments

**Recommendation:**

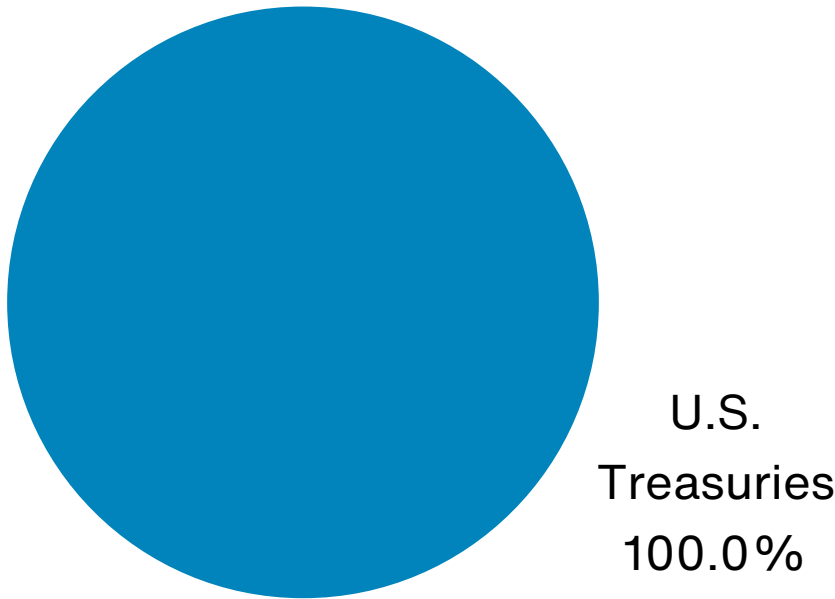
Consider upcoming proposed changes to the Custom SSPEI benchmark



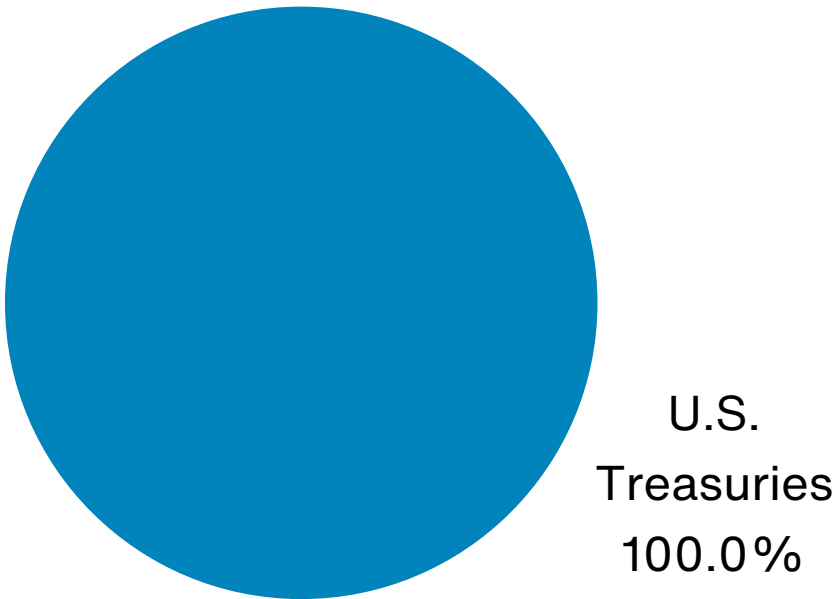
# U.S. Treasuries: Bloomberg Barclays Long-Term Treasury

Asset Class	Stable Value
Sub -Asset Class	U.S. Treasuries
Benchmark	Bloomberg Long-Term Treasury
Long Term Target	16%
Current Target	14%
Specified in Advance	
Appropriate	
Measurable	
Unambiguous	
Reflective	
Accountable	
Investable	
Overall View	
AIUSA Comments	None
Benchmark for Consideration	Current

Bloomberg Barclays Long-Term Treasury Index



TRS Portfolio



- Benchmark:**

Includes all publicly issued U.S. Treasury securities that have a remaining maturity of 10 or more years, are rated investment grade, and have \$250 million or more of outstanding face value
- Pros:**

Complete coverage of the segment and meets the requirements of a valid benchmark
- Opinion:**

Aon views the Bloomberg Long-Term Treasury index as the best available long Treasury benchmark
- Recommendation:**

Maintain the Bloomberg Long-Term Treasury index as the primary benchmark

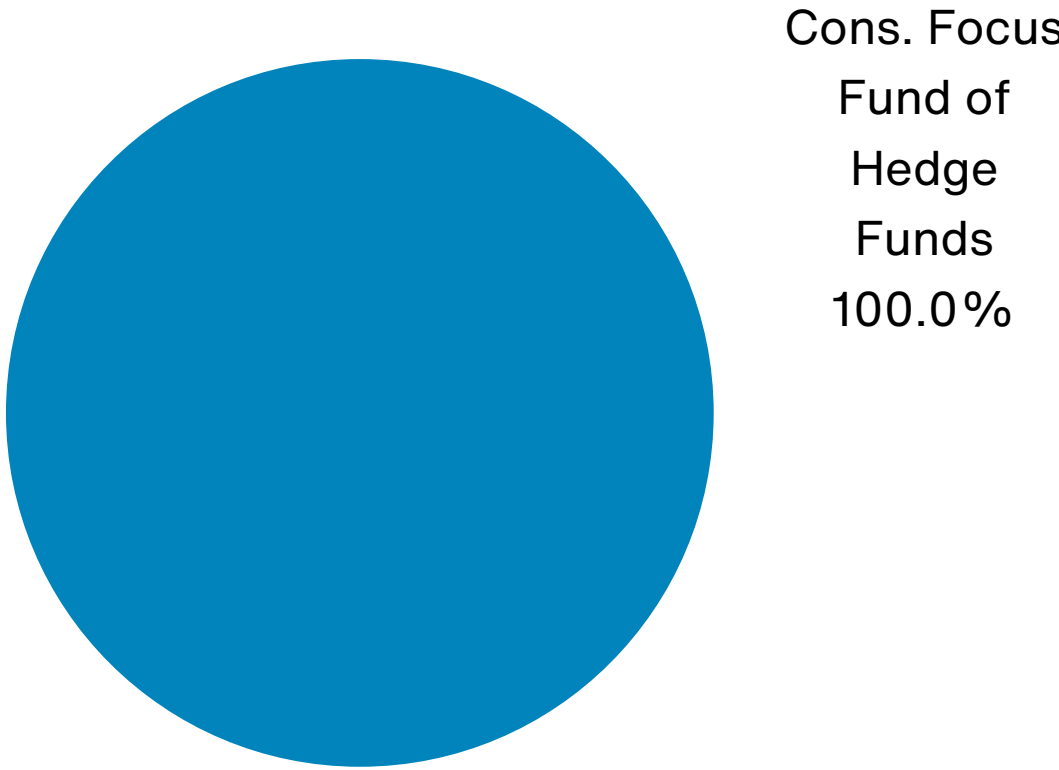
- Property of the benchmark is **valid**
- Property of the benchmark is **nuanced**
- Property of the benchmark is **not valid**

