INVESTMENT SECTION

Assist in securing the financial security of generations of state employees by providing a lifetime of guaranteed pension benefits.

Chief Investment Officer's Report

MOSERS
MISSOURI STATE EMPLOYEES' RETIREMENT SYSTEM

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November 13, 2023

Dear Members,

I am pleased to present the *Investment Section* of the *MOSERS Annual Comprehensive Financial Report* for the fiscal year ended June 30, 2023. Over the last fiscal year, equity markets performed well in the face of continuous calls for a mild to moderate recession. Fixed income assets had negative returns given the Federal Reserve's (the Fed) material interest rate increases over the year. The Fed raised short-term interest rates by 4.25% over the year, negatively impacting most fixed income securities. Rest assured however, that the MOSERS portfolio is built to withstand all kinds of market uncertainties over time.

As long-term investors, MOSERS recognizes the importance of portfolio diversification and of maintaining those allocations in the portfolio over the long run. The total MOSERS portfolio generated a time-weighted rate of return of 2.5% for the fiscal year ended June 30, 2023, net of all fees and expenses.

While this result is disappointing on a nominal return basis, on a relative return basis, every asset class outperformed its benchmark and the portfolio in total exceeded the Board's 1.9% policy benchmark return expectation by about 0.6%. This resulted in over $56 million of value added, above the policy benchmark, for this fiscal year. Total assets as of June 30, 2023, were approximately $8.7 billion.

Specifically, the growth portion of the portfolio (which includes both public and private equity) rebounded nicely, returning 13.7%, versus a -12.7% return for the previous fiscal year while outperforming its benchmark by 0.2%. The absolute return portfolio also turned in strong nominal and relative performance for the fiscal year returning 6.8%, outperforming its benchmark of 4.6%.

Due primarily to their long interest rate duration positioning in a rising rate environment, both the inflation hedge and income allocations of the portfolio had negative nominal performance for the year, returning -5.6% and -7.0%, respectively. These allocations, however, did both exceed their benchmark returns of -5.7% and -7.4%, respectively.

Economies the world over continue to transition away from the historic impact of the pandemic environment and are having varying degrees of success in fighting the current higher inflation, higher interest rate, and lower-growth environments.

In the U.S., consumer spending appears to be slowing. However, with the unemployment rate near historic lows, consumer spending is slowing less than some have expected thus far. The personal savings rate is also lower than at almost any time in history. Both of these factors are contributing to a slowing, but still positive, growth trajectory in the U.S. Calls for a recession in the near term continue to abate, and economists are starting to debate the potential timing of the next interest rate reduction cycle.

I look forward to continuing work with the MOSERS Board and our highly talented, and experienced, investment staff to continue providing secure, reliable retirement benefits to all our plan members.

Sincerely,

TJ Carlson
Chief Investment Officer

Investment Policy Summary

The investment policy summary serves as a reference point for management of System assets and outlines MOSERS' investment philosophy and practices. Investments within this report are presented on the basis of fair value using a variety of sources such as appraisals, valuations of underlying companies and assets for limited partnerships and commingled funds, and through fair values obtained from the investment custodian.

The purpose of MOSERS' investment program is to ensure that MOSERS' members and beneficiaries receive their benefits at a reasonable and predictable cost to their employers. Plan assets may be invested, reinvested, and managed by MOSERS' investment staff or third-party investment managers, subject to the terms, conditions, and limitations provided by law and contracts, where applicable.

The MOSERS Board is charged with the responsibility for investing the assets of the System in a manner consistent with fiduciary standards set forth in the prudent person rule and has adopted the following objectives and philosophies to guide all investment related decisions.

Investment Objectives

- Develop a Real Return Objective (RRO) intended to keep contribution rates at a reasonable level over long periods of time, absent changes in actuarial assumptions.
- Establish an asset allocation policy that is expected to meet the RRO, while minimizing the impact of the portfolio investments' volatility on the contribution rate.
- Maximize long-term investment returns by exposing plan assets to a prudent level of risk in order to support the goal of having sufficient funds available to meet projected benefit payment obligations.
- Monitor costs associated with the efficient implementation of the asset allocation policy through the use of internal and external resources.

Investment Philosophy

- A key risk to the portfolio is asset shortfall where assets are insufficient to meet promised benefit obligations. As a result, the Board will strive to minimize the potential for long-term impact from disproportionate drawdowns.
- MOSERS is willing to take measured risks for which it expects to be compensated, and will seek to avoid risks, which may not be appropriately rewarded.
- The Board will employ a disciplined, objective, and quantitatively-driven asset/liability analysis process with the goal of determining the optimal asset allocation policy to meet the investment objectives.
- In order to meet the RRO, it is necessary for the Plan to maintain a significant allocation to growth (i.e., equity) assets. As a result, equity risk is expected to be the key contributor to the overall risk of the Plan's investments (Total Fund). In recognition of this, the Board's asset allocation policy will seek to mitigate the risk from large equity market declines.
- Strategic asset allocation is a significant factor influencing long-term investment performance and asset volatility. The asset allocation targets, determined by the Board, will be adhered to through clearly defined rebalancing guidelines.
- The Board will seek to cause the total fund to be broadly diversified in view of the fact that not all strategies will add value at all times, which should mitigate the impact of negative market environments over its long-term investment horizon.
- Risk management and performance benchmarking are integral to the investment program. The Board will establish and regularly monitor appropriate absolute and relative return risk as well as other key risks that affect the total fund.
- The Board recognizes the importance of benchmarking for monitoring how well investment decisions are fulfilling the Fund's objectives and will employ industry-accepted benchmarks for all asset classes and sub-asset classes for which the Board sets policy, using published market indices where feasible.
- Costs meaningfully impact investment returns and will be a consideration in all investment program decisions. Investment performance shall be reported net of fees to incorporate the full impact of fees and costs.

Roles and Responsibilities

Board of Trustees

The Board bears the ultimate fiduciary responsibility for the investment of System assets. Members of the Board must adhere to state law and prudent standards of diligence with respect to their duties as investment fiduciaries. Accordingly, they are required to discharge their duties in the interest of plan participants. They must also “act with the same care, skill, prudence, and diligence under prevailing circumstances that a prudent person, acting in a similar capacity and familiar with those matters, would use in the conduct of a similar enterprise with similar aims.”[1] Specifically related to investments, the Board is responsible for prudent oversight, governance, and management of the System’s assets.

Executive Director

The executive director is appointed by, and serves at the pleasure of, the Board. Pursuant to its authority to delegate functions to employees of the System under Section 104.1069, RSMo, the Board of Trustees has delegated to the executive director the responsibility to manage the staff that oversees and executes MOSERS’ investment program. The executive director selects, evaluates, and terminates the chief investment officer and is responsible for monitoring the investment program compliance, as established by policies set forth by the Board.

Chief Investment Officer (CIO) and Internal Staff

The CIO serves at the pleasure of the executive director and has primary responsibility for the overall direction of the investment program. The CIO works with the Board investment consultant and executive director in advising the Board on policies related to the investment program. The CIO has primary responsibility to make hiring and termination decisions related to money managers with the approval of the staff investment consultant. The CIO is also charged with the responsibility of making strategic allocation decisions within parameters established by Board policy. Other responsibilities of the CIO include monitoring the investment of System assets, oversight of external money managers and the internally managed portfolios, and keeping the Board apprised of situations that merit their attention. The internal investment staff is accountable to the CIO.

External Consultants

The Board investment consultant serves at the pleasure of the Board. The Board investment consultant’s primary duty is to provide the Board with independent and objective investment advice and assist the Board in making decisions and overseeing the investment program. Specifically, the Board investment consultant assists the Board in developing investment policy, recommends asset allocation policy as requested by the Board, and assists the Board in oversight of the investment program.

Staff investment consultants serve at the pleasure of the CIO. The primary responsibilities of the staff investment consultants are to provide independent and objective investment advice to the staff. Among other duties, as applicable, each staff investment consultant agrees in writing to the CIO’s proposed hiring or termination of external investment management firms and third-party plan administrators.

Chief Auditor

The chief auditor reports directly to the executive director and if, in the opinion of the chief auditor, circumstances warrant, may report directly to the Board. The chief auditor is independent of the System’s investment operations and, among other duties, is responsible for providing objective audit and review services for investment operations. It is the chief auditor’s objective to promote adequate and effective internal controls at a reasonable cost.

Master Custodian

BNY Mellon serves as the master custodian of the System’s assets except in cases where investments are held in partnerships, commingled accounts, or unique asset classes where it is impossible for them to do so. The master custodian is responsible for maintaining the official book of records, providing performance reports, and serving as an additional layer of risk control in the safekeeping of System assets.

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[1] *Section 105.688, RSMo - Investment Fiduciaries, Duties.*

Asset Allocation

Determining the System's asset allocation is one of the most important decisions in the investment management process. The Board, with advice from the Board investment consultant and the CIO, adopted a new portfolio allocation in July 2018 that is designed to provide the highest probability of meeting or exceeding the System's investment objectives at a controlled level of risk and with liquidity that is acceptable to the Board. In determining the optimum mix of assets, the Board considers factors such as:

- The expected risk of each asset class.
- The expected rate of return for each asset class.
- The correlation between the rates of return of the asset classes.
- The investment objectives and risk constraints of the fund.
- The impact of the portfolio's volatility on the contribution rate.

While the Board maintains a set policy allocation mix, they have taken steps to provide flexibility by granting authority to the CIO to make strategic allocation decisions to capitalize on attractively valued opportunities within prudent risk constraints. This flexibility has allowed the System to take advantage of changing market conditions. The table below illustrates the policy asset allocation and ranges formally adopted by the Board for the new portfolio.

