Investment Section

Chief Investment Officer's Report

Missouri State Employees' Retirement System
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MOSERS®
WE ARE HERE FOR YOUR BENEFIT.

October 16, 2017

Dear Members:

I start this letter by thanking the MOSERS Board of Trustees and executive director, John Watson, for allowing me the honor of leading the investment effort at MOSERS.

MOSERS' fund returned 3.5% this fiscal year, which is 1.9% more than expected from passive investing. The extra return was made from decisions MOSERS' investment staff implemented through the year. We achieved this excess return while also cutting about $7 million in management fees (about 12% savings). Finishing with higher-than-expected returns and reducing fees are the two things staff has the most control over and, by those measurements, this year was a success.

However, our absolute return is lower than what most other pension funds experienced. The reason for the performance difference is because we do not own what they own. By way of analogy, investment portfolios are like recipes. Think of the recipe for a chocolate chip cookie. Now, think of the recipe for a brownie. The two recipes contain many of the same ingredients, but the outcomes are distinct. In 2012, MOSERS chose a cookie recipe for portfolio returns, but all other pension funds chose a brownie recipe. Therefore, since the recipes are different, it follows that MOSERS' outcomes will be different.

So far as I can tell, having foresight about which recipe will be most rewarded in any given year is impossible. This year stocks, the most common ingredient in the other pension recipes, were the highest returning asset. As a rule of thumb, other funds have 85% of their outcome linked to stocks. MOSERS has only 40% of our outcome linked to stocks. When stocks are up 18%, having 85% of your outcome linked to equities is a good thing. However, equities do not always provide these returns. In fact, sometimes they lose money. In losing environments the preference will be for fewer stocks.

Why is our recipe different? In 2012, when the recipe was changed, MOSERS had one of the highest return hurdles in the country. Speaking technically, our "real return assumption"— that is, what we assumed our return would be after adjusting for inflation—was tied for the highest in the U.S. at 5.5%. At that time, using a recipe similar to other public pension funds would not have achieved the high return. So, in order to clear the hurdle, the portfolio had to shift to something that was different. That's why we chose a different recipe in 2012.

Now, let's talk about where MOSERS is going. Over the last two years, the MOSERS Board of Trustees has lowered the real rate of return assumption. For fiscal year 2017, the board lowered the rate from 5.5% to 5.15% and for fiscal year 2018 the board adopted a rate of 5%. It is important for MOSERS' return assumptions to be economically viable, because it will increase the likelihood of MOSERS achieving that return. There is currently a plan to continue reducing the return assumption in the future and this will increase the economic viability of MOSERS' assumptions.

In addition, lowering the return assumption reduces the need for our portfolio to be different from the pension plan universe. Accordingly, we will begin discussions to consider a deliberate transition to a portfolio with a more comfortable risk profile.

However, as we move down this path, we have to be careful to make these moves in deliberate installments which can be tolerated by all MOSERS' stakeholders. Our current situation accrued over a period of many years, so no single year will resolve the challenge. Ignoring this challenge is no longer acceptable, but we also have to acknowledge that all solutions require time. The great thing about defined benefit plans is this—we have some time. As the old saying goes: "Rome wasn't built in a day." Well, neither are solutions to pension plan funding. I am convinced that working together, MOSERS' Board of Trustees and staff members will develop a plan that answers these challenges.

Sincerely,

Seth Kelly
Chief Investment Officer

Investment Policy Summary

Guiding Principles

Critical to the financial security of present and future benefit recipients is the effectiveness and efficiency of the system's asset management program. The MOSERS Board of Trustees, 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, has adopted the following fundamental principles to guide all investment-related decisions:

- Preserve the long-term corpus of the fund.
- Maximize total return within prudent risk parameters.
- Act in the exclusive interest of the system's members.

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.

Investment Objective

In keeping with the three guiding principles, the board has adopted the following broad investment objectives:

- Develop a real return objective (RRO) that will keep contribution rates reasonably level over long periods of time, absent changes in actuarial assumptions.
- Establish an asset allocation policy that is expected to meet the RRO over long periods of time, while minimizing the impact of the fund's volatility on the contribution rate.
- Monitor costs associated with the efficient implementation of the asset allocation through the use of internal and external resources.

Investment Beliefs

MOSERS has arrived at investment beliefs, which are the foundation for implementation of the investment portfolio to achieve the institution's objectives. These beliefs guide every decision made within MOSERS' portfolio. They are the fundamental concepts underlying the MOSERS investment program. These beliefs are:

- **Portfolio construction should focus first on risk; it is the allocation of risk that drives portfolio returns.** While investment returns receive a lot of public attention, understanding risk across asset classes improves the consistency of returns for a given level of risk and thus provides more stability in the contribution rate for the employer. Returns are the end product, where risks are the ingredients.
- **Diversification is critical because the future is unknown.** Reliable diversification requires a fundamental understanding of the economic drivers of risk and return. MOSERS' policy portfolio has been built upon the premise that very little is known about what the future holds.
- **Every investment should be examined in the context of its potential return from beta (market return) and alpha (value added return); while separation is not always possible, every effort should be made to distinguish the two distinct return components.** Beta is the return which is expected to be earned by investing passively within a specific asset class or compensated risk premium. Exposure to beta can be purchased cheaply, and over long periods of time, the beta return should be positive and coincide with the risk associated with a given asset class. In contrast, alpha is the return generated through a manager's ability to select particular investments that perform better than the asset class as a whole. Alpha is a zero-sum game.
- **Regardless of the source of the return, it is important to construct the portfolio based on a conscious decision to include a certain amount of beta exposure in the portfolio and a certain amount of alpha exposure.** By consciously selecting this balance within the portfolio, staff is better able to manage the risks of the portfolio which increases the chance the RRO is achieved.