# Stable Value Hedge Funds: HFRI FoF Conservative Composite

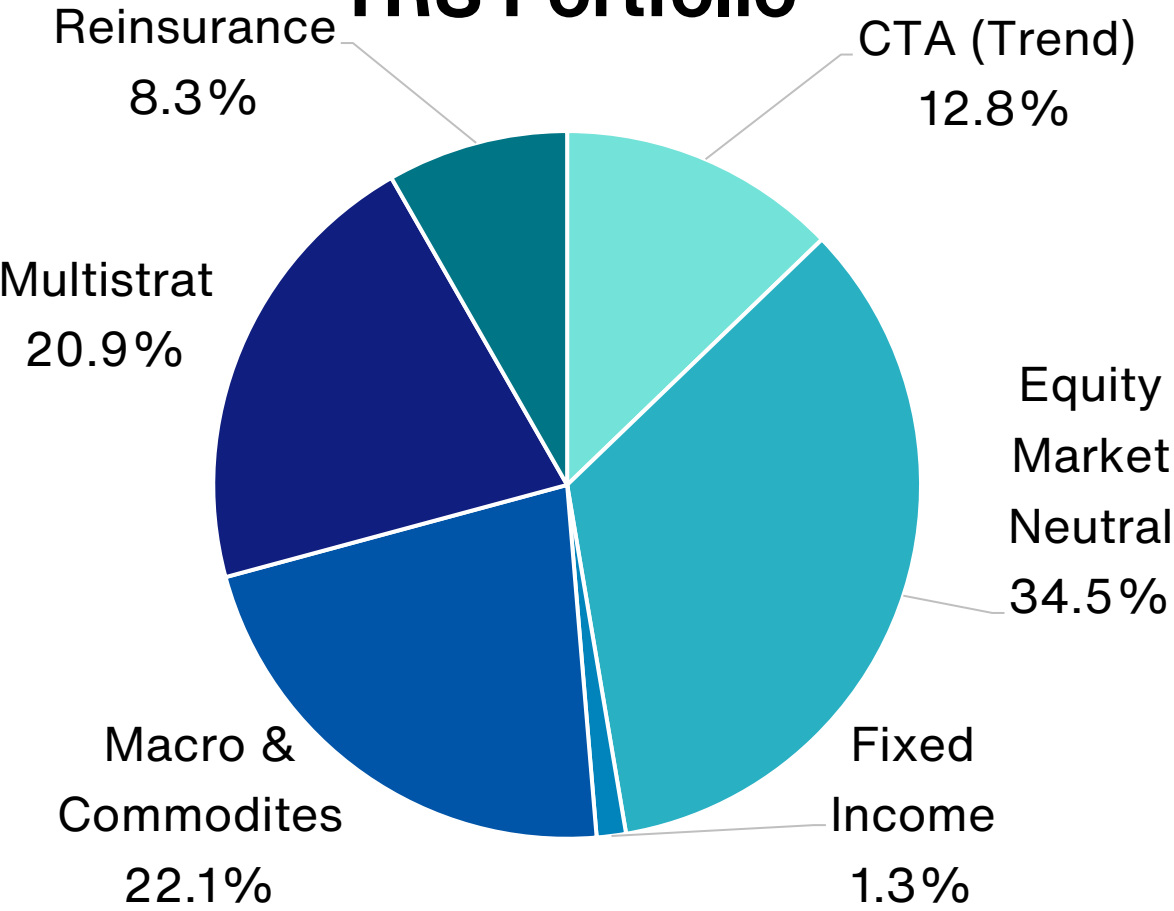
Asset Class	Stable Value
Sub -Asset Class	Stable Value HFs
Benchmark	HFRI Fund of Funds Conservative
Long Term Target	5%
Current Target	4%
Specified in Advance	
Appropriate	
Measurable	
Unambiguous	
Reflective	
Accountable	
Investable	
Overall View	
AIUSA Comments	Peer Universe has been shrinking
Benchmark for Consideration	Current

	Property of the benchmark is <b>valid</b>
	Property of the benchmark is <b>nuanced</b>
	Property of the benchmark is <b>not valid</b>

HFRI FoF Conservative



TRS Portfolio

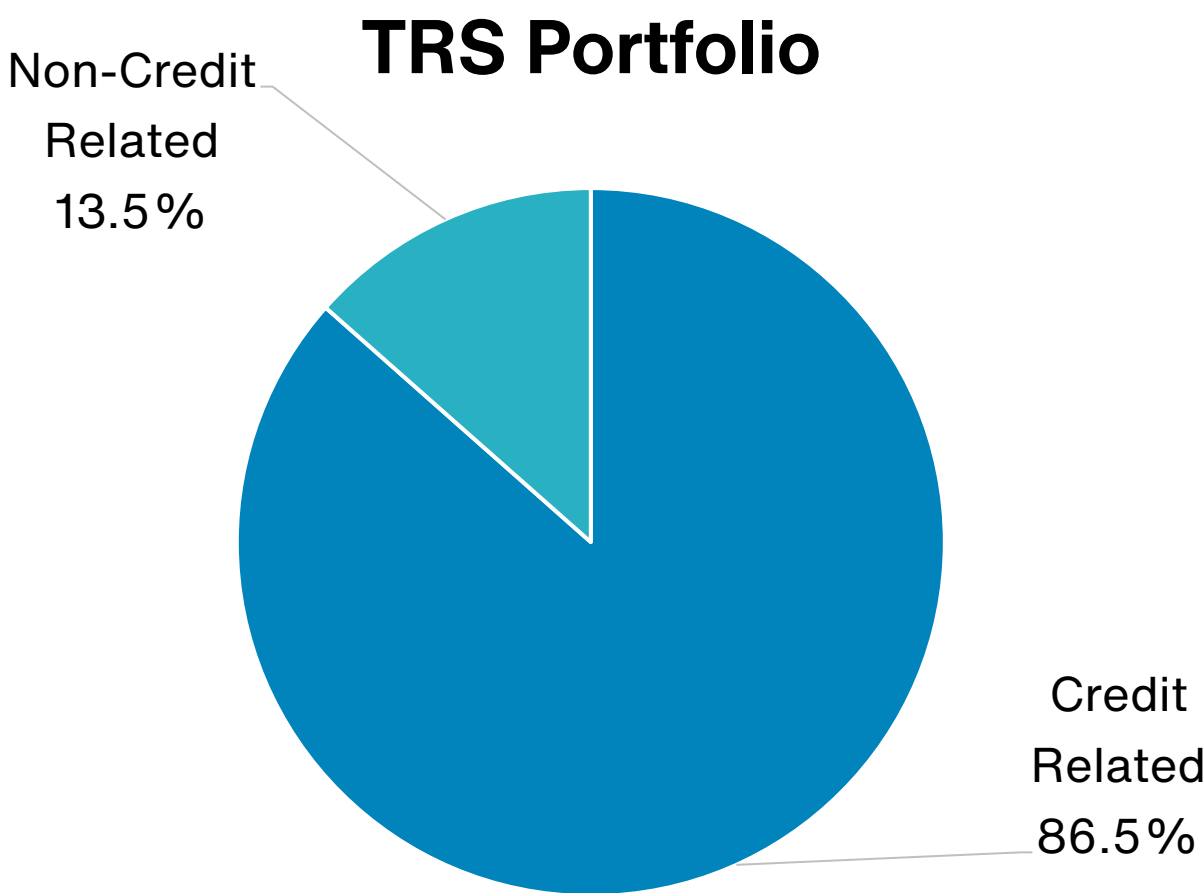


- Benchmark:** Seeks consistent returns by primarily investing in the 24 funds that generally engage in more conservative strategies such as equity market neutral, fixed income arbitrage, or convertible arbitrage, and exhibits a lower historical annual standard deviation
- Pros:** Appropriately reflective of the sectors represented in the TRS portfolio
- Cons:** The index is comprised of Fund of Funds while TRS holds direct fund investments, index also suffers from survivorship bias
- Opinion:** Aon views the HFRI FoF Conservative Composite index as an appropriate stable value hedge fund index
- Recommendation:** Consider upcoming proposals to modify this benchmark

# Absolute Return: SOFR + 4%

Asset Class	Stable Value
Sub -Asset Class	Absolute Return
Benchmark	SOFR + 4%
Long Term Target	0%
Current Target	0%
Specified in Advance	
Appropriate	
Measurable	
Unambiguous	
Reflective	
Accountable	
Investable	
Overall View	
AIUSA Comments	None
Benchmark for Consideration	Current

	Property of the benchmark is <b>valid</b>
	Property of the benchmark is <b>nuanced</b>
	Property of the benchmark is <b>not valid</b>