Asset Allocation

Asset Classes	Asset Allocation Policy	Asset Allocation Ranges[1]	Benchmark[2]
Total growth	**45%**	**35% - 55%**	**Blended**
Global public equities	30%	15% - 45%	MSCI ACWI
Global private equities	15%	5% - 20%	Custom Private Equity Benchmark[3]
Total income	**35%**	**30% - 40%**	**Blended**
Long treasuries	25%	20% - 30%	Bloomberg Long U.S. Treasury
Core bonds	10%	5% - 15%	Bloomberg U.S. Aggregate Bond
Total inflation hedge	**40%**	**35% - 45%**	**Blended**
Commodities	5%	0% - 10%	Bloomberg Commodity
TIPS	25%	20% - 30%	Bloomberg U.S. Treasury Inflation Notes 1 - 10 yr
Private real assets	5%	0% - 10%	NCREIF ODCE
Public real assets	5%	0% - 10%	FTSE NAREIT
Total absolute return	**20%**	**15% - 25%**	**Blended**
Hedge funds	5%	0% - 10%	HFRI FoF: Conservative + 0.70%
Alternative beta	10%	5% - 15%	HFRX Macro/CTA
Private credit	5%	0% - 10%	Morningstar LSTA U.S. Leveraged Loan + 2%

[1] *The Board has granted the CIO the authority to operate within the risk allocation and policy asset allocation ranges.*

[2] *Benchmarks are net of MOSERS' actual leveraging costs on borrowed assets.*

[3] *Custom Private Equity Benchmark is a weighted average roll-up of the underlying manager benchmarks which include State Street Private Equity Buyout Index, MSCI ACWI Index, and Legacy Private Equity Returns.*

Rebalancing

It is the responsibility of staff to ensure that the asset allocation adheres to the System's rebalancing policy. MOSERS utilizes a combination of cash market and derivative transactions to maintain the total portfolio's allocation at the broad policy level. Reviews are conducted at least monthly to bring the portfolio back within allowable ranges of the broad policy targets.

Risk Controls

MOSERS' investment program faces numerous risks; however, the primary risk to MOSERS is that the assets will not support the liabilities over long periods of time. In order to control this risk and numerous other risks that face the System, the Board has taken the following steps, on an ongoing basis, to help protect the System:

- Actuarial valuations are performed each year to ensure the System is on track to meet the funding objectives of the plan. In addition, every five years an external audit of the actuary is conducted to ensure that the assumptions being made and calculation methods being utilized are resulting in properly computed liabilities.
- Asset/liability studies are conducted at least once every five years. The purpose of these studies is to ensure that the current portfolio design is structured to meet the System's liabilities. During these studies, investment expectations are also re-examined in more detail.
- An investment policy statement is in place to ensure that Board policies are clearly identified. Within these documents, desired outcomes are identified, responsibilities for individuals are identified in relation to particular areas of the portfolio's management, and details are provided for measuring outcomes. Reporting requirements are clearly identified to ensure appropriate checks and balances are in place. In addition, annual performance audits are conducted to ensure the performance measurement tools and methodologies being utilized are proper.

Performance Objectives and Monitoring Process

Generating a total nominal rate of return net of expenses of at least 6.95% is the primary performance objective for the total portfolio. This return objective is equal to the RRO plus expected inflation.

The reason for the long-term focus on this objective is to preclude the temptation to overreact to events in the marketplace that have no relevance in the management of the relationship between the System's assets and liabilities. The resulting dilemma is the conflicting need to evaluate investment policy implementation decisions over shorter time frames while maintaining the longer-term focus necessary to manage and measure the fund's performance relative to the RRO. To address this problem, the Board evaluates performance relative to policy benchmarks. This helps to evaluate the Board's broad policy decisions and the staff and external consultant's implementation decisions. Policy benchmarks measure broad investment opportunities of each sub-asset class in which MOSERS has chosen to invest. The difference between the policy benchmarks and the actual portfolio returns represent decisions made by the CIO to strategically deviate from the policy asset allocation for each sub-asset class.

The policy benchmarks are used in the following manner to evaluate Board and staff decisions:

- **Board Decisions:** The value added through Board policy decisions is measured by the difference between the total fund policy benchmark return and the RRO. This difference captures the value added by the Board through their policy asset allocation decisions relative to the return necessary to fund the System's liabilities. A policy benchmark return greater than the RRO reflects the achievement of the RRO goals. A policy benchmark return less than the RRO reflects losses or shortfalls in performance in funding the liabilities. These policy decisions are measured over long periods of time.

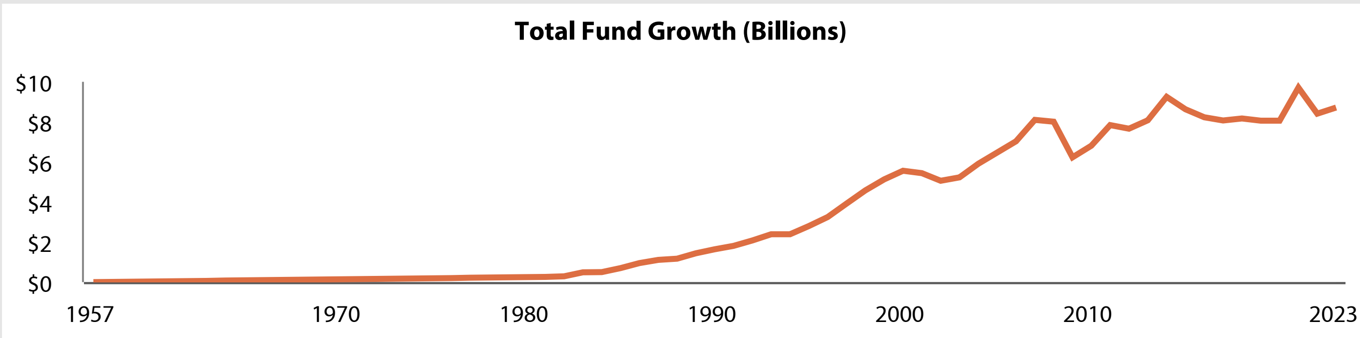
- **CIO and External Consultants' Decisions:** There are two components to decisions made by the CIO and external consultants, which are monitored by the Board on an ongoing basis. They are: 1) strategic allocation decisions, and 2) implementation decisions.

Strategy decisions are made by the CIO to deviate from the policy benchmark weight. Implementation decisions are money manager selection choices made by the CIO with the agreement of the appropriate external consultant and the acknowledgement from the executive director that the decision was made in accordance with the Board's adopted policy. The value added through both strategic and implementation decisions is measured by the difference between the actual portfolio return and the policy benchmark return. An actual portfolio return greater than the policy benchmark return reflects value added through these decisions of the CIO and the external consultants. An actual portfolio return less than the policy benchmark return reflects losses to the fund's performance based upon these decisions. These CIO and external consultant decisions should be measured over all periods of time with a majority weight placed on outcomes that have occurred over a market cycle.

The Board reviews performance information on a quarterly basis to help ensure adequate monitoring of the fund's overall performance objectives.

Total Fund Review

As of June 30, 2023, the MOSERS investment portfolio had a fair value of $8.7 billion. The graph below illustrates the growth of MOSERS' portfolio since the System's inception.



Investment Performance

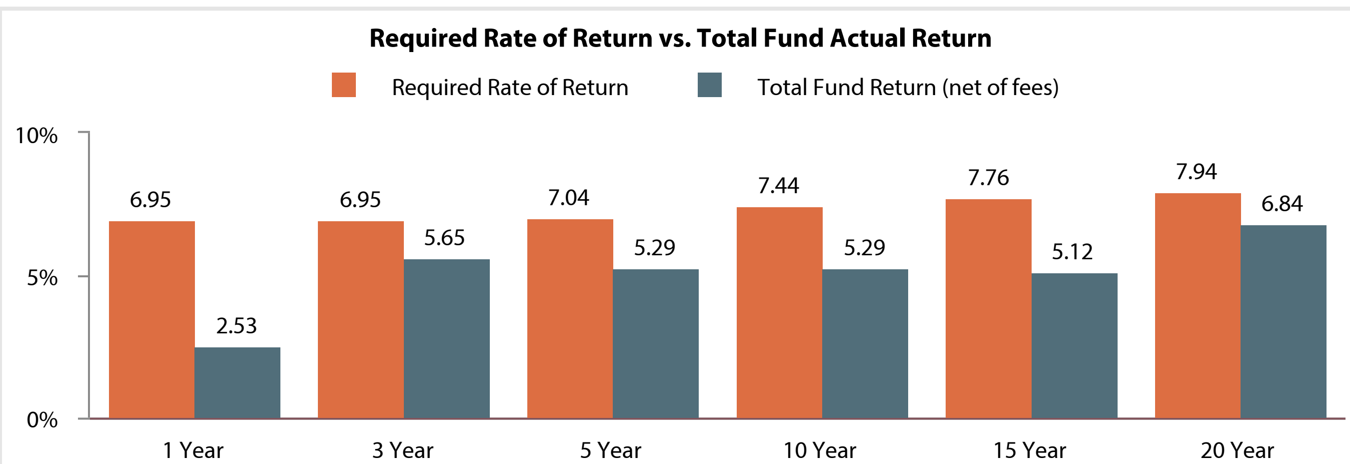
MOSERS' investments generated a time-weighted return of 2.5%, net of fees, for fiscal year 2023. The total fund return exceeded the 1-year policy benchmark of 1.9%. This additional 0.6% investment return produced $56.2 million in excess of what would have been earned if the fund had been invested passively in the policy benchmark.

Investment Performance vs. Required Rate of Return

The total fund investment return is compared to a required rate of return. The required rate of return is established by the Board to determine how well the fund is performing over the long term in order to meet future plan obligations after accounting for inflation. The required rate of return for fiscal year 2023 is 6.95%.

Given the volatility of the investment markets, the portfolio should not be expected to meet the required rate of return every year. A review of long periods of time is best to evaluate whether or not the total return has kept pace with the System's funding objectives.