- **Flexibility to opportunistically alter the portfolio when markets are driven to extremes as a result of short-term economic cycles is an important portfolio management tool.** As a result of the cyclical nature of the economy, asset classes or investment strategies may be more or less attractive relative to others in given time frames, thus marginal flexibility in the allocation policy provides the system with the opportunity to capitalize on this within prudent risk constraints. Under circumstances where the valuations of a particular asset class are compelling, it may make sense to modify the portfolio's allocation at the margins in order to capitalize on attractively valued opportunities without exposing the fund to additional risk.

Roles and Responsibilities

Board of Trustees

The board of trustees 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, taking into consideration the recommendations of staff and the external asset consultants, is charged with the duties of establishing and maintaining broad policies and objectives for the investment program.

Executive Director

The executive director is appointed by and serves at the pleasure of the board. The board has given the executive director broad authority for planning, organizing, and administering the operations and investments of the system under broad policy guidance from the board. Specifically with regard to investments, the executive director is broadly responsible for the oversight of the investment program. The executive director must ensure that system assets are invested in accordance with the board's policies and that internal controls are in place to safeguard system assets. The executive director must also certify that all manager hiring and termination decisions were made in accordance with the board's governance policy. In addition, the executive director certifies strategic allocation decisions were made in accordance with the governance policy.

Chief Investment Officer (CIO) and Internal Staff

The CIO serves at the pleasure of the executive director, yet has a direct line of communication with the board on investment-related issues. The CIO has primary responsibility for the overall direction of the investment program. The CIO works with the external asset consultants and the 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 external general asset consultant. The CIO is also responsible for making strategic allocation decisions with the approval of the external general asset consultant. Other responsibilities of the CIO include monitoring the investment of system assets, overseeing external money managers and the internally managed portfolios, and keeping the board apprised of situations which merit their attention. The internal investment staff is accountable to the CIO.

External Asset Consultants

Summit Strategies Group of St. Louis, Missouri serves as the system's external general asset consultant at the pleasure of the board. The primary duties of the external general asset consultant are to:

- Advise the board on policies related to the investment program.
- Provide a third-party perspective and level of oversight to the system's investment program.

The external general asset consultant must approve all manager hiring and termination decisions and strategic allocation decisions made by the CIO. The external general asset consultant provides advice and input to the CIO and internal investment staff on investment-related issues and money manager searches.

Blackstone Alternative Asset Management serves as the system's external hedge fund consultant at the pleasure of the board. The primary duties of the external hedge fund consultant are to:

- Advise the board on policies related to the hedge fund program.
- Provide a third-party perspective and level of oversight to the system's hedge fund investment program.

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

The external hedge fund consultant must approve all hedge fund manager hiring and termination decisions. The external hedge fund consultant provides advice and input to the CIO and internal investment staff on hedge fund program issues and manager searches.

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 the investment operations. It is the chief auditor's objective to promote adequate and effective internal controls at a reasonable cost.

Master Custodian

Bank of New York 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 record, providing performance reports, and serving as an additional layer of risk control in the safekeeping of system assets.

Asset Allocation

Determining the system's asset allocation is regarded as one of the most important decisions in the investment management process. The board, with advice from staff and the external general asset consultant, has developed a risk-weighted policy allocation that is designed to achieve the long-term required return objectives of the system, given certain risk constraints. The current allocation reflects the need for a diversified portfolio, which will perform well in a variety of economic conditions and will help reduce the portfolio's overall volatility. In determining the optimum mix of assets, the board considers five factors:

- 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, with the approval of the external general asset consultants and certification of the executive director, 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 in July 2016.

Asset Allocation

Beta-Balanced Portfolio	Risk Allocation Policy	Risk Allocation Ranges[1]	Benchmark Index (weight)[2]
Global opportunistic equity	36%	25% - 47%	MSCI ACWI + .75% - (38%)[3]
Nominal bonds	24%	17% - 31%	Barclays Long Treasury - (44%)
Inflation-linked bonds	8%	5% - 10%	Barclays 1-10 TIPS - (39%)
Commodities	19%	13% - 25%	S&P GSCI/BCOM - (20%)[4]
Alternative beta	13%	9% - 17%	AQR DELTA - (31%)[5]

[1] The board has granted the CIO the authority to alter the equal risk-weighted allocation policy. This authority exists within risk ranges as depicted in the table above. These risk ranges, like the policy allocation, are driven by the long-term volatility and correlation expectations for the five betas that make up the beta-balanced portfolio. The CIO will make these strategic allocation decisions away from the policy benchmark subject to consultation and agreement from the chief general asset consultant (CGAC).