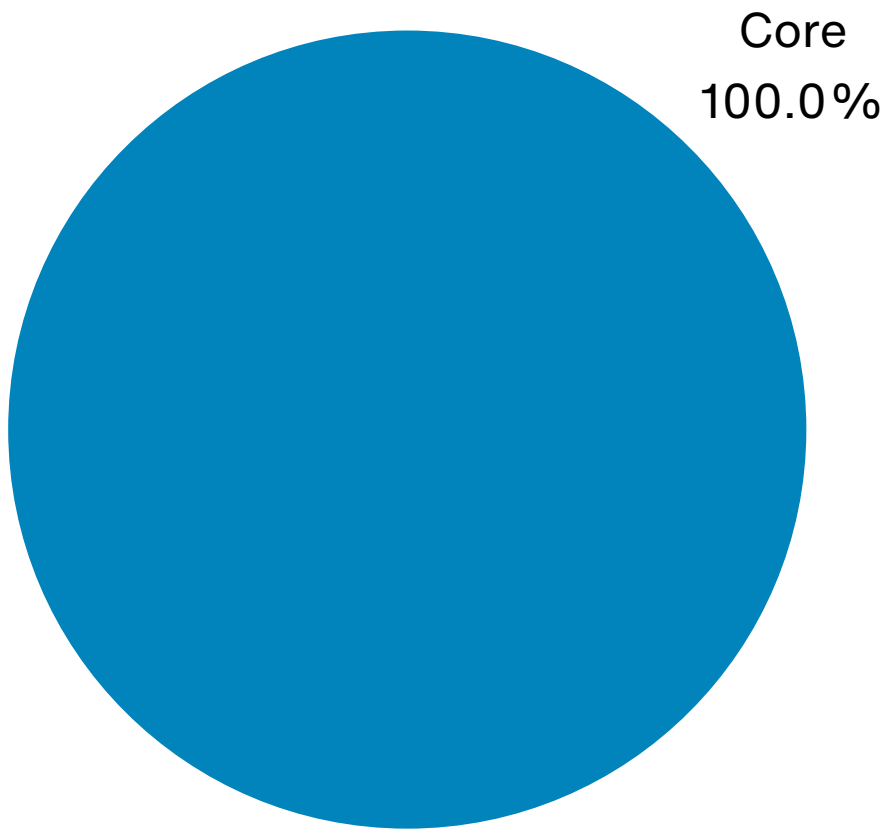


- Benchmark:** Measures the cost of borrowing cash overnight collateralized by Treasury securities
- Pros:** SOFR represents the cost of borrowing using U.S. Treasuries as collateral; The 4 % premium represents the compensation expected for incurring risk; This is not a component of the Total Fund Benchmark
- Cons:** Fails many of the tests used to determine benchmark appropriateness
- Opinion:** Aon views SOFR +4 % as an appropriate benchmark for the Absolute Return investments
- Recommendation:** Maintain the 3 Month SOFR +4 % index as the primary benchmark

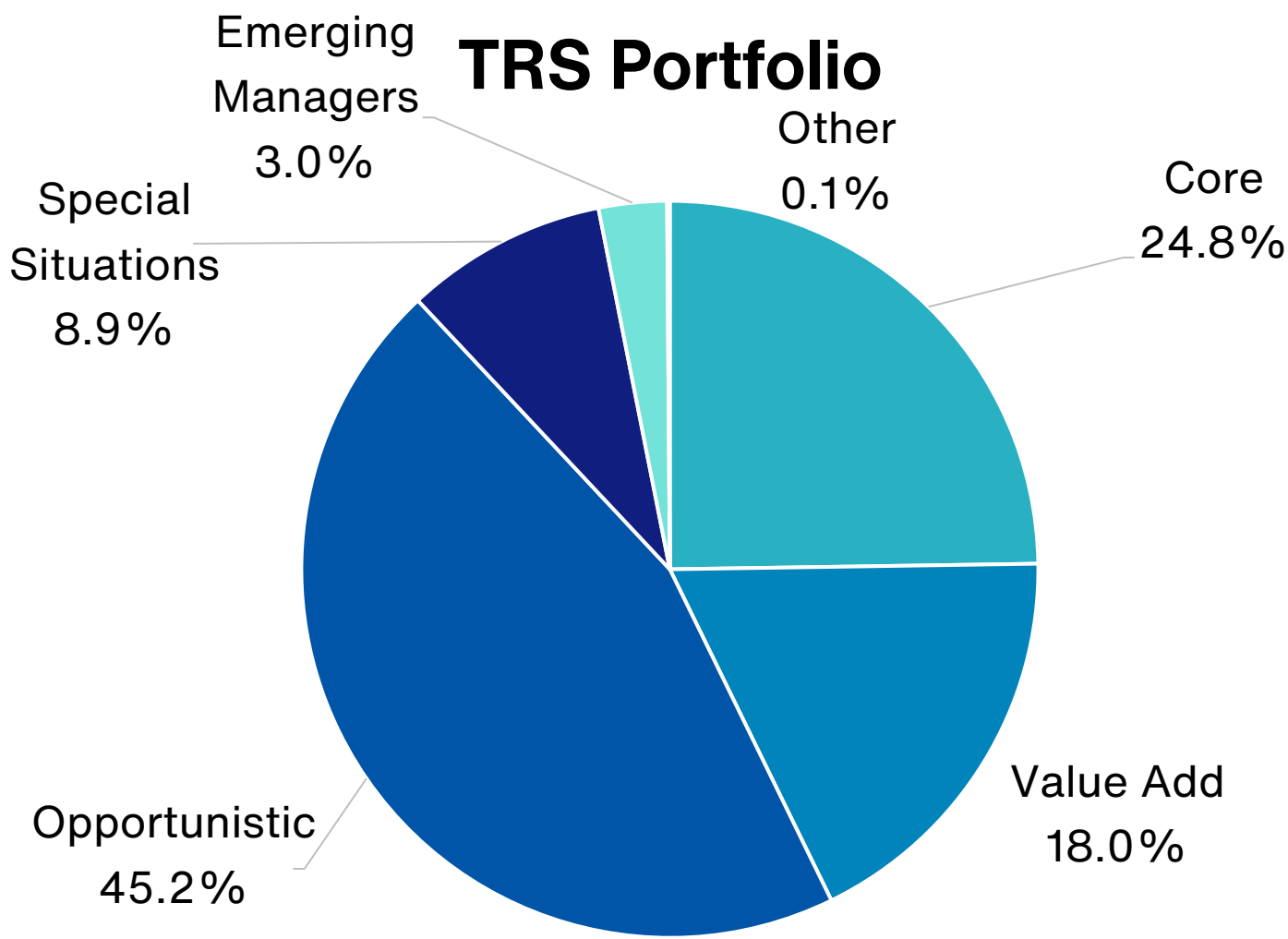
# Real Estate: NCREIF ODCE (Lagged)

Asset Class	Real Return
Sub -Asset Class	Real Estate
Benchmark	NCREIF ODCE (lagged)
Long Term Target	15%
Current Target	17%
Specified in Advance	
Appropriate	
Measurable	
Unambiguous	
Reflective	
Accountable	
Investable	
Overall View	
AIUSA Comments	Portfolio includes non-core real estate
Benchmark for Consideration	Consider Potential Return Premium

NCREIF ODCE Index



TRS Portfolio



- Benchmark:

A capitalization-weighted, time-weighted return series reflecting the net-of-fee performance of 25 open-ended diversified core real estate funds
- Pros:

Reflects the performance of open-ended diversified core real estate funds
- Cons:

Does not include non-core real estate exposures
- Opinion:

The benchmark could be refined by adding a return premium to account for the out-of-benchmark non-core real estate investments in the TRS portfolio
- Recommendation:

Consider potential return premium over the ODCE

Property of the benchmark is **valid**

Property of the benchmark is **nuanced**

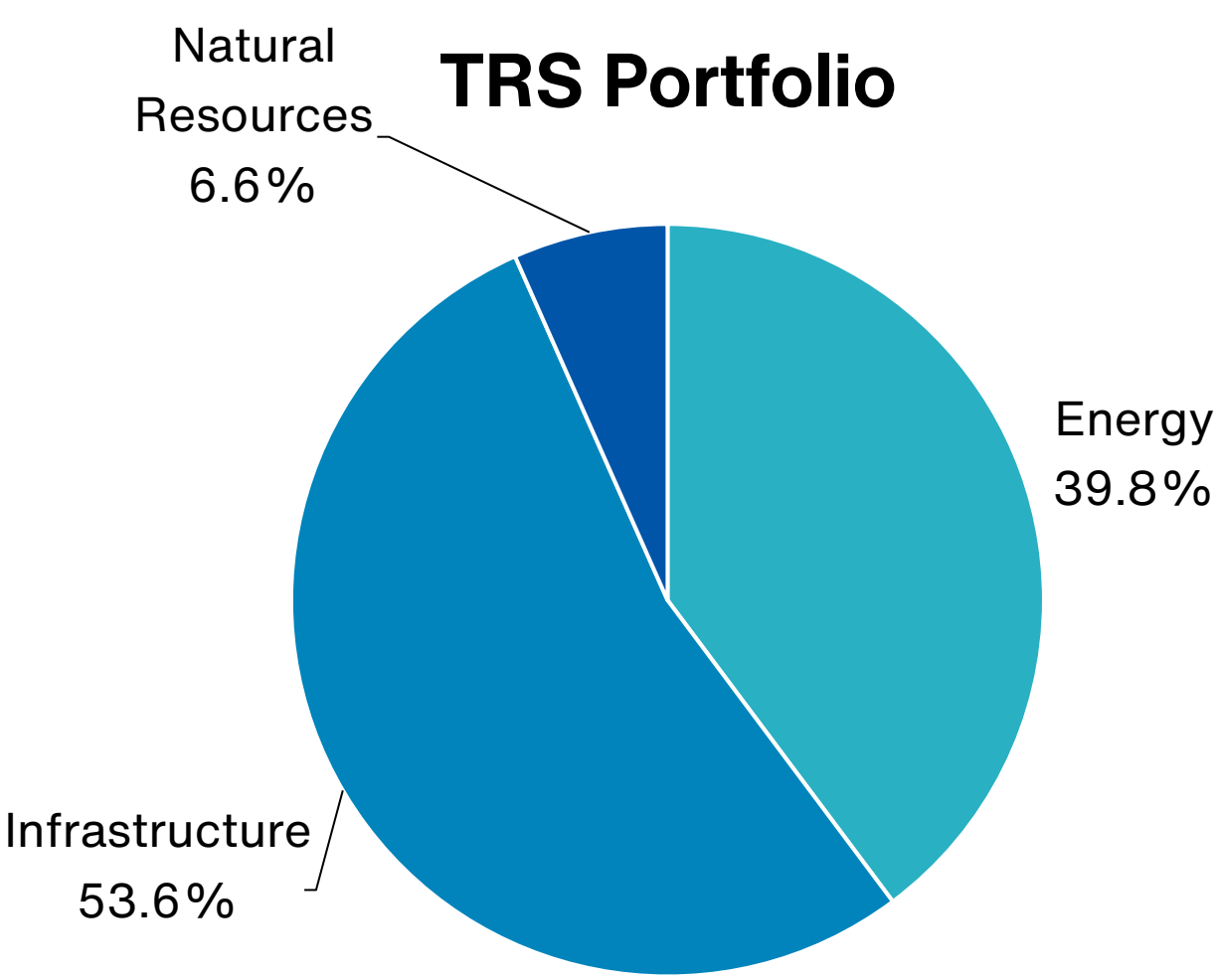
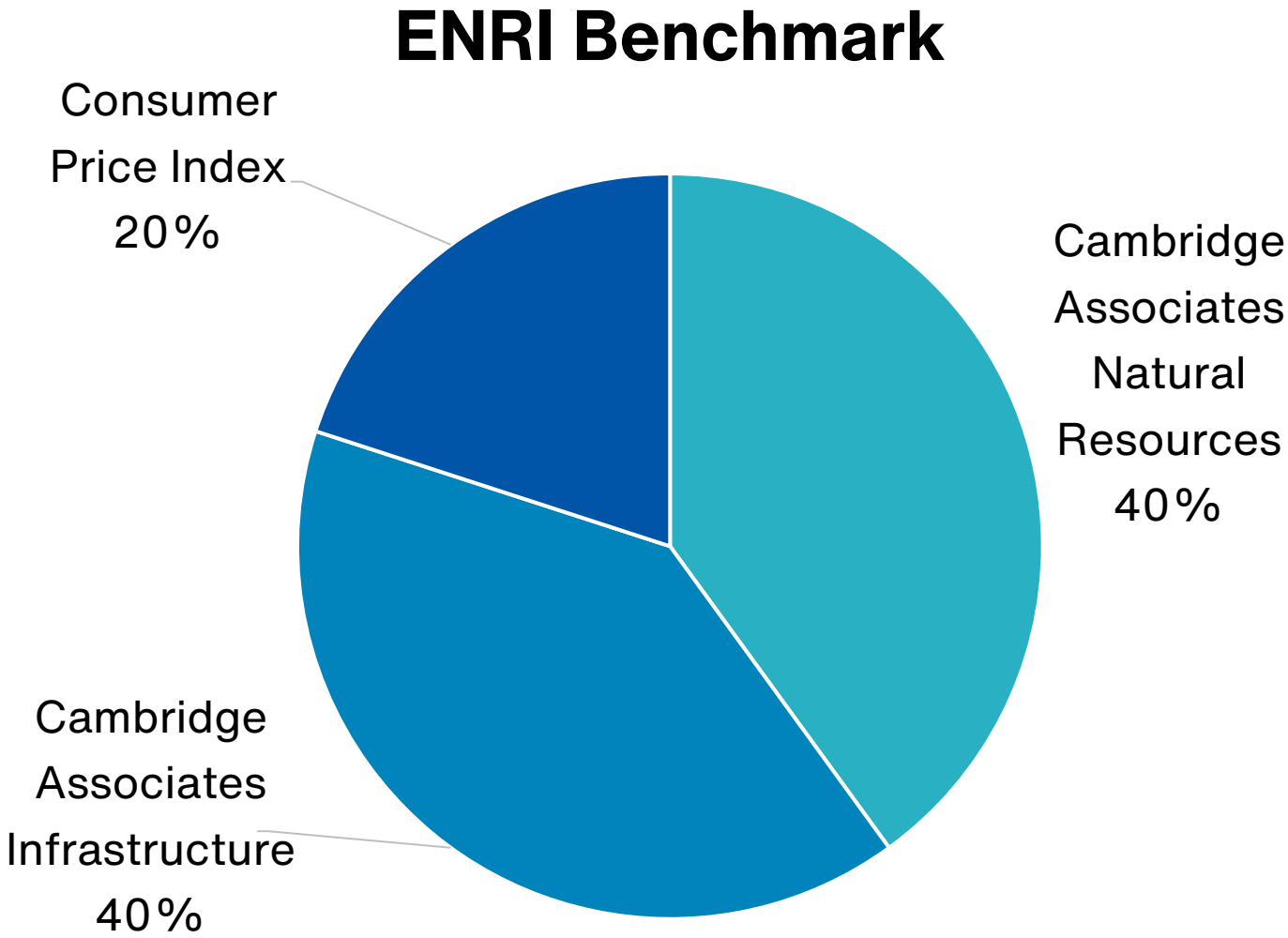
Property of the benchmark is **not valid**



# Energy, Natural Res., & Infra: 80% Cambridge + 20% CPI (Lagged)

Asset Class	Real Return
Sub -Asset Class	Energy Nat. Res. Infra
Benchmark	80% Cambridge + 20% CPI (lagged)
Long Term Target	6%
Current Target	7%
Specified in Advance	
Appropriate	
Measurable	
Unambiguous	
Reflective	
Accountable	
Investable	
Overall View	
AIUSA Comments	None
Benchmark for Consideration	Current

	Property of the benchmark is <b>valid</b>
	Property of the benchmark is <b>nuanced</b>
	Property of the benchmark is <b>not valid</b>