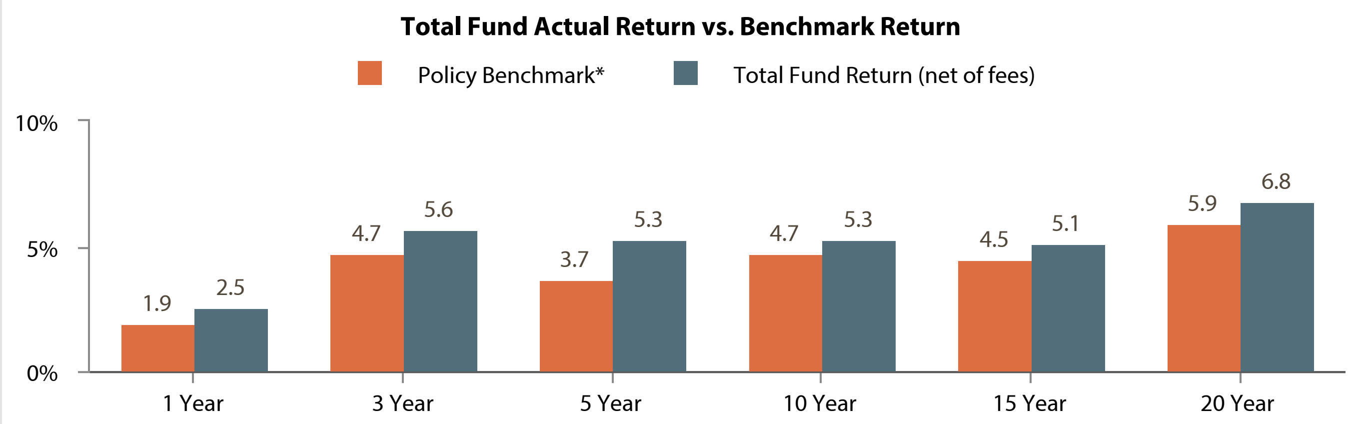
As indicated in the following bar chart, MOSERS' investment returns trailed the required rate of return by 1.1% over the 20-year period ended June 30, 2023.[1]



[1] *Performance returns are calculated using a time-weighted rate of return on fair values.*

Investment Performance vs. Benchmark Comparisons

In addition to measuring performance relative to the required rate of return, the Board also compares fund returns to the policy benchmark. Returns for the total fund versus policy benchmarks are displayed in the following bar chart.



** As of June 30, 2023, the total fund policy benchmark was comprised of the following components: 45% total growth policy, 35% total income policy, 40% total inflation hedge policy and 20% total absolute return policy.*

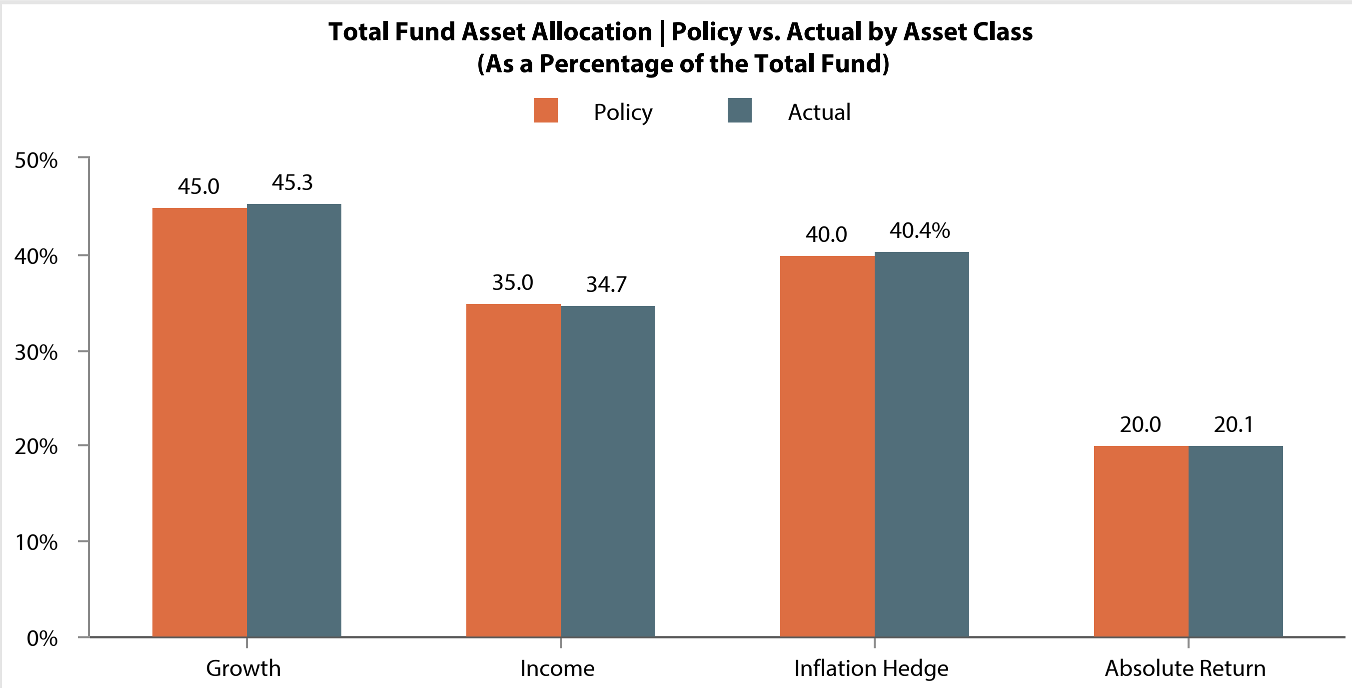
All policy return components are adjusted for financing costs associated with the program.

The policy benchmark provides an indication of the returns that could have been achieved (excluding transaction costs) by a portfolio invested in the designated benchmarks for each asset class at the percentage weights allocated to each asset class in MOSERS' policy asset allocation. Comparison of the total return to the policy benchmark reflects the total value added or detracted by the CIO through strategic and manager implementation decisions. Value is added when the total fund return exceeds the policy benchmark return. The total fund 1-, 3-, 5-, 10-, 15-, and 20-year actual performance outperformed its policy benchmark by 0.6%, 0.9%, 1.6%, 0.6%, 0.6%, and 0.9%, respectively.

Total Fund Policy Allocation Overview

As of June 30, 2023, the Board's broad policy allocation mix was 45% growth assets, 35% income assets, 40% inflation hedge assets, and 20% absolute return assets. The policy target, as of June 30, 2023, for each sub-asset class, along with the actual strategic allocation to each type of investment, is shown in the bar graph below.

The Board has granted authority to the CIO to make strategic decisions. A strategic decision should be thought of as any decision that might cause MOSERS' actual portfolio to differ from the policy asset allocation.



Schedule of Fees and Commissions

	Commissions Paid	Volume of Trades*	Shares Traded
Barclays Capital	$ 3,234	$ 28,855,544	646,733
BTIG, LLC	6,491	56,215,078	1,297,996
Citigroup Global Markets, Inc.	358	179,440	—
Credit Suisse	34	45,690	(1)
Jefferies & Co., Inc.	2,948	28,531,738	589,557
Morgan Stanley & Co., LLC	96,622	77,752,183	(1,198)
Total	$ 109,687	$ 191,579,673	$ 2,533,087

* *Volume does not include futures notional value.*

Schedule of Investment Portfolios by Asset Class

As of June 30, 2023

	Portfolio Value	Percentage of Portfolio	Market Exposure	Percentage of Investments at Market Exposure
Growth	$ 3,952,118,840	45.3%	$ 3,951,986,999	45.4%
Income	1,538,840,923	17.7	3,023,772,994	34.7
Inflation hedge	1,467,882,502	16.9	3,516,474,491	40.4
Absolute return	1,750,789,042	20.1	1,750,789,320	20.1
Total portfolio	8,709,631,307	100.0	12,243,023,804	140.6
Residual accounts	5,610,759	0.1	5,610,759	0.1
Cash reserve	759,302	0.0	759,302	0.0
MOSERS Total Fund	$ 8,716,001,368	100.0%	$ 12,249,393,865	140.6%

Reconciliation to Statement of Fiduciary Net Position	
Total fund value	$ 8,716,001,368
Obligations under repurchase agreements	3,603,920,038
Receivable - investment income	(580,579,237)
Receivable - investment sales	(191,763,748)
Investment activities payable	581,523,664
Management and incentive fee payable	1,167,159
Payable for investments purchased	77,176,334
Investments per *Statement of Fiduciary Net Position*	$ 12,207,445,578

Total Fund – Top Ten Publicly Traded Separate Account Holdings

Ten Largest Holdings as of June 30, 2023*		Fair Value	Percent of the Total Fund
U.S. Treasury Bond CPI Inflation - 1.125% 2033	$	92,984,258	1.07%
U.S. Treasury Bond CPI Inflation - 0.625% 2032		90,743,444	1.04
U.S. Treasury Bond CPI Inflation - 0.125% 2027		90,236,861	1.04
U.S. Treasury Bond CPI Inflation - 0.375% 2025		86,592,674	0.99
U.S. Treasury Bond CPI Inflation - 0.125% 2024		83,397,143	0.95
U.S. Treasury Bond CPI Inflation - 1.625% 2027		80,549,592	0.92
U.S. Treasury Bond CPI Inflation - 0.125% 2031		80,148,917	0.92
U.S. Treasury Bond CPI Inflation - 0.250% 2025		80,079,829	0.92
U.S. Treasury Bond CPI Inflation - 0.125% 2024		77,704,407	0.89
U.S. Treasury Bond CPI Inflation - 0.375% 2027		77,560,330	0.89

** For a complete list of holdings, contact MOSERS.*

Schedule of Investment Results

1-, 3-, 5-, 10-, 15-, and 20-Year Periods

Total fund – As of June 30, 2023, the total fund policy benchmark was comprised of the following components: 45% total growth policy, 35% total income policy, 40% total inflation hedge policy, and 20% total absolute return policy. This program did not begin until January 2019.

Growth – As of June 30, 2023, the total growth policy was 66.7% global public equities policy benchmark and 33.3% global private equities policy benchmark.

- Global public equities policy - As of June 30, 2023, the total global public equities policy was MSCI All Country World Index (ACWI).
- Global private equities policy - As of June 30, 2023, the global private equities policy benchmark was a blend of 29.0% MOSERS legacy private equity return/35.4% State Street Buyout Index (weighted by vintage year)/35.6% MSCI ACWI Index.

Income – As of June 30, 2023, the total income policy was 71.4% long treasury policy benchmark and 28.6% core bonds policy benchmark.

- Long treasuries - As of June 30, 2023, the long treasuries policy was Bloomberg U.S. Long Treasury Index.
- Core bonds - As of June 30, 2023, the core bonds policy was Bloomberg U.S. Aggregate Bond Index.

Inflation hedge – As of June 30, 2023, the total inflation hedge policy was 12.5% commodities policy benchmark, 62.5% TIPS policy benchmark, 12.5% private real assets policy benchmark, and 12.5% public real assets policy benchmark.