[2] Benchmarks are net of MOSERS' actual leveraging costs on borrowed assets with the exception of the alternative beta benchmark which is net of management fees.

[3] Morgan Stanley Capital International All Country World Index (net dividends). Legacy real estate and timber assets are benchmarked to the Dow Jones U.S. REIT Index and NCREIF Timber, respectively.

[4] S&P Goldman Sachs Commodity Index/Bloomberg Commodity Index. The board approved a three-year transition from S&P GSCI to BCOM beginning August 1, 2016.

[5] A diversified risk-balanced portfolio of liquid hedge fund risk premia managed by AQR Capital net of management fees.

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 exchange traded futures transactions to maintain the total fund's allocation at the broad policy level. Month-end reviews are conducted 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 reexamined in more detail.
- A governance policy, which incorporates investment limitations, 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 returns net of expenses equaling the RRO (5.15% in FY17) plus inflation remains the primary performance objective for the total fund.

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 and strategy 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 strategy benchmarks represent decisions made by the CIO to strategically deviate from the policy asset allocation for each sub-asset class. The returns of the strategy benchmarks are determined based upon the actual weight of the asset class multiplied by the appropriate benchmark.

The policy and strategy 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 value added through board decisions. 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.

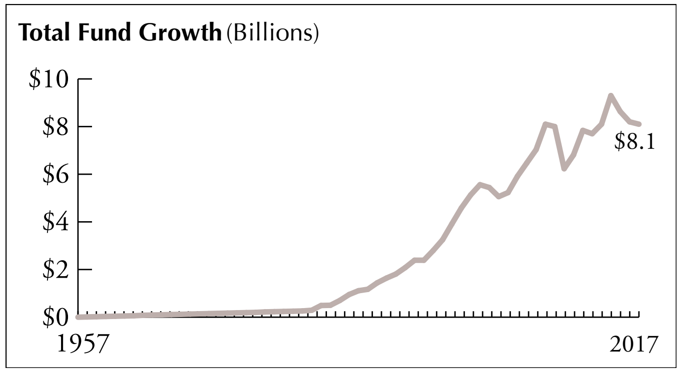
Strategy decisions are made by the CIO, with the approval of the external general asset consultant and the review of the executive director, to deviate from the policy benchmark weight. The difference between the strategy benchmark return and the policy benchmark return captures the value added by the CIO through strategic decisions to overweight or underweight asset allocations relative to the board's policy allocation decisions. A strategy benchmark return greater than the policy benchmark return reflects value added through the sub-asset class allocation decisions. A strategy benchmark return less than the policy benchmark return reflects losses to the fund's performance based upon strategy decisions. Strategy decisions should be measured over all periods of time with majority weight placed on outcomes that have occurred over a market cycle.

Implementation decisions are money manager selection choices made by the CIO with the approval of the appropriate external consultant and the certification of the executive director that the decision was made in accordance with the board's adopted governance policy. The value added through these decisions is measured by the difference between the actual portfolio return and the strategy benchmark return. This difference captures the value added through these external manager selection decisions. An actual portfolio return greater than the strategy benchmark return reflects value added through these external manager selection decisions. An actual portfolio return less than the strategy benchmark return reflects losses to the fund's performance based upon implementation decisions. Implementation 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, 2017, the MOSERS investment portfolio had a fair value of $8.1 billion. The graph to the right illustrates the growth of MOSERS' portfolio since the system's inception.



Investment Performance

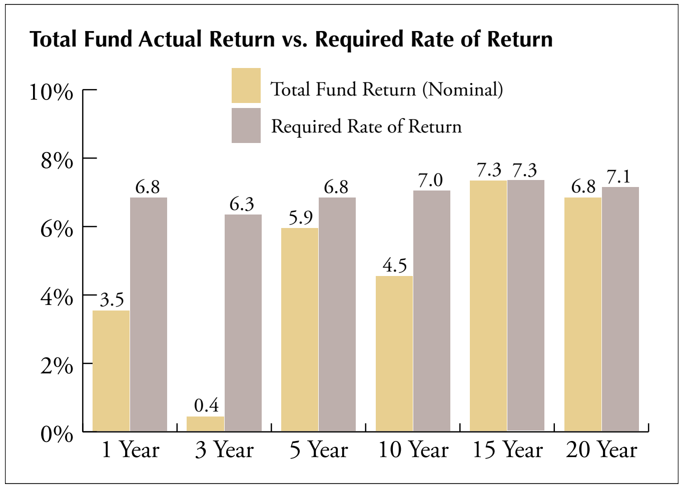
MOSERS' investments generated a time-weighted return of 3.5%, net of fees, for FY17. The total fund return exceeded the 1-year policy benchmark of 1.6%. This additional 1.9% investment return produced $152 million over what would have been earned if the fund had been invested passively in the policy 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 FY17 is equal to the RRO of 5.15% plus inflation. The best known measure of inflation is the Consumer Price Index (CPI).[1]

Given the randomness 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.