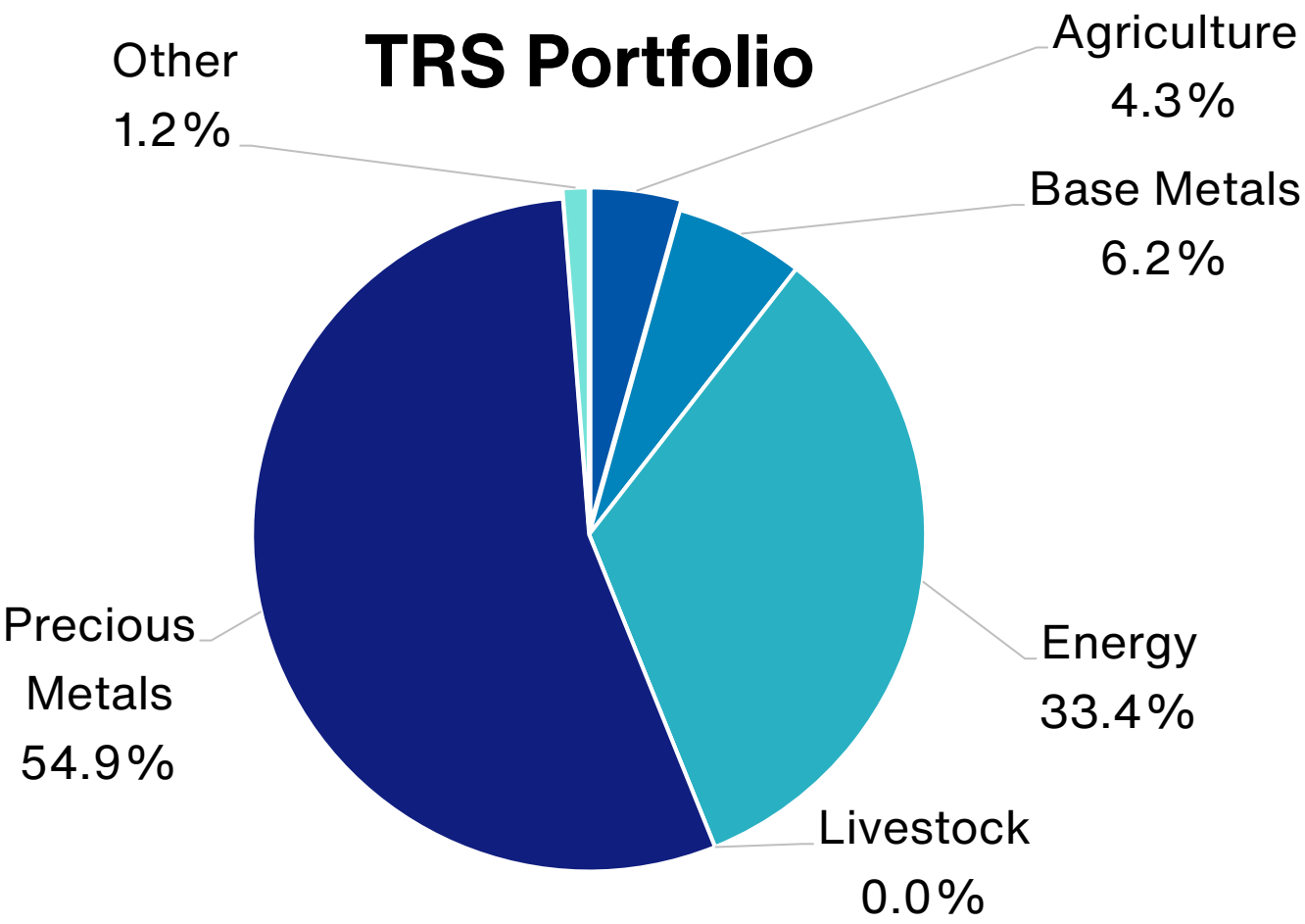
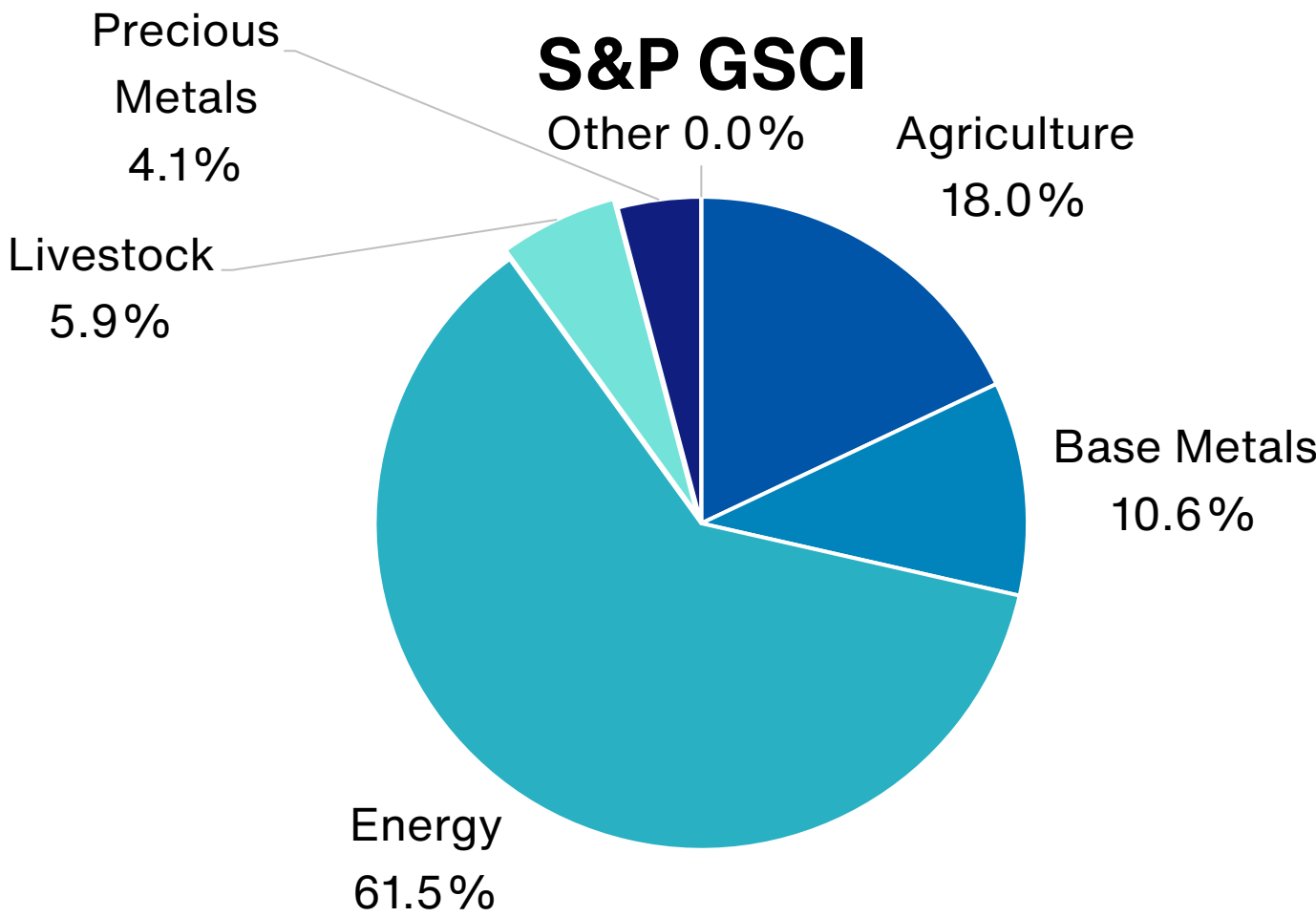


<b>Benchmark:</b>	A composite of private Cambridge benchmarks and inflation
<b>Pros:</b>	Blended benchmark is measurable, includes similar investment types as TRS portfolio
<b>Cons:</b>	The blended benchmark is not investable and may not be the most appropriate representation, but other approaches are similarly flawed
<b>Opinion:</b>	Aon views the blended index as an appropriate benchmark for the asset class
<b>Recommendation:</b>	Maintain the blended index as the primary benchmark

# Commodities: Goldman Sachs Commodity

Asset Class	Real Return
Sub -Asset Class	Commodities
Benchmark	GS Commodity
Long Term Target	0%
Current Target	0%
Specified in Advance	
Appropriate	
Measurable	
Unambiguous	
Reflective	
Accountable	
Investable	
Overall View	
AIUSA Comments	None
Benchmark for Consideration	Current