- Commodities - As of June 30, 2023, the commodities policy was Bloomberg Commodity Index.
- Treasury inflation protected securities (TIPS) - As of June 30, 2023, the TIPS policy was the Bloomberg U.S. Treasury Inflation Notes 1 - 10 yr Index.
- Private real assets - As of June 30, 2023, the private real assets policy benchmark was NCREIF Fund Index - Open End Diversified Core Equity (ODCE).
- Public real assets - As of June 30, 2023, the public real assets policy was FTSE NAREIT ALL REITS Index.

Absolute return – As of June 30, 2023, the absolute return policy benchmark was comprised of 25.0% direct hedge funds policy benchmark, 50.0% alternative beta - beta policy benchmark, and 25.0% private credit policy benchmark.

- Alternative beta - As of June 30, 2023, the alternative beta policy was HFRX Macro/CTA Index.
- Hedge funds - As of June 30, 2023, the hedge funds policy benchmark was the HFRI Fund of Funds: Conservative Index + 0.70%.
- Private credit - As of June 30, 2023, the private credit policy was Morningstar LSTA U.S. Leveraged Loan + 2%.

Schedule of Investment Results (continued)

	1 Year	3 Year	5 Year	10 Year	15 Year	20 Year
Total fund	2.5%	5.6%	5.3%	5.3%	5.1%	6.8%
Total fund policy benchmark	1.9%	4.7%	3.7%	4.7%	4.5%	5.9%
Growth	13.7%	12.9%	N/A	N/A	N/A	N/A
Growth policy benchmark	13.5%	13.3%	N/A	N/A	N/A	N/A
Global public equities	18.5%	12.2%	6.8%	8.2%	7.3%	9.0%
Global public equities policy benchmark	16.8%	11.2%	8.2%	8.9%	6.7%	8.0%
Global private equities	4.3%	15.7%	N/A	N/A	N/A	N/A
Global private equities policy benchmark	6.8%	15.8%	N/A	N/A	N/A	N/A
Income	(7.0)%	(10.1)%	N/A	N/A	N/A	N/A
Income policy benchmark	(7.4)%	(10.6)%	N/A	N/A	N/A	N/A
Long treasuries	(9.8)%	(12.9)%	(2.0)%	1.0%	N/A	N/A
Long treasuries policy benchmark	(9.9)%	(13.2)%	(2.3)%	0.8%	N/A	N/A
Core bonds	0.2%	(2.7)%	N/A	N/A	N/A	N/A
Core bonds policy benchmark	(0.9)%	(4.0)%	N/A	N/A	N/A	N/A
Inflation hedge	(5.6)%	4.6%	N/A	N/A	N/A	N/A
Inflation hedge policy benchmark	(5.7)%	3.7%	N/A	N/A	N/A	N/A
Commodities	(13.0)%	16.0%	3.3%	(4.8)%	(6.8)%	(0.3)%
Commodities policy benchmark	(13.4)%	15.9%	2.7%	(4.6)%	(8.3)%	(1.6)%
Inflation-indexed bonds	(3.9)%	0.0%	1.2%	0.9%	2.2%	3.3%
Inflation-indexed bonds policy benchmark	(3.8)%	0.0%	1.3%	1.0%	2.2%	3.3%
Private real assets	(7.7)%	13.5%	N/A	N/A	N/A	N/A
Private real assets policy benchmark	(10.7)%	5.6%	N/A	N/A	N/A	N/A
Public real assets	(4.2)%	6.2%	N/A	N/A	N/A	N/A
Public real assets policy benchmark	(4.3)%	6.2%	N/A	N/A	N/A	N/A
Absolute return	6.8%	8.0%	N/A	N/A	N/A	N/A
Absolute return policy benchmark	4.6%	6.0%	N/A	N/A	N/A	N/A
Hedge funds	6.9%	9.7%	N/A	N/A	N/A	N/A
Hedge funds policy benchmark	4.3%	10.3%	N/A	N/A	N/A	N/A
Alternative beta	3.8%	6.3%	1.7%	3.2%	N/A	N/A
Alternative beta policy benchmark	0.7%	2.7%	(3.2)%	(0.4)%	N/A	N/A
Private credit	12.9%	9.8%	N/A	N/A	N/A	N/A
Private credit policy benchmark	12.7%	8.3%	N/A	N/A	N/A	N/A

Results are based on time-weighted rates of return on fair values adjusted for cash flows. Where applicable, benchmarks are calculated net of financing costs.

Broad asset allocations (Growth, Income, Inflation Hedge, and Absolute Return) were established with the asset allocation adopted by the Board in 2018. Therefore, 5-, 10-, 15-, and 20-Year returns are not available yet as of June 30, 2023.

Schedule of Investment Manager Fees

For the Year Ended June 30, 2023

	Portfolio Fair Value	Total Fees	Manager Fees	Fund Pass Through Expenses *	Incentive Fees Earned
Equity					
Artisan International Value Fund	337,667,473	3,204,058	3,103,931	100,127	0
Baillie Gifford Intl. Alpha Private Equity	222,999,727	1,138,765	929,421	209,344	0
Baillie Gifford EM Private Equity	86,001,622	713,428	573,763	139,665	0
NS Partners Emerging Markets	173,676,108	1,479,766	1,197,061	282,705	0
Silchester International Investors	345,225,099	2,053,535	2,053,535	0	0
Total equity	1,165,570,029	8,589,552	7,857,711	731,841	0
Multi-asset					
Blackrock	321,679,571	1,274,370	576,850	697,520	0
NISA Investment Advisors	1,665,369,971	5,124,746	5,124,746	0	0
Total multi-asset	1,987,049,542	6,399,116	5,701,596	697,520	0
Alternatives					
ABRDN Eclipse HFRX Macro/CTA SPC	343,350,057	1,666,587	644,957	1,021,630	0
Aberdeen Davi Alpha	160,917,250	728,168	920,884	(192,716)	0
Actis Emerging Markets 3	476,000	(357,000)	0	(357,000)	0
Actis Emerging Markets 4	21,466,872	(3,888,098)	448,070	16,832	(4,353,000)
Altas Partners Holdings III LP	136,255	9,072	(331,507)	340,579	0
Appian Natural Resources Fund III	3,082,340	424,330	369,863	54,467	0
Axiom Asia Private Capital Fund II, LP	15,356,303	138,743	167,882	32,621	(61,760)
Axiom Asia Private Capital Fund III, LP	72,812,697	763,867	287,867	41,863	434,137
Axiom Asia Fund 6, LP	22,267,318	584,422	500,000	103,571	(19,149)
Axxon Brazil Private Equity Fund II B, LP	8,923,281	156,537	117,051	39,486	0
Blackstone Real Estate Partners IV	854,091	42,912	0	73,584	(30,672)
Blackstone Real Estate Partners V	111,516	56,478	0	6,747	49,731
Blackstone Real Estate Partners VI	1,091,731	(104,779)	0	16,176	(120,955)
Blackstone Real Estate Partners VII	13,136,857	(273,740)	9,440	(283,180)	0
Blackstone Topaz Fund, LP	362,736,787	3,990,021	2,718,044	336,642	935,335
Blackstone Topaz Private Credit	267,780,476	2,175,020	1,623,375	199,415	352,230
Blue Diamond Non-Directional Fund	83,397,143	2,649,993	696,302	40,181	1,913,510
Brevan Howard Alpha Strategies Fund, LP	229,943,789	20,366,311	2,411,304	10,196,244	7,758,763
Catalyst Fund Limited Partnership III	13,673,581	225,542	186,317	39,225	0
Catalyst Fund Limited Partnership IV	2,642,705	75,610	55,989	19,621	0
Catalyst Fund Limited Partnership V	62,900,265	1,905,500	1,977,504	(72,004)	0
CBRE U.S. Core Partners, LP	129,627,586	1,586,985	1,254,971	168,328	163,686
Centiva Capital	130,277,647	5,854,134	0	3,285,524	2,568,610
Cornwall Domestic, LP	1,386,798	28,433	0	28,433	0
DE Shaw Diopter Fund, LLC	71,976,667	1,077,554	355,267	57,565	664,722
EIG Energy Fund XIV, LP	1,791,474	103,349	0	103,349	0
EIG Energy Fund XV, LP	5,859,113	96,752	9,213	87,539	0
EIG Energy Fund XVI, LP	22,287,258	283,045	238,167	44,878	0
EIG Co-Investment	241,881	33,340	0	33,340	0

Schedule of Investment Manager Fees continued on following page

Schedule of Investment Manager Fees (continued)

For the Year Ended June 30, 2023

	Portfolio Fair Value	Total Fees	Manager Fees	Fund Pass Through Expenses*	Incentive Fees Earned
Eisler Multi-Strategy Fund, LP	187,797,113	16,204,297	137,932	4,709,359	11,357,006
Elliott International Limited	260,338,858	6,981,087	3,862,634	1,513,181	1,605,272
Exodus Point Partners Fund	157,192,971	13,199,783	0	4,349,977	8,849,806
Farallon Capital Institutional Partners, LP	576,332	(8,977)	0	0	(8,977)
Gateway Energy & Resource Holdings, LLC	3,405,084	17,737	0	17,737	0
Global Forest Partners GTI7 Institutional Investors Company Ltd.	443,002	5,285	2,282	3,003	0
Gryphon Partners VI, LP	81,342,069	(474,356)	(80,000)	256,276	(650,632)
Harrison Street Real Estate Core Property Fund, LP	59,438,348	1,068,011	806,766	261,245	0
HBK Merger Strategies Offshore Fund, Ltd.	105,580,732	4,100,219	1,177,353	289,872	2,632,994
HIG Middle Mkt LBO Fund IV, LP	709,677	1,110,402	872,283	238,119	0
JLL Partners Fund V, LP	2,988,096	(159,825)	0	6,023	(165,848)
JLL Partners Fund VI, LP	1,277,841	(44,340)	0	15,026	(59,366)
King Street Capital, LP	868,642	184,679	13,072	0	171,607
LaSalle Property Fund	79,546,638	831,981	771,985	59,996	0
Linden Capital Partners II, LP	13,465,520	(1,125,434)	0	21,054	(1,146,488)
Mercato Partners Traverse IV, LP	22,940,696	3,217,372	2,312,742	702,506	202,124
Merit Energy Partners F-II, LP	1,538,759	11,847	9,983	1,864	0
MHR Institutional Partners IIA, LP	8,556,807	(735,642)	0	18,747	(754,389)
MHR Institutional Partners III, LP	13,574,043	37,063	0	37,063	0
MHR Institutional Partners IV, LP	65,468,279	3,170,880	654,867	237,668	2,278,345
Millennium USA LP	9,329,190	8,800,057	0	7,625,378	1,174,679
Millennium Technology Value Partners II	11,641,964	(1,277,440)	259,078	25,294	(1,561,812)
Oaktree Real Estate Income Fund, LP	50,894,452	680,354	411,472	268,882	0
OCM Opportunities Fund VIIb, LP	38,857	(10,522)	0	(15,089)	4,567
OCM Opportunities Fund VIIIb, LP	8,624,087	1,547,950	52,396	13,038	1,482,516
OCM Power Opportunities Fund III, LP	152,953	(66,008)	0	9,543	(75,551)
Partners Group Direct Equity IV A, LP	78,799,982	2,635,511	1,860,069	317,412	458,030
Portfolio Advisors Secondary Fund IV, LP	142,593,213	1,291,416	1,530,843	31,727	(271,154)
Silver Creek Special Opportunities Fund I, LP	2,717,654	24,628	0	24,628	0
Silver Creek Special Opportunities Fund II, LP	5,361,455	39,579	0	39,579	0
Standard Investment Research Hedged Equity Fund	172,703,442	6,041,396	3,364,563	201,715	2,475,118
Smart Markets Fund, LP	50,852,104	586,607	520,657	65,950	0
TA Realty Core Property Fund, LP	90,676,239	824,945	674,170	150,775	0
Thomas H. Lee Partners LP	40,829,155	2,432,268	1,499,999	1,101,846	(169,577)
Voleon Institutional Strategies Fund LP	68,098,594	4,350,873	1,254,352	438,534	2,657,987
Voleon Investors Fund LP	21,582,682	1,258,720	393,789	134,628	730,303
Total alternatives	3,872,451,268	117,151,491	37,024,247	38,655,496	41,471,748
Total fees	7,025,070,839	132,140,159	50,583,554	40,084,857	41,471,748