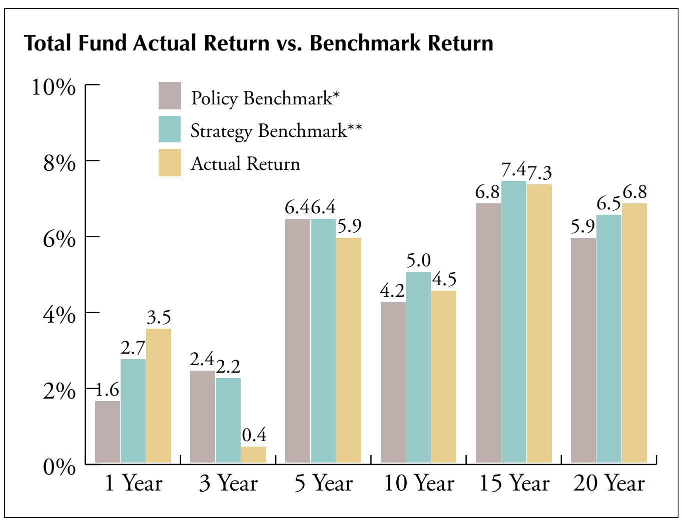
As indicated in the center bar chart, MOSERS' investment returns trailed the required rate of return by 0.3% over the 20-year period ended June 30, 2017.[2]



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 and the strategy benchmark. Returns for the total fund versus these benchmarks are displayed in the bar chart to the right.

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.



* As of June 30, 2017, the total fund policy benchmark was comprised of the following components: 38% MSCI ACWI Net +.75%, 44% Barclays Long Treasuries, 20% S&P GSCI/BCOM, 39% Barclays U.S. TIPS 1-10 YR, and 31% AQR Delta. All policy return components are adjusted for financing cost associated with the beta-balanced program. This program did not begin until September 2012.

** As of June 30, 2017, the strategy benchmark was comprised of the following components: 39.3% total opportunistic global equities strategy, 38.5% total nominal bonds strategy, 16.2% total commodities strategy, 37.6% total inflation-linked bonds strategy, and 29.2% total alternative beta strategy. All strategy return components are adjusted for financing cost associated with the beta-balanced program. This program did not begin until September 2012.

[1] CPI Source: United States Department of Labor, Bureau of Labor Statistics (not seasonally adjusted).

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

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-, 10-, 15-, and 20-year actual performance over performed its policy benchmark by 1.9%, 0.3%, 0.5% and 0.9% with the actual 3- and 5-year returns trailing the policy benchmarks by 2.0% and 0.5%, respectively.

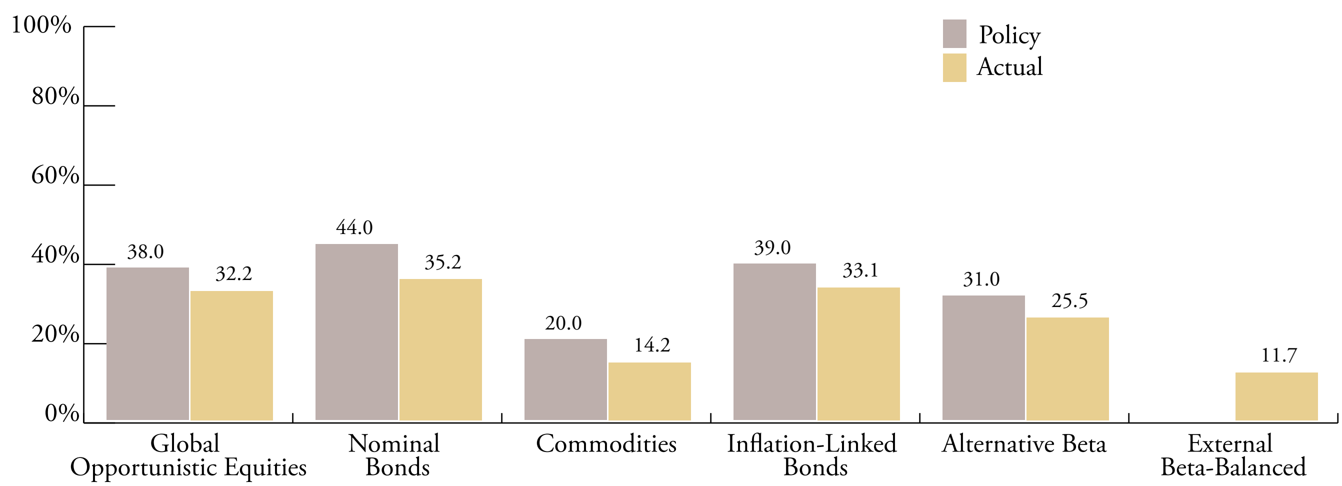
The strategy benchmark is more narrowly defined and focuses on sub-asset class allocation decisions made by the CIO. Comparison of the strategy benchmark to the policy benchmark reflects the component of the value added or detracted which can be attributed to the strategic sub-class allocation decisions made by the CIO. Value is added when the strategy benchmark return exceeds the policy benchmark return. Comparison of the strategy benchmark to the total return reflects the component of the value added which can be attributed to the manager implementation (manager hiring and termination) decisions made by the CIO and approved by the external asset consultant. Value is added when the total fund return exceeds the strategy benchmark return.