	Property of the benchmark is <b>valid</b>
	Property of the benchmark is <b>nuanced</b>
	Property of the benchmark is <b>not valid</b>



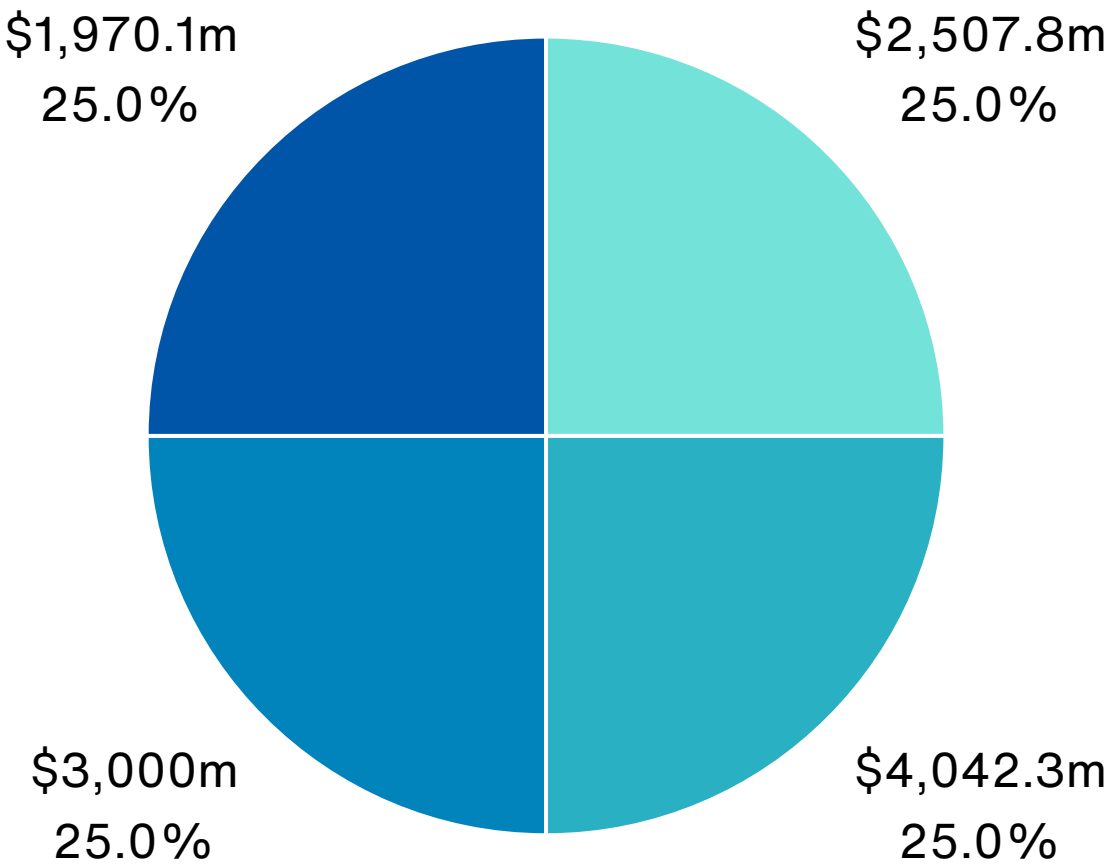
- Benchmark:** Measures a fully collateralized production weighted commodity futures investment (24 nearby futures contracts) that is rolled forward from the fifth to the ninth business day each month
- Pros:** Broadly utilized as a representative measure of a (energy dominated) basket of commodities; This is not a component of the Total Fund Benchmark
- Cons:** The TRS Portfolio currently holds opportunistic allocations to commodities, including gold, which is different from the benchmark
- Opinion:** Aon views the Goldman Sachs Commodity index as an appropriate commodity index, and the TRS gold position as tactical
- Recommendation:** Maintain the Goldman Sachs Commodity index as the benchmark

# Risk Parity: HFR Risk Parity Vol. 12 Institutional

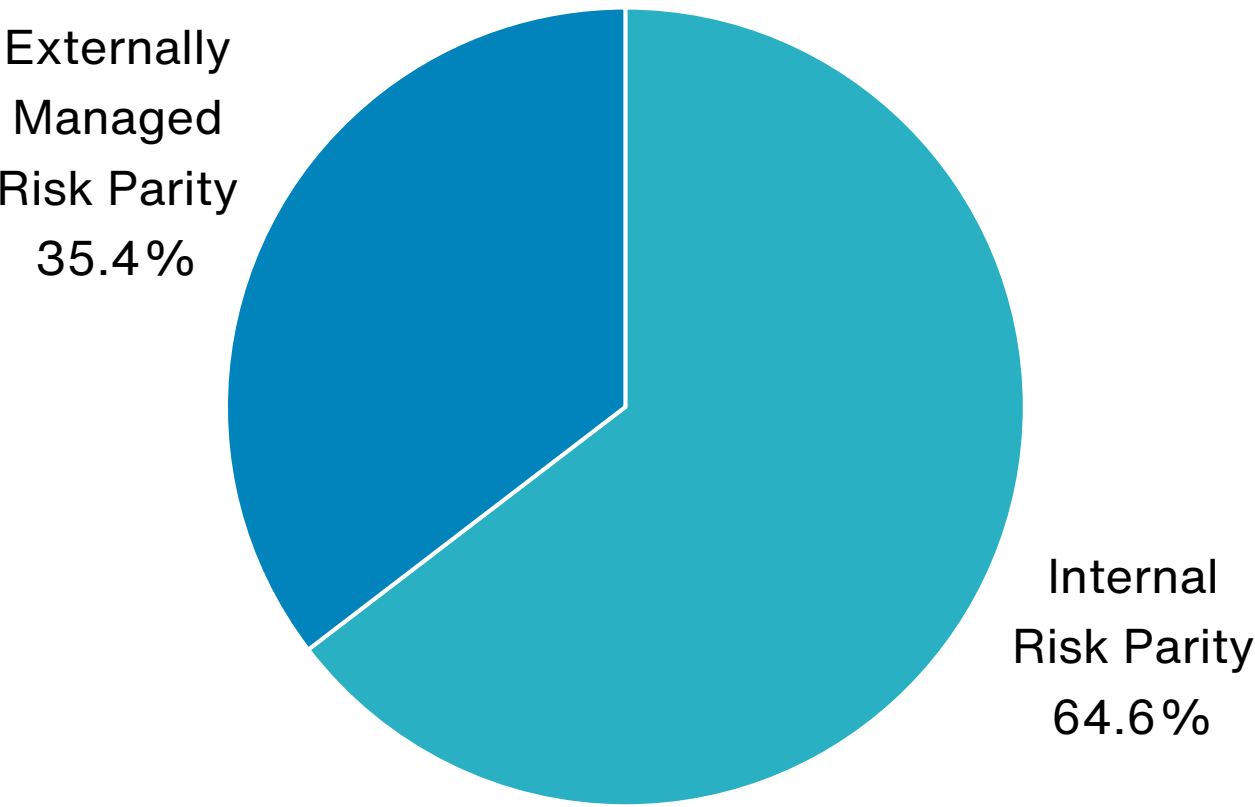
Asset Class	Risk Parity
Sub -Asset Class	Risk Parity
Benchmark	HFR Risk Parity Vol 12 Index
Long Term Target	8%
Current Target	7%
Specified in Advance	
Appropriate	
Measurable	
Unambiguous	
Reflective	
Accountable	
Investable	
Overall View	
AIUSA Comments	None
Benchmark for Consideration	Current

	Property of the benchmark is <b>valid</b>
	Property of the benchmark is <b>nuanced</b>
	Property of the benchmark is <b>not valid</b>