* *Fund pass through expenses are administrative expenses charged to the fund and paid by the limited partners (including MOSERS), in addition or in lieu of management fees and incentive fees. These expenses may include, but are not limited to, accounting, audit, legal, and custody expenses directly related to the administration of the underlying fund investments and pass through management fees and incentive fees.*

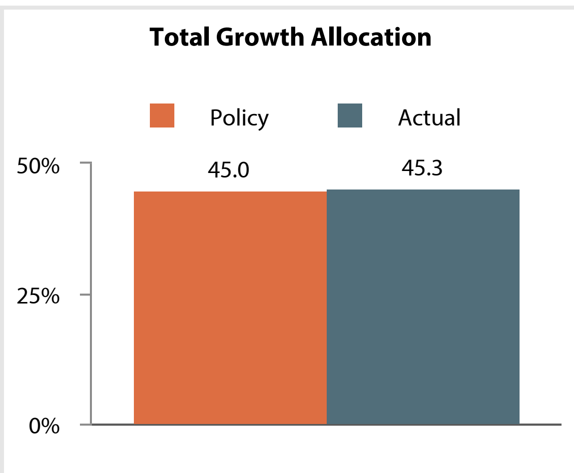
Asset Class Summary

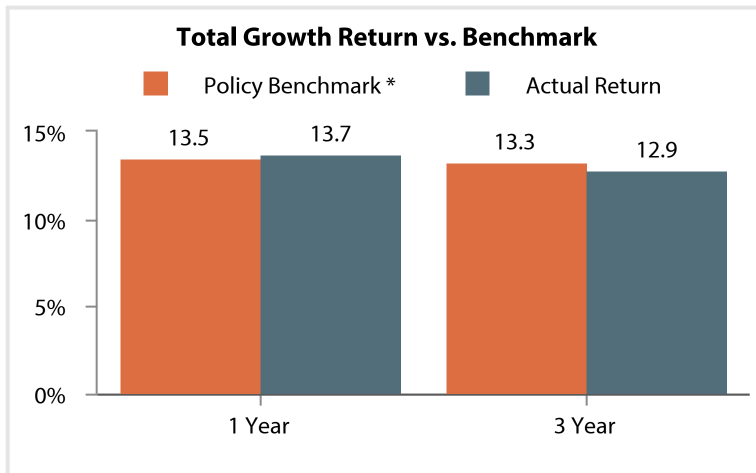
The portfolio consists of four broad investment allocations: growth, income, inflation hedge, and absolute return. Each of these allocations are made up of a number of different sub-asset classes. Two of the four allocations had positive performance during the fiscal year. The growth allocation return was 13.7%, and the income allocation returned (7.0)%. The inflation hedge allocation return was (5.6)% and the absolute return allocation returned 6.8%.

Growth Allocation

The growth allocation is designed to provide capital appreciation by accessing both an equity risk premium and a liquidity risk premium. In addition, it is expected that investments in this category would perform well in periods of rising economic growth. Investments in this allocation include U.S. and non-U.S. equity investments with varying characteristics related to market capitalization and investment style. Because of the non-U.S. nature of some of these investments, this allocation is subject to some foreign currency exposure. The growth allocation is made up of global public equities and global private equities.

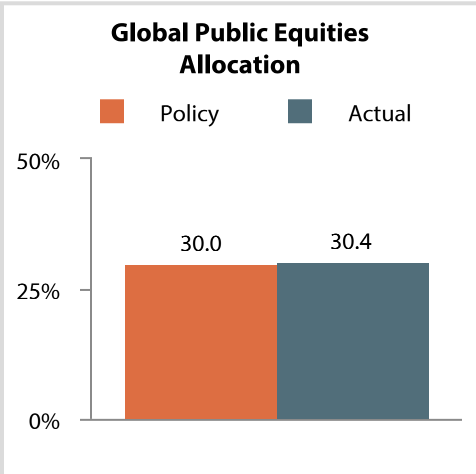
The market exposure of the growth allocation on June 30, 2023, was $3.95 billion, representing 45.3% of total market value of the portfolio. The bar chart below (left) illustrates the actual exposure compared to policy. For the fiscal year, the growth allocation returned 13.7% versus 13.5% for the policy benchmark. This outperformance was the result of manager implementation that outperformed the benchmark. The bar chart below (right) illustrates actual performance as compared to the policy benchmark.

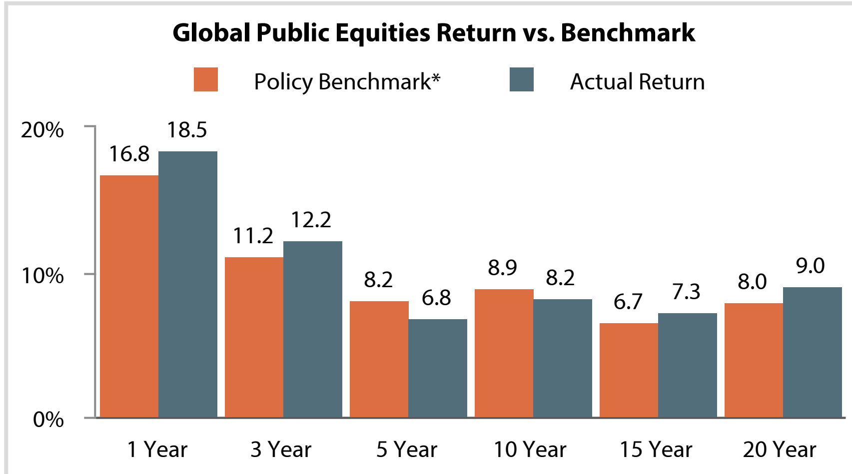




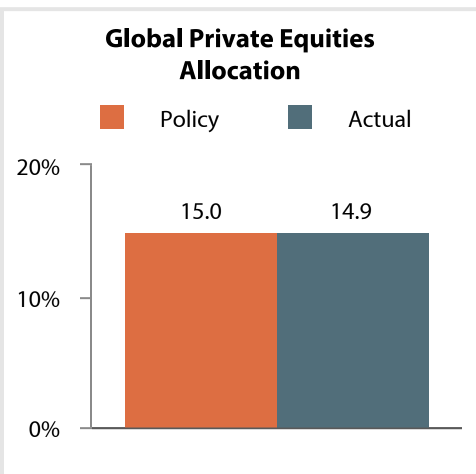
* *As of June 30, 2023, the total growth policy benchmark was comprised of 66.7% global public equities policy benchmark and 33.3% global private equities policy benchmark.*

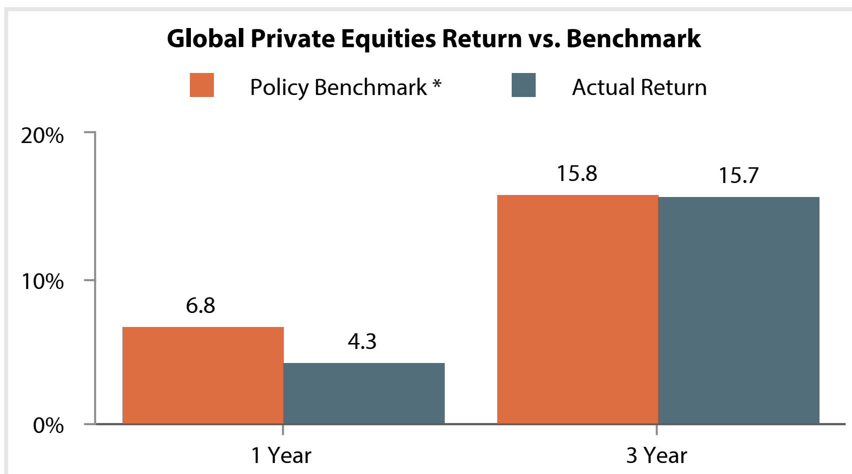
For the fiscal year, public equities returned 18.5% versus 16.8% for the policy benchmark. This outperformance was the result of manager implementation that outperformed the benchmark. Private equities, for the fiscal year, returned 4.3% compared to its policy benchmark return of 6.8%. This underperformance was the result of manager implementation that underperformed the benchmark.