Total Fund Policy Allocation Overview

As of June 30, 2017, the board's broad policy allocation mix was 38% opportunistic global equities, 44% nominal bonds, 20% commodities, 39% inflation-linked bonds, and 31% alternative beta. The policy target, as of June 30, 2017, 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. This has allowed MOSERS to capitalize on investment opportunities at the margin by overweighting asset classes that are viewed as "cheap" relative to their historical norm and underweighting asset classes that are "expensive" relative to their historical norm.

Total Fund Allocation | Policy vs. Actual (As a Percentage of the Total Fund)



The asset allocation is built upon the belief that diversification is critical. The tables below reflect the asset classes and their correlation to each other and the statistical performance data, net of fees, of the total fund, as of June 30, 2017.

Total Fund - Correlation Table - 5 Years

	Opportunistic Global Equities	Nominal Bonds	Commodities	Inflation-Linked Bonds	Alternative Beta
Opportunistic global equities	1.00				
Nominal bonds	(0.17)	1.00			
Commodities	0.44	(0.34)	1.00		
Inflation-linked bonds	0.25	0.64	0.14	1.00	
Alternative beta	0.39	0.15	(0.18)	0.21	1.00

Total Fund - Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year	10 Year	15 Year	20 Year
Annualized return	3.5%	0.4%	5.9%	4.5%	7.3%	6.8%
Annualized standard deviation	4.4%	6.4%	6.3%	8.8%	8.4%	9.3%
Sharpe ratio	0.69	0.02	0.91	0.45	0.72	0.51
Excess return*	1.9%	(2.0)%	(0.6)%	0.2%	0.6%	0.9%
Beta*	0.76	0.87	0.91	0.74	0.79	0.83
Annualized alpha*	2.2%	(1.7)%	0.0%	1.2%	1.9%	1.7%
Correlation*	0.98	0.93	0.94	0.95	0.95	0.96
Value added in dollars**	$152M	$(552)M	$(215)M	$352M	$975M	$1.7B

* *As compared to the total fund policy benchmark.*
** *MOSERS' earnings above what would have been earned if assets had been invested passively.*

Schedule of Investment Portfolios by Asset Class | As of June 30, 2017

	Fair Value	Percentage of Investments at Fair Value	Market Exposure	Percentage of Investments at Market Exposure
Internal beta-balanced				
Global opportunistic equities	$2,717,429,664	33.7%	$ 2,601,563,280	32.2%
Nominal bonds	747,798,836	9.3	2,840,437,911	35.2
Commodities	313,169,917	3.9	1,144,649,079	14.2
Inflation-linked bonds	912,475,569	11.3	2,673,386,121	33.1
Alternative beta	2,170,513,175	26.9	2,060,111,457	25.5
Total internal beta-balanced	6,861,387,161	85.1	11,320,147,848	140.2
External beta-balanced	943,582,998	11.7	943,582,998	11.7
Residual accounts from old portfolio	3,792,791	0.0	3,792,791	0.0
Cash reserve	261,705,569	3.2	0	0.0
Grand total	$8,070,468,519	100.0%	$12,267,523,637	151.9%

Reconciliation to *Statements of Fiduciary Net Position*	
Total portfolio value	$ 8,070,468,519
Reverse repurchase agreements	3,373,773,555
Short-term investment fund (STIF)	(2,418,765,451)
Uninvested cash	722,484
Interest and dividends receivable	(5,469,068)
Variation margin	(12,184,564)
Investment sales	(10,435,252)
Investment purchases payable	10,165,707
Fees payable	10,314,862
Investments per *Statements of Fiduciary Net Position*	$ 9,018,590,792