HFR RP Vol12 Inst. – Fund Sizes



TRS Portfolio

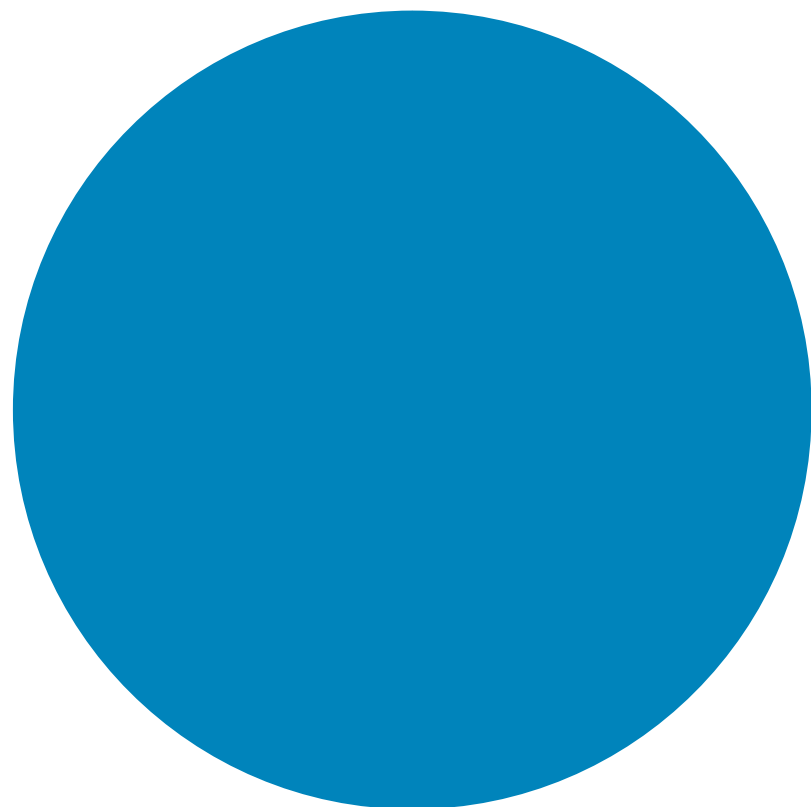


- Benchmark:** Equal weighted composite of 4 risk parity strategies targeting 12% volatility
- Pros:** Reflects the targeted risk/return of the investment strategy
- Cons:** Index is uninvestable and may not be entirely reflective of the TRS portfolio; Consists of 4 strategies
- Opinion:** Aon views the HFR Risk Parity Vol. 12 Institutional index as the best available Risk Parity index
- Recommendation:** Maintain the HFR Risk Parity Vol. 12 Institutional index as the primary benchmark

# Cash: FTSE 3 Month Treasury Bill

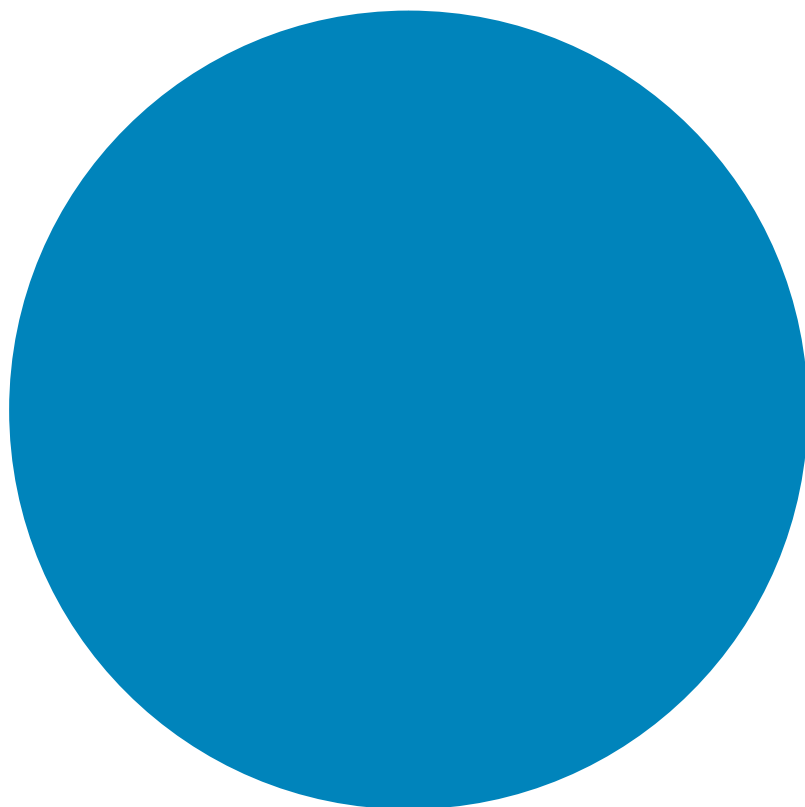
Asset Class	Cash
Sub -Asset Class	Cash Equiv.
Benchmark	FTSE 3 Month Treasury Bill
Long Term Target	2%
Current Target	2%
Specified in Advance	
Appropriate	
Measurable	
Unambiguous	
Reflective	
Accountable	
Investable	
Overall View	
AIUSA Comments	None
Benchmark for Consideration	Current

FTSE 3 Month Treasury Bill



U.S.  
Treasuries  
100.0%

TRS Portfolio



U.S.  
Treasuries  
100.0%

- Benchmark:** Represents the daily performance of 3-month U.S. Treasury bills
- Pros:** Reflects desired risk and liquidity profile
- Opinion:** Aon views the FTSE 3 Month Treasury Bill index as the best available cash equivalent index
- Recommendation:** Maintain the FTSE 3 Month Treasury Bill index as the primary benchmark

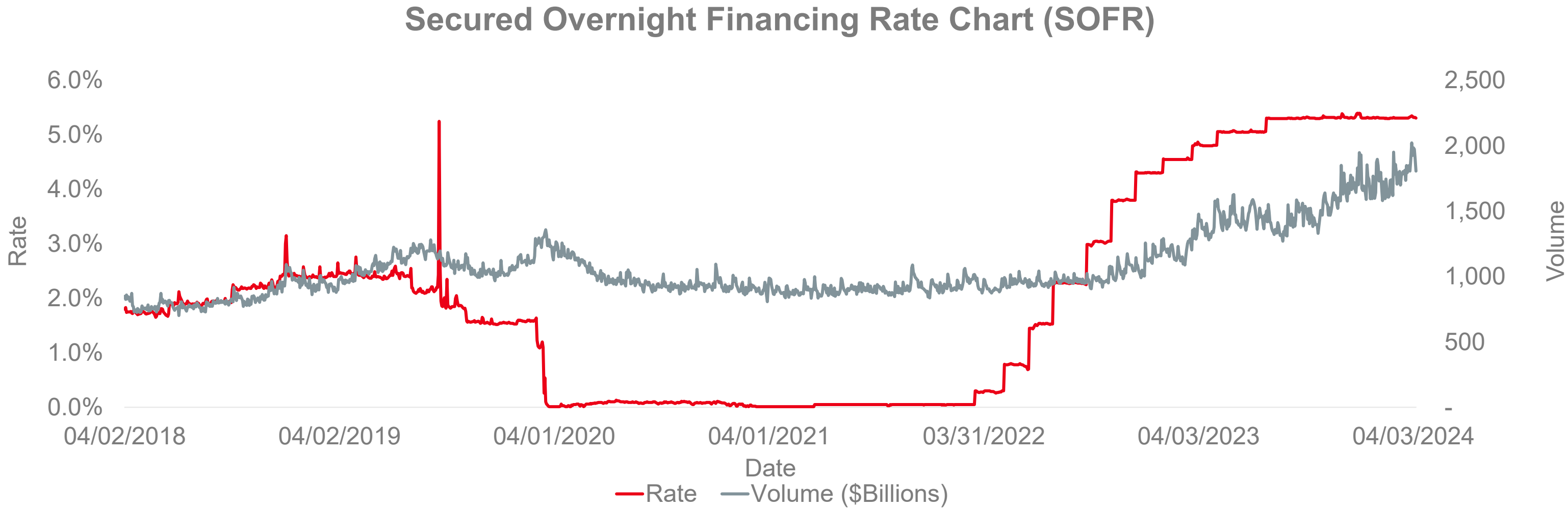
- Property of the benchmark is **valid**
- Property of the benchmark is **nuanced**
- Property of the benchmark is **not valid**