* *As of June 30, 2023, the global public equities policy benchmark was MSCI All Country World Index (ACWI).*



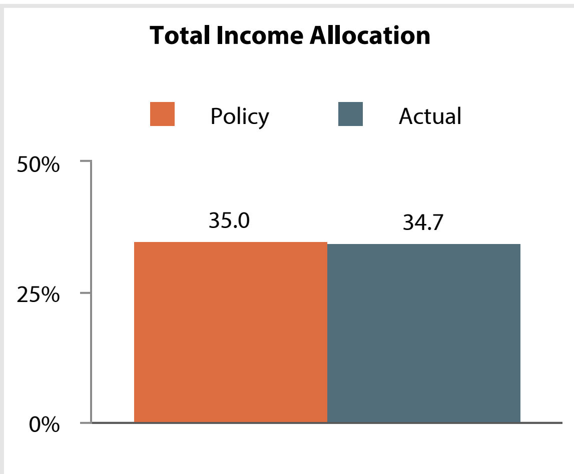


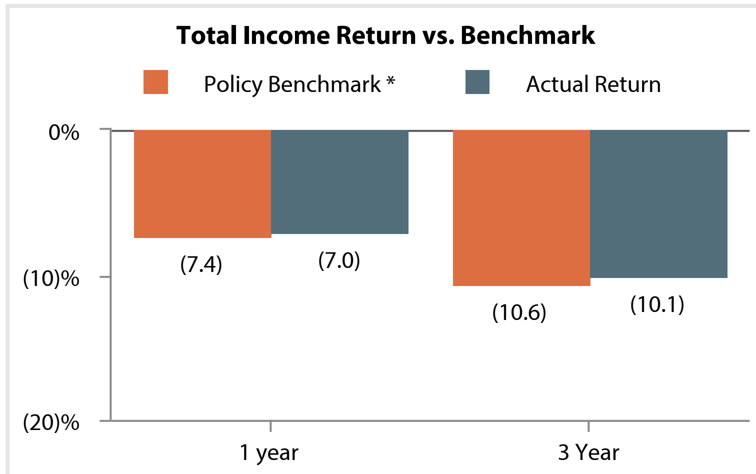
* *As of June 30, 2023, the global private equities policy benchmark was a blend of 29.0% MOSERS legacy private equity return/35.4% State Street Buyout Index (weighted by vintage year)/35.6% MSCI ACWI Index.*

Income Allocation

This allocation is designed to provide a source of current income and to reduce overall fund volatility. It is expected that investments in this asset class will perform well in periods of stable or falling economic growth and falling inflation. Investments in this asset class include U.S. bonds that have been issued, collateralized, or guaranteed by the U.S. Government, its agencies, or its instrumentalities. Core bonds may also include debt issued by corporations, or securitized debt. Because this asset class is invested in all U.S. bonds, there is currently not any foreign currency exposure as part of this allocation.

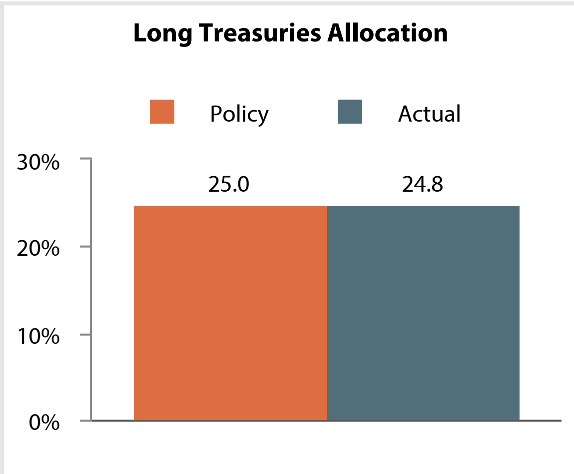
As of June 30, 2023, the market exposure of the income allocation was $3.02 billion, representing 34.7% of total market value of the portfolio. The bar chart below (left) illustrates the actual exposure compared to policy. For the fiscal year, the income allocation returned (7.0)% as compared to (7.4)% for the income allocation policy benchmark. The outperformance was mainly driven by core bonds that outperformed the policy benchmark by 1.1%. The bar chart below (right) illustrates actual performance as compared to the policy benchmark.

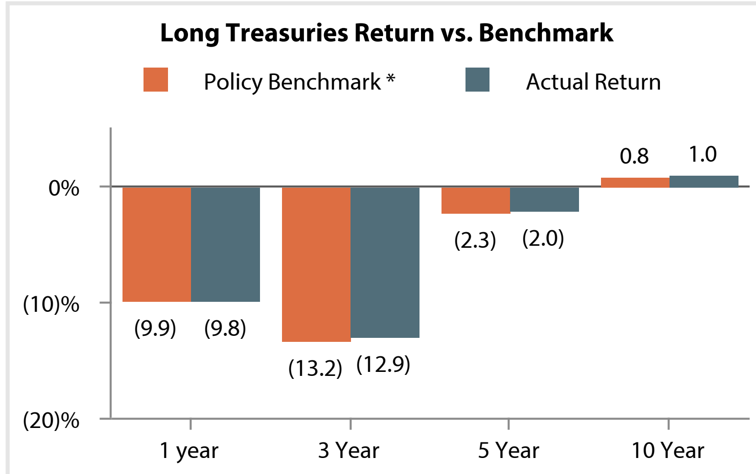




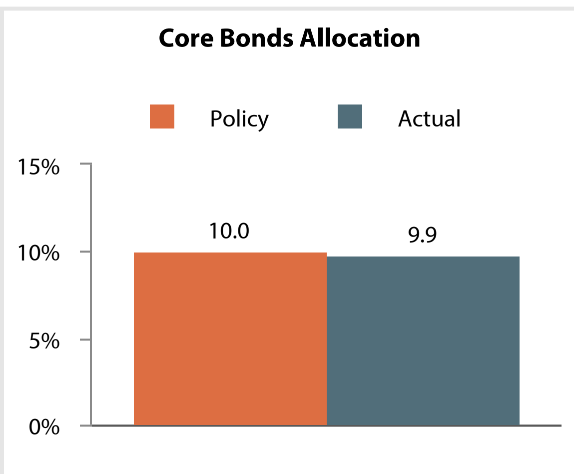
* *As of June 30, 2023, the total income policy benchmark was comprised of 71.4% long treasury policy benchmark and 28.6% core bonds policy benchmark.*

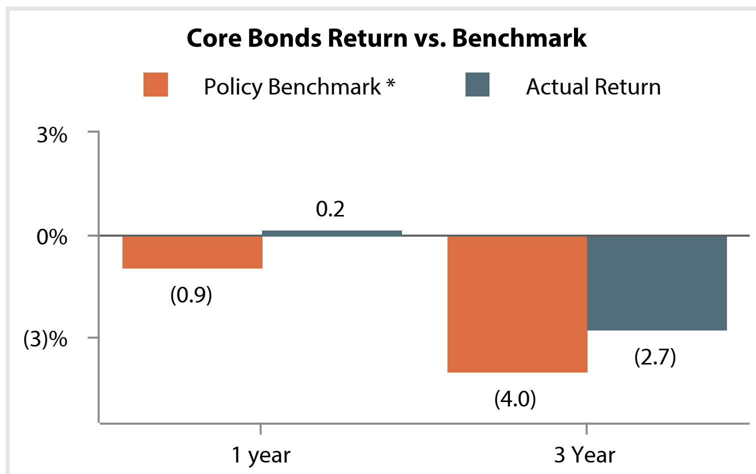
For the fiscal year, long treasuries returned (9.8)% versus (9.9)% for the policy benchmark. The exposure to long treasuries is gained passively with minimal tracking error. Core bonds, for the fiscal year, returned 0.2% compared to its policy benchmark return of (0.9)%. This outperformance was the result of manager implementation that outperformed the benchmark.





* *As of June 30, 2023, the long treasuries policy benchmark was Bloomberg U.S. Long Treasury Index.*



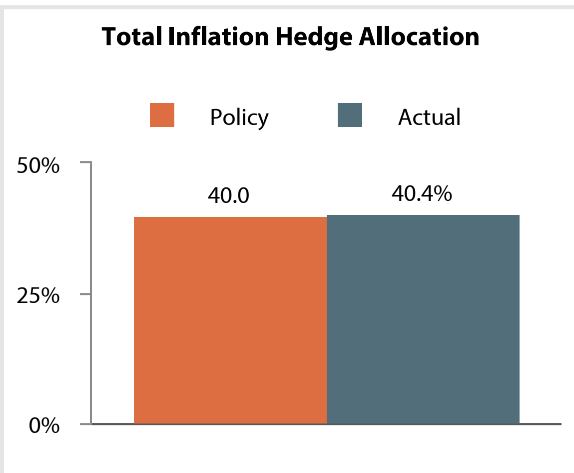


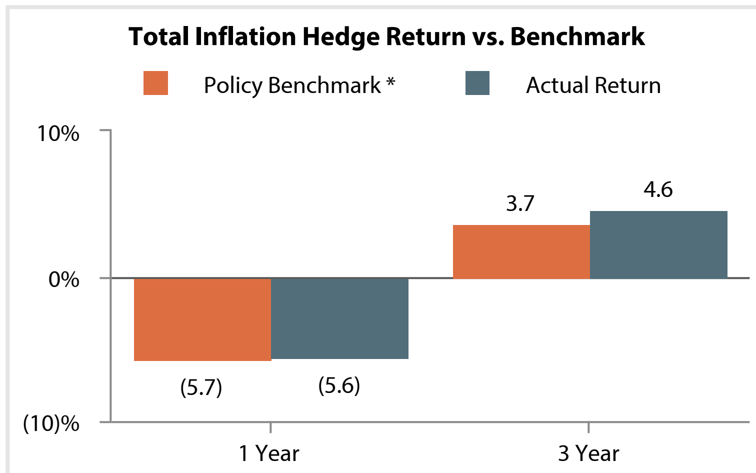
* *As of June 30, 2023, the core bonds strategy benchmark was Bloomberg U.S. Aggregate Bond Index.*

Inflation Hedge Allocation

It is expected that investments in this asset class will perform well during periods of rising inflation. Investments in this asset class include U.S. Government treasury inflation protected securities (TIPS), commodities, private real assets, and public real assets. TIPS are designed to provide a source of current income and protect against actual inflation. It is expected that investments in this asset class will perform well during periods of falling economic growth and rising inflation. Commodities are designed to provide protection from an unexpected rise in inflation. In addition, it is expected that investments in this category would perform well in periods of rising economic growth. Private real assets are designed to provide capital appreciation and income and provide access to a form of equity risk premium and liquidity risk premium. It is expected that investments in this category would perform well in periods of rising economic growth and rising inflation. Public real assets are designed to provide capital appreciation and income and provide access to a form of equity risk premium. In addition, it is expected that investments in this category would perform well in periods of rising economic growth and rising inflation. Because this asset class is invested primarily in U.S. denominated assets, there is not expected to be meaningful foreign currency exposure as part of this allocation.