Schedule of Investment Advisors

Investment Advisors Name	Style	Portfolio Fair Value
Actis Emerging Markets	Opportunistic global equities – emerging markets	$ 38,400,002
Alinda Capital Partners	Opportunistic global equities – infrastructure	21,005,641
AQR Capital Management	Alternative beta – multi-strategy	408,424,347
AQR Capital Management	External beta balanced – risk parity	405,634,864
Axiom Asia Private Capital Associates	Opportunistic global equities – emerging markets	85,825,308
Axxon Management	Opportunistic global equities – emerging markets	25,657,177
Bayview Asset Management	Opportunistic global equities – opportunistic mortgages	22,302,981
Blackstone Alternative Asset Management	Alternative beta – fund-of-funds	240,743,966
Blackstone Real Estate Partners	Opportunistic global equities – active real estate	117,182,318
Blakeney Management	Opportunistic global equities – emerging markets	51,978,370
Bridgewater Associates	Alternative beta – global macro	100,543,340
Bridgewater Associates	External beta balanced – risk parity	461,643,476
Campbell Group	Opportunistic global equities – timberland	1,005,329
CarVal Investors	Opportunistic global equities – distressed real estate debt	14,400,000
Catalyst Capital Group	Opportunistic global equities – Canadian distressed debt	99,323,485
Catterton Partners	Opportunistic global equities – corporate buyout	2,731,889
Cornwall Capital	Alternative beta – multi-strategy	62,747,524
Davidson Kempner Capital Management	Alternative beta – event driven	28,676,279
Development Partners International	Opportunistic global equities – emerging markets	43,070,044
DRI Capital	Opportunistic global equities – intellectual property	14,818,718
EIG Energy Partners	Opportunistic global equities – energy – diversified	15,758,412
EIG Energy Partners	Opportunistic global equities – energy – mezzanine	66,820,509
Elliott Management Corporation	Alternative beta – multi-strategy	190,191,000
Farallon Capital Partners	Alternative beta – multi-strategy	2,500,000
Gaoling Fund	Opportunistic global equities – long/short – equity	125,614,684
Glenview Capital Management	Opportunistic global equities – long/short – equity	39,781,005
Glenview Capital Management Sidecar	Opportunistic global equities – active equity	59,227,608
Global Forest Partners	Opportunistic global equities – timberland	141,717,994
Harvest Fund Advisors	Opportunistic global equities – active MLP	71,143,365
HBK Capital Management	Alternative beta – merger arbitrage	115,091,118
JLL Partners	Opportunistic global equities – corporate buyout	65,433,054
King Street Capital Management	Alternative beta – credit driven	4,299,013
Linden Capital Partners	Opportunistic global equities – corporate buyout	49,277,379
Mast Capital Management	Alternative beta – credit driven	21,196,607
Merit Energy Partners	Alternative beta – energy – oil & gas	5,154,997
MHR Fund Management	Alternative beta – distressed debt	61,122,948
Millennium Technology Value Partners	Opportunistic global equities – direct secondaries	20,101,888
NISA Investment Advisors	Nominal bonds – passive long term U.S. treasuries	46,079,205
NISA Investment Advisors	Commodities – passive commodities	(6,642,698)
NISA Investment Advisors	Alternative beta – strategy	176,398,253
NISA Investment Advisors	Inflation-linked bonds – passive TIPS	268,528,249
Oaktree Capital Management	Opportunistic global equities – corporate buyout	13,357,793
Oaktree Capital Management	Opportunistic global equities – distressed debt	22,815,861
Pharo Management	Alternative beta – global macro	122,709,138

Schedule of Investment Advisors continued on page 77

Schedule of Investment Advisors continued from page 76

Investment Advisors Name	Style	Portfolio Fair Value
Resource Management Service – Wildwood Timberlands	Opportunistic global equities – timberland	73,420,187
Silchester International Investors	Opportunistic global equities – active international equity	797,676,394
Silver Creek Capital Management	Opportunistic global equities – fund-of-funds (special situations)	22,245,213
Silver Lake Management Company	Opportunistic global equities – corporate buyout	4,348,208
SIR Capital Management	Alternative beta – equity market neutral	99,796,938
Siris Capital Group	Opportunistic global equities – corporate buyout	11,483,438
State Street Global Advisors	Opportunistic global equities – passive emerging markets	174,880,049
StepStone Group	Alternative beta – fund-of-funds corporate buyouts	24,976,953
Stone Harbor Investment Partners	Alternative beta – emerging market debt	53,072,830
Viking Global Investors	Alternative beta – long/short – equity	168,906,465
Visium Asset Management	Alternative beta – long/short – equity	3,460,388
Miscellaneous (each less than $1M)		5,457,861
		$5,383,517,364

Total Fund - Top Ten Publicly Traded Separate Account Holdings

Ten Largest Holdings as of June 30, 2017	Fair Value	Percent of the Total Fund
U.S. Treasury Note – 1.750%, 2021	$246,365,200	3.05%
U.S. Treasury Note – 1.500%, 2026	168,233,468	2.08
U.S. Treasury Bond – 2.500%, 2045	138,181,676	1.71
U.S. Treasury CPI Inflation – 0.125%, 2022	131,588,543	1.63
U.S. Treasury CPI Inflation – 0.375%, 2023	131,164,678	1.62
U.S. Treasury CPI Inflation – 0.125%, 2023	130,161,409	1.61
U.S. Treasury CPI Inflation – 0.125%, 2024	129,778,974	1.61
U.S. Treasury CPI Inflation – 0.375%, 2025	128,492,657	1.59
U.S. Treasury Bond – 3.000%, 2045	124,535,140	1.54
U.S. Treasury CPI Inflation – 1.125%, 2021	122,940,399	1.52

** 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, 2017, the total fund policy benchmark was comprised of the following components: 38% total opportunistic global equities policy, 44% total nominal bonds policy, 20% total commodities policy, 39% total inflation-linked bonds policy, and 31% total alternative beta policy. All policy return components are adjusted for financing cost associated with the beta-balanced program. This program did not begin until September 2012.

- *Opportunistic global equities* – As of June 30, 2017, the opportunistic global equities policy was MSCI ACWI Net +.75%. Legacy real estate and timber assets are benchmarked to the Dow Jones U.S. Select REIT Index and NCREIF Timber respectively.
- *Nominal bonds* – As of June 30, 2017, the total nominal bonds policy was Barclays Long Treasury.
- *Commodities* – As of June 30, 2017, the total commodities policy was 69.5% S&P GSCI and 30.5% BCOM.
- *Inflation-linked bonds* – As of June 30, 2017, the total inflation-linked bonds policy was Barclays US TIPS 1-10 YR.
- *Alternative beta* – As of June 30, 2017, the total alternative beta policy was AQR Delta.