# Leverage: SOFR + 26.161 bps

Asset Class	Leverage
Sub -Asset Class	Asset Allocation Leverage
Benchmark	SOFR + 26.161 bps
Long Term Target	-6%
Current Target	-6%
Specified in Advance	
Appropriate	
Measurable	
Unambiguous	
Reflective	
Accountable	
Investable	
Overall View	
AIUSA Comments	None
Benchmark for Consideration	Current

- Property of the benchmark is **valid**
- Property of the benchmark is **nuanced**
- Property of the benchmark is **not valid**



- Benchmark:** Measures the cost of borrowing cash overnight collateralized by Treasury securities
- Pros:** SOFR represents the cost of borrowing using U.S. Treasuries as collateral
- Opinion:** Aon views SOFR + 26.161 bps as an appropriate benchmark for the asset allocation leverage
- Recommendation:** Maintain SOFR + 26.161 bps as the primary benchmark

# Alternative Investments Benchmarking Options

Benchmark Options	Example	Pros	Cons
<b>Absolute return</b>	Cash (T-bill or SOFR) or Inflation plus a risk premium	<ul style="list-style-type: none"> <li>Reasonable measure of performance for an investment category with broad latitude as to what is included in it</li> <li>Benchmark returns not directly related to traditional asset class returns</li> </ul>	<ul style="list-style-type: none"> <li>TWRs can produce misleading returns for closed-end funds (capital not at work over entire measurement period)</li> <li>Only meaningful over long time horizons</li> <li>Not investable</li> </ul>
<b>Public market comparables with/without risk premium (opportunity cost)</b>	MSCI ACWI IMI + 300 bps	<ul style="list-style-type: none"> <li>Captures market exposure and risk of certain private assets</li> <li>Readily explainable to stakeholders</li> <li>Fully transparent as to composition of benchmark</li> <li>Daily performance available with no lag</li> </ul>	<ul style="list-style-type: none"> <li>Uninvestable (return cannot be earned with a passive index-type investment, especially the premium)</li> <li>No universally accepted “science” to size of risk premium over public indices</li> <li>Not directly related to performance of alternative assets</li> <li>Not ideal for short-term performance measurement</li> </ul>
<b>Universe (or peer-group) based</b>	<ul style="list-style-type: none"> <li>Burgiss (PE)<sup>1</sup></li> <li>NCREIF ODCE<sup>2</sup> (RE)</li> <li>HFR<sup>3</sup> suite of indices (HFs)</li> </ul>	<ul style="list-style-type: none"> <li>Directly captures performance of (peer) alternative investments</li> <li>Readily explainable</li> <li>Customizable to Client’s portfolio structure if desired</li> </ul>	<ul style="list-style-type: none"> <li>Uninvestable</li> <li>Limited transparency</li> <li>Database biases and shortcomings</li> </ul>

<sup>1</sup> Burgiss Private iQ indices are based on the Burgiss Manager Universe, a quarterly-updated database and provides a wide variety of measures, including standard and public-market comparisons, including ICM, Kaplan-Schoar PME, and Direct Alpha

<sup>2</sup> National Council of Real Estate Investment Fiduciaries (NCREIF) Open-End Diversified Core Equity (ODCE) Index is a capitalization-weighted (open-end commingled funds), time-weighted return index that is most widely used to benchmark core private real estate

<sup>3</sup> Hedge Fund Research (HFR) is the global leader in the indexation, analysis and research of the hedge fund industry. With indices ranging from broad composites down to specific, niche areas of sub-strategy and regional investment focus, the HFR suite of indices are considered the industry standard benchmarks of hedge fund performance

# Private Equity Benchmarking: Typical Approaches and Usage

Portfolio Component	Recommended Best Practice (Metric)	What's Being Measured	Pros	Cons
Total Portfolio	Public market + premium (TWR)	Opportunity cost	<ul style="list-style-type: none"> <li>• Can be aggregated into total program performance</li> <li>• Captures market exposure and risk of private equity</li> <li>• Readily explainable and daily performance available with no lag</li> </ul>	<ul style="list-style-type: none"> <li>• TWRs can produce misleading returns for closed-end funds (capital not at work over entire measurement period)</li> <li>• Only meaningful over long time horizons</li> <li>• Not investable</li> </ul>
Total Portfolio	Public market + premium (PME IRR)	Opportunity cost	<ul style="list-style-type: none"> <li>• IRR is a more meaningful metric for private equity</li> </ul>	<ul style="list-style-type: none"> <li>• Can't be aggregated into total program</li> <li>• Only meaningful over long time horizons</li> <li>• Not investable</li> </ul>
Vintage Year Performance	Peer universe by vintage year (IRR, TVPI, DPI)	Portfolio construction relative to opportunity set	<ul style="list-style-type: none"> <li>• Meaningful metrics</li> <li>• Directly captures performance of vintage year peers</li> <li>• Readily explainable</li> <li>• Customizable to Client's portfolio structure if desired</li> </ul>	<ul style="list-style-type: none"> <li>• Not investable</li> <li>• Limited transparency</li> <li>• Database biases and shortcomings</li> </ul>
Fund	Peer universe by strategy, vintage year and geography (IRR, TVPI, DPI)	<ul style="list-style-type: none"> <li>• Fund selection</li> <li>• Fund manager skill</li> </ul>	<ul style="list-style-type: none"> <li>• Meaningful metrics</li> <li>• Directly captures performance of peers by vintage year, geography and strategy</li> <li>• Readily explainable</li> </ul>	<ul style="list-style-type: none"> <li>• Not investable</li> <li>• Limited transparency</li> <li>• Database biases and shortcomings</li> </ul>

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# Private Equity Benchmarking: Typical Approaches and Usage (continued)

- Challenges of Private Equity Benchmarking: Unlike traditional market asset classes, there are no perfect or universally accepted benchmarks for private equity investments.
  - Varied cash flows and no daily valuations
  - Performance takes time to materialize
- Two major benchmarking options
  - Public market index plus a premium
  - Peer benchmark
- Public market index plus a premium
  - Measures the opportunity cost of the decision to invest in private equity
  - Premium added to compensate for higher risk associated with illiquidity and other factors
  - Unbiased measure
  - Tends to be less meaningful in the early years of a private equity investment and can result in high tracking error over short term periods
- Peer benchmark
  - Customized portfolios to provide performance for like-invested funds (i.e., based on vintage years and geographical allocation)
  - IRR is the standard performance metric provided
  - Data typically only available on a 4-5 month lag



# Real Assets: Benchmarking Options

Benchmark Options	Example	Attractive Features	Challenges
<b>Absolute return (Current)</b>	Cash (T-bill or SOFR) or Inflation plus a risk premium  Current = CPI + 4%	<ul style="list-style-type: none"> <li>Reasonable measure of performance for an investment category with broad latitude as to what is included in it</li> <li>Benchmark returns not directly related to traditional asset class returns</li> </ul>	<ul style="list-style-type: none"> <li>Does not measure opportunity cost</li> <li>Intended for long-term performance measurement</li> <li>Difficult to measure success of implementation of strategies</li> <li>Does not reflect success in diversifying the Total Fund</li> </ul>
<b>Strategy-Weighted</b>	Weighted average of benchmarks of investment strategies included in the Real Assets bucket (currently Real Estate, Infrastructure & Resources)	<ul style="list-style-type: none"> <li>Good measure of shorter-term performance</li> <li>Directly captures performance of (peer) alternative investments</li> <li>Readily explainable</li> <li>Customizable to Client's portfolio structure if desired</li> </ul>	<ul style="list-style-type: none"> <li>Does not measure opportunity cost</li> <li>Uninvestable</li> <li>Limited transparency</li> <li>Database biases and shortcomings</li> <li>Does not reflect success in diversifying the Total Fund</li> </ul>
<b>Public market comparables with/without risk premium (opportunity cost)</b>	MSCI ACWI IMI + 300 bps	<ul style="list-style-type: none"> <li>Captures market exposure and risk of certain private assets</li> <li>Readily explainable to stakeholders</li> <li>Fully transparent as to composition of benchmark</li> <li>Daily performance available with no lag</li> </ul>	<ul style="list-style-type: none"> <li>Not directly related to performance of alternative assets</li> <li>Not ideal for short-term performance measurement</li> <li>Difficult to measure success of implementation of strategies</li> </ul>

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