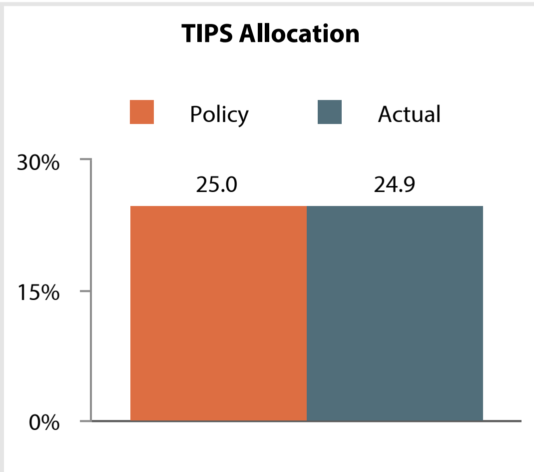
As of June 30, 2023, the market exposure of the inflation hedge allocation was $3.52 billion representing 40.4% of total market value of the portfolio. The bar chart below (left) illustrates the actual exposure compared to policy. For the fiscal year, the inflation hedge allocation returned (5.6)% versus (5.7)% for the policy benchmark. The outperformance was mainly driven by private real assets that outperformed the policy benchmark by 3%. The bar chart below (right) illustrates actual performance as compared to the policy benchmark.

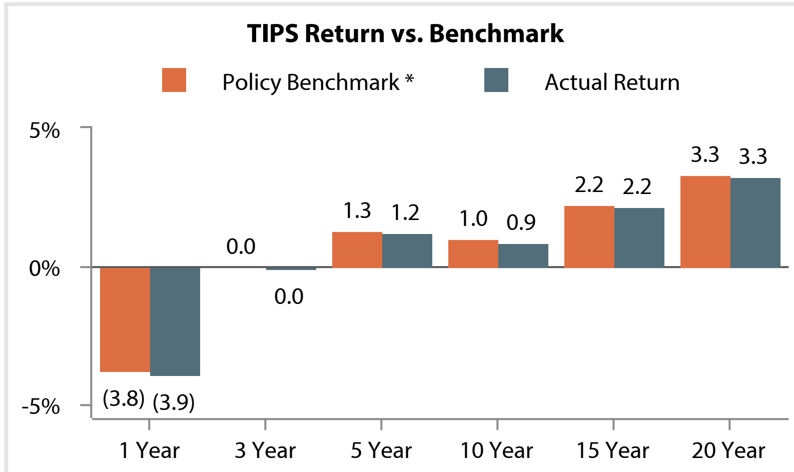




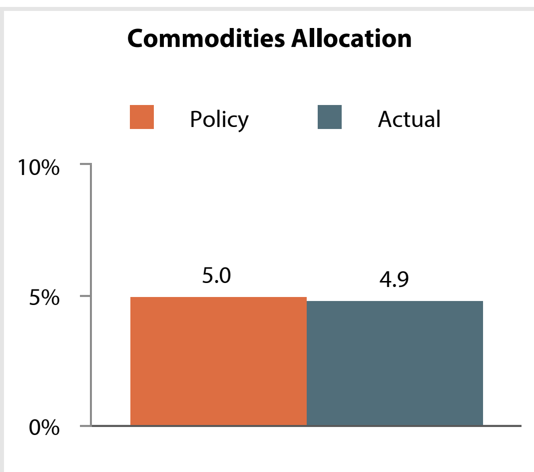
* *As of June 30, 2023, 12.5% commodities policy benchmark, 62.5% TIPS policy benchmark, 12.5% private real assets policy benchmark, and 12.5% public real assets policy benchmark.*

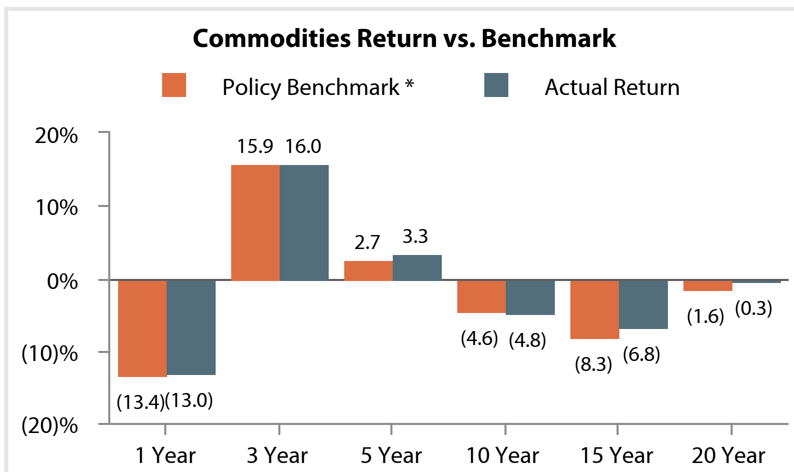
For the fiscal year, TIPS returned (3.9)% versus (3.8)% for the policy benchmark. There was no internal or external active management strategy utilized during the fiscal year; thus, providing a return that closely matched the benchmark. Commodities, for the fiscal year, returned (13.0)% compared to its policy benchmark return of (13.4)% providing a return similar to the benchmark. Public real assets returned (4.2)%, for the fiscal year, compared to its policy benchmark return of (4.3)%. There was no internal or external active management strategy utilized during the fiscal year; thus, providing a return that closely matched the benchmark. For the fiscal year, private real assets returned (7.7)% versus (10.7)% for its policy benchmark. This outperformance was the result of manager implementation that outperformed the benchmark.



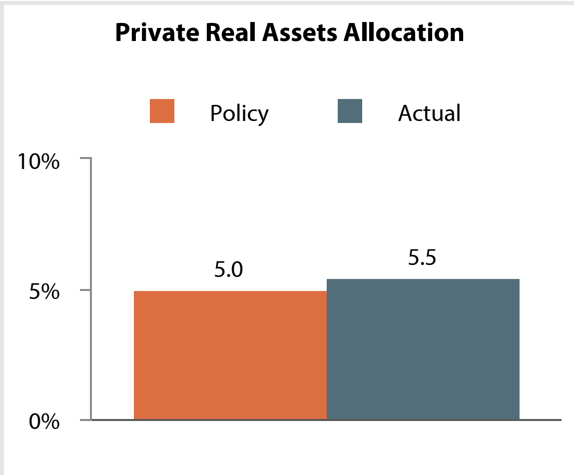


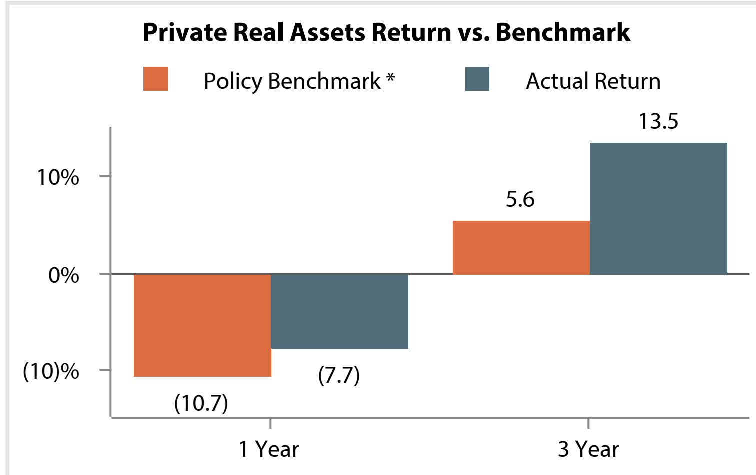
* *As of June 30, 2023, the TIPS policy benchmark was the Bloomberg U.S. Treasury Inflation Notes 1 - 10 yr Index.*



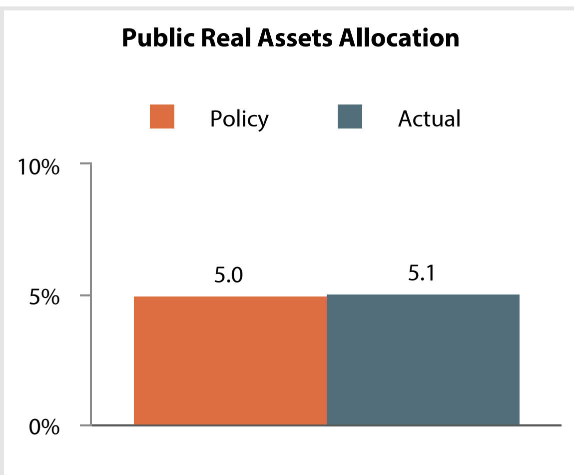


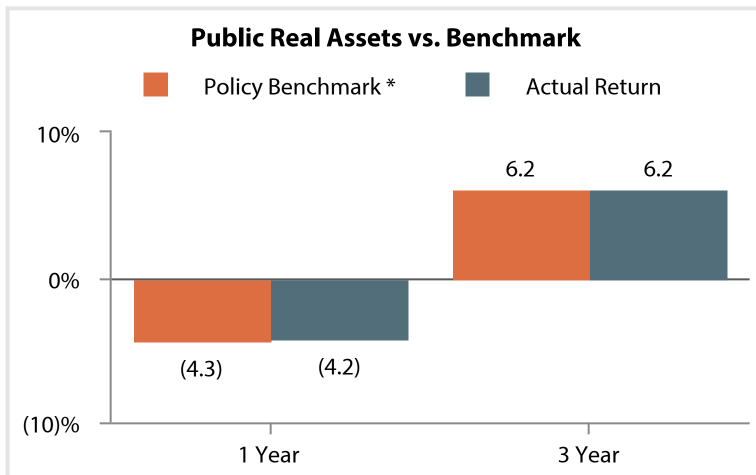
* *As of June 30, 2023, the commodities policy benchmark was the Bloomberg Commodity Index.*





* *As of June 30, 2023, the private real assets policy benchmark was NCREIF Fund Index - Open End Diversified Core Equity (ODCE).*