	1 Year	3 Year	5 Year	10 Year	15 Year	20 Year
Total fund *	3.5%	0.4%	5.9%	4.5%	7.3%	6.8%
Total fund policy benchmark	1.6%	2.4%	6.4%	4.2%	6.8%	5.9%
Opportunistic global equities	15.3%	4.9%	11.4%	6.3%	N/A	N/A
Opportunistic global equities benchmark	16.0%	7.6%	12.4%	6.4%	N/A	N/A
Nominal bonds	(6.9)%	5.1%	N/A	N/A	N/A	N/A
Nominal bonds policy benchmark	(7.8)%	5.2%	N/A	N/A	N/A	N/A
Commodities	(11.0)%	(25.7)%	(14.6)%	(7.7)%	(1.0)%	N/A
Commodities policy benchmark	(8.8)%	(24.8)%	(13.7)%	(9.7)%	(2.6)%	N/A
Inflation-linked bonds	(1.1)%	(0.1)%	(0.1)%	4.1%	5.2%	N/A
Inflation-linked bonds policy benchmark	(0.9)%	0.0%	0.0%	4.1%	5.2%	N/A
Alternative beta	6.7%	4.5%	N/A	N/A	N/A	N/A
Alternative beta policy benchmark	3.6%	6.2%	N/A	N/A	N/A	N/A
External risk parity	6.7%	0.7%	N/A	N/A	N/A	N/A
Total fund policy benchmark	1.6%	2.4%	N/A	N/A	N/A	N/A

** Time weighted rates of return on fair values adjusted for cash flows.*

Schedule of Investment Manager Fees | For the Year Ended June 30, 2017

	Total Fees	Manager Fees	Fund Pass Through Expenses (1)	Incentive Fees Earned in FY17	Portfolio Company Charges (2)
Actis Emerging Markets III	$ 570,000	$ 514,000	$ 56,000	$ 0	$ 0
Actis Emerging Markets IV	767,000	721,000	46,000	0	0
African Development Partners I, LLC	6,124,649	316,191	241,517	5,566,942	0
African Development Partners II, LLC	876,116	752,005	124,110	0	0
Alinda Infrastructure Fund I, LP	252,397	235,840	16,557	0	0
American Industrial Partners Capital Fund V, LP	569,543	345,000	30,773	193,770	0
American Industrial Partners Capital Fund VI, LP	547,566	500,000	47,566	0	0
AQR DELTA Sapphire Fund, LP	3,853,999	3,461,801	392,198	0	0
AQR Global Risk Premium Fund IV, LP	2,534,728	2,117,324	417,404	0	0
AQR Style Premia Fund, LP	(260,960)	0	56,153	(317,113)	0
Astenbeck Capital Management	14,687,942	1,922,069	7,650	12,758,223	0
Axiom Asia Private Capital Fund II, LP	527,886	315,900	40,195	171,791	0
Axiom Asia Private Capital Fund III, LP	899,432	500,000	40,536	358,896	0
Axxon Brazil Private Equity Fund II B, LP	214,813	215,288	(475)	0	0
Bayview Opportunity Domestic III b, LP	2,012,366	818,244	382,550	811,573	0
Bayview Opportunity Domestic, LP	416,974	107,313	86,872	222,788	0
BlackRock Financial Management Bank Loans	851	851	0	0	0
Blackstone Real Estate Partners IV	(264,839)	0	80,165	(345,004)	0
Blackstone Real Estate Partners V	1,637,500	0	82,871	1,554,629	0
Blackstone Real Estate Partners VI	1,861,237	285,712	36,033	1,539,492	0
Blackstone Real Estate Partners VII	2,016,005	723,857	42,261	1,249,887	0
Blackstone Topaz Fund, LP	3,076,671	2,366,927	323,611	386,133	0
Blakeney Onyx, LP	1,244,099	786,068	458,031	0	0
Bridgewater Associates - All Weather @ 12%, LLC	2,124,398	1,829,560	294,837	0	0
Bridgewater Associates - Diamond Ridge Fund, LLC	3,578,600	3,475,645	102,955	0	0
CarVal Investors CVI Global Value Fund A, LP – private debt	112,187	80,701	31,487	0	0
CarVal Investors CVI Global Value Fund A, LP – real estate	112,187	80,701	31,487	0	0
Castlelake Aviation II, LP	399,034	238,965	76,498	83,571	0
Catalyst Fund III, LP	1,362,736	984,570	77,992	300,174	0
Catalyst Fund IV, LP	1,100,975	494,376	87,043	519,556	0
Catalyst Fund V, LP	4,038,430	1,977,504	348,351	1,712,575	0
Catterton Partners V, LP	132,623	113,555	7,731	0	11,337
Catterton Partners VI, LP	242,350	154,104	5,939	75,097	7,209
Catterton Partners VII, LP	580,308	322,687	16,068	226,968	14,586
Cornwall Domestic, LP	1,057,385	1,413,338	404,887	(760,840)	0
Davidson Kempner Institutional Partners, LP	685,496	274,609	90,143	320,744	0
DRI Capital - LSRC	732,161	0	372,469	359,692	0
EIG Energy Fund XIV, LP	300,558	257,928	42,630	0	0
EIG Energy Fund XV, LP	578,248	479,837	98,411	0	0
EIG Energy Fund XVI, LP	1,471,813	500,000	53,268	918,545	0
Elliott International Ltd.	7,776,269	2,217,105	976,551	4,582,613	0
Farallon Capital Institutional Partners, LP	57,569	0	0	57,569	0
Gaoling Fund, LP	7,248,917	1,669,881	93,063	5,485,974	0
Garnet Sky Investors Company, Ltd.	2,622,791	641,276	113,438	1,868,077	0
Gateway Energy & Resource Holdings, LLC	382,453	327,214	43,583	11,656	0
Glenview Capital Opportunity Fund, LP	387,820	241,151	146,669	0	0
Glenview Sidecar	166,220	0	166,220	0	0
Global Forest Partners GTI7 Institutional Investors Company, Ltd.	589,262	420,390	168,872	0	0
Harvest Fund Advisors, LLC	715,732	715,732	0	0	0
HBK Merger Strategies Offshore Fund, Ltd.	3,262,626	750,465	279,436	2,232,725	0
JLL Partners Fund V, LP	581,137	137,631	10,875	432,631	0
JLL Partners Fund VI, LP	3,260,820	459,672	33,268	2,767,880	0
King Street Capital, LP	76,127	53,142	0	22,985	0
King Street Capital, Ltd.	6,811	6,811	0	0	0
Linden Capital Partners II, LP	3,717,158	546,161	16,570	3,154,427	0
Mast Credit Opportunities I, LP	830,960	634,252	196,708	0	0
Merit Energy Partners F-II, LP	186,334	114,824	71,510	0	0