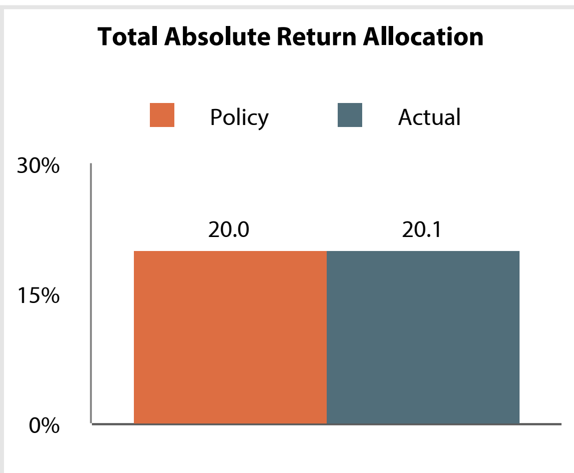
* *As of June 30, 2023, the public real assets policy benchmark was the FTSE NAREIT ALL REITS Index.*

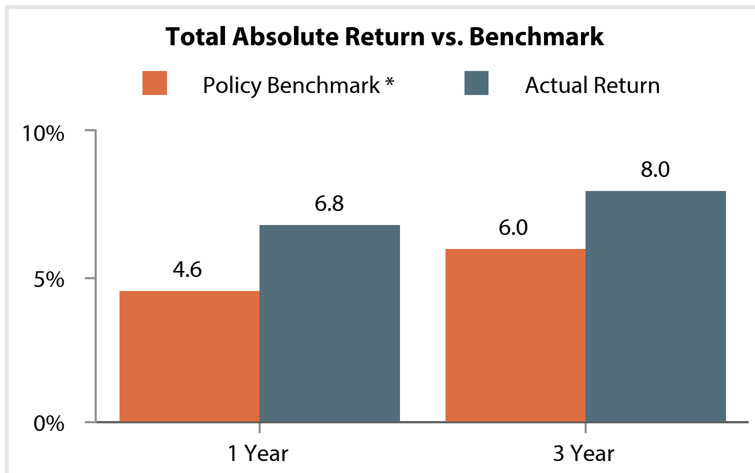
Absolute Return Allocation

This asset class represents alternative betas, hedge funds, and private credit. Alternative betas and hedge funds are designed to provide a source of stable returns and low correlations with traditional asset strategies. In addition, it is expected that investments in this category would perform well across multiple economic environments. Private credit is designed to provide a source of current income and provide access to a form of credit risk premium. It is expected that investments in this category would perform well in periods of rising economic growth.

As a result of the multitude of strategies being deployed, it is expected that this asset class will provide meaningful diversification to the portfolio. While the sensitivities to economics will be dependent on positioning at the time, it is expected that these betas will have their best returns in rising growth environments and their worst returns in falling growth environments. Because of the non-U.S. nature of some of these investments, this allocation is subject to some foreign currency exposure.

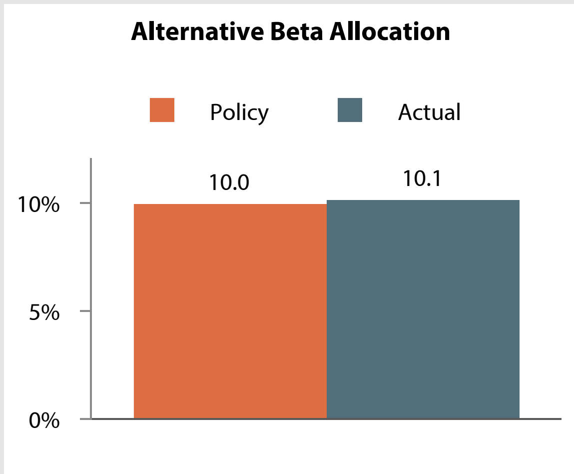
As of June 30, 2023, the market exposure of the absolute return allocation was $1.75 billion, representing 20.1% of total market value of the portfolio. The bar chart below (left) illustrates the actual exposure compared to policy. The absolute return allocation returned 6.8% for the fiscal year versus 4.6% for the policy benchmark. The outperformance was mainly driven by hedge funds and alternative betas that outperformed the policy benchmarks by 2.6% and 3.1%, respectively. The bar chart below (right) illustrates actual performance as compared to the policy benchmark.

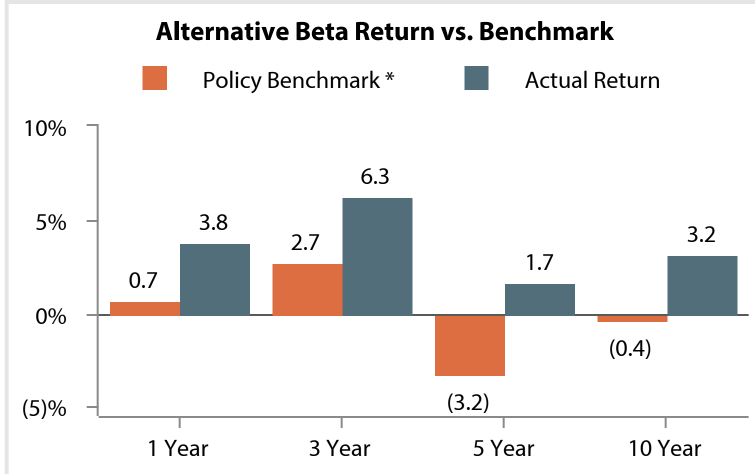




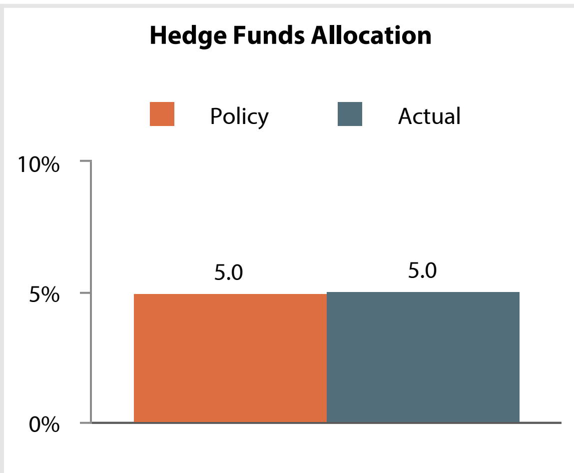
* *As of June 30, 2023, the absolute return policy benchmark was comprised of 25.0% direct hedge funds policy benchmark, 50.0% alternative beta - beta policy benchmark, and 25.0% private credit policy benchmark.*

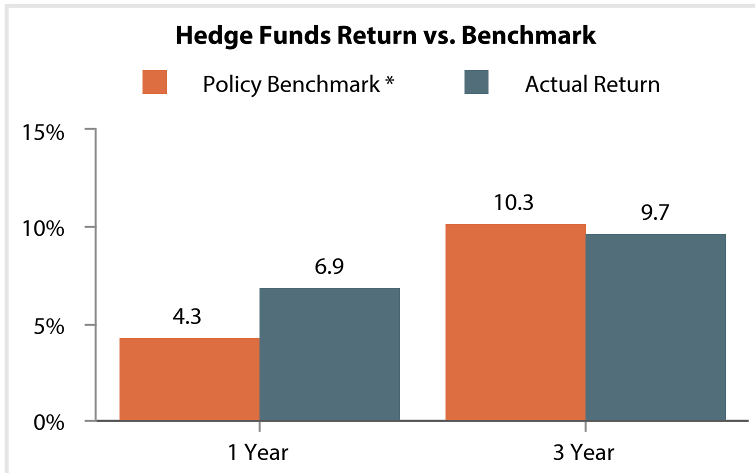
For the fiscal year, alternative betas returned 3.8% versus 0.7% for the policy benchmark. The outperformance was primarily related to a passive trend strategy implementation and manager implementation. Hedge funds, for the fiscal year, returned 6.9% compared to its policy benchmark return of 4.3%. The primary driver of the outperformance was manager implementation within the hedge fund class. For the fiscal year, private credit returned 12.9% versus 12.7% for its policy benchmark. This outperformance was due to manager implementation that outperformed the benchmark.



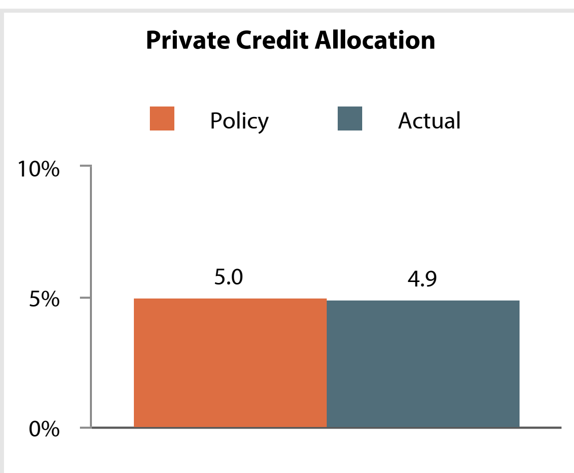


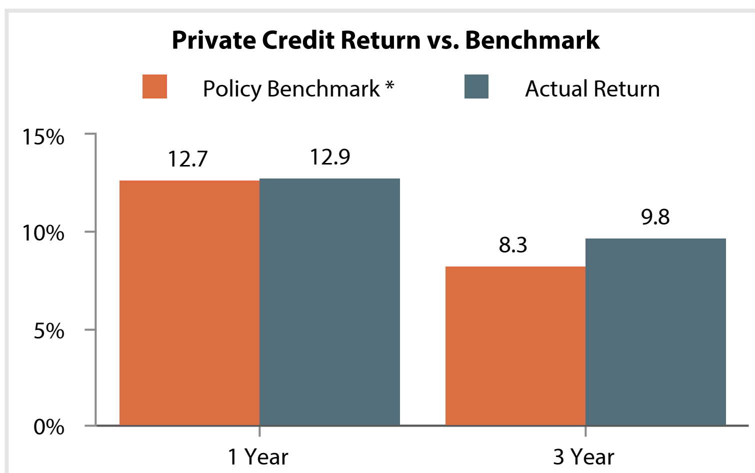
* *As of June 30, 2023, the alternative beta - beta policy benchmark was the HFRX Macro/CTA Index.*





* *As of June 30, 2023, the hedge funds policy benchmark was the HFRI Fund of Funds: Conservative Index + 0.70%.*





* *As of June 30, 2023, the private credit policy benchmark was the Morningstar LSTA U.S. Leveraged Loan + 2%.*

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