Schedule of Investment Manager Fees continued on page 80

Schedule of Investment Manager Fees continued from page 79

	Total Fees	Manager Fees	Fund Pass Through Expenses (1)	Incentive Fees Earned in FY17	Portfolio Company Charges (2)
MHR Institutional Partners II A, LP	428,039	0	38,274	389,765	0
MHR Institutional Partners III, LP	3,986,599	341,540	59,489	3,585,570	0
MHR Institutional Partners IV, LP	715,978	656,250	59,728	0	0
Millennium Technology Value Partners II	737,808	484,664	21,912	231,232	0
New Mountain Partners III, LP	4,203,455	144,891	120,401	3,911,945	26,218
NISA Investment Advisors	4,767,533	4,767,533	0	0	0
OCM Opportunities Fund IV b, LP	2,142	0	6,614	(4,472)	0
OCM Opportunities Fund VII b, LP	630,482	186,987	137,550	305,945	0
OCM Opportunities Fund VIII b, LP	273,794	294,973	71,371	(92,550)	0
OCM Power Opportunities III, LP	511,341	167,754	17,454	326,133	0
OCM Real Estate Opportunities Fund III, LP	(77,006)	0	17,292	(94,298)	0
OCM/GFI Power Opportunities Fund II, LP	123,574	0	20,118	103,456	0
Perry Partners, LP	514	514	0	0	0
Pharo Macro Fund, Ltd.	6,806,474	2,254,041	78,444	4,473,989	0
Resource Management Service – Wildwood Timberlands, LLC	974,988	368,506	37,699	568,783	0
Silchester International Investors	4,620,851	4,620,851	0	0	0
Silver Creek Special Opportunities Fund I, LP	26,602	0	26,602	0	0
Silver Creek Special Opportunities Fund II, LP	38,090	0	38,090	0	0
Silver Lake Partners II, LP	(205,215)	12,426	995	(218,636)	0
Siris Partners II, LP	218,317	133,078	3,900	81,339	0
Siris Partners III, LP	314,281	262,500	51,781	0	0
State Street Global Advisors	157,670	157,670	0	0	0
SIR Hedged Equity Fund	3,042,511	1,924,917	182,411	935,183	0
StepStone Capital Buyout Fund I, LP	175,839	28,314	62,673	84,852	0
StepStone Capital Buyout Fund II, LP	96,164	66,253	29,911	0	0
StepStone Opportunities Fund II, LP	34,484	5,643	81,152	(52,311)	0
Stone Harbor Investment Partners	185,318	185,318	0	0	0
The Veritas Capital Fund III, LP	1,314,698	43,218	5,625	1,265,855	0
The Veritas Capital Fund IV, LP	1,596,740	158,663	4,748	1,433,329	0
Viking Global Equities III, Ltd.	4,520,596	2,441,535	92,528	1,986,533	0
Grand totals	$134,867,133	$58,327,216	$8,734,299	$67,746,268	$59,350

(1) Fund Pass Through Expenses are administrative expenses charged to the fund and paid by the limited partners (including MOSERS), in addition to the management fee. 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.

(2) Portfolio Company Charges are fees/costs paid to the general partners of private equity funds which are not applied as offsets to gross management fees. These charges are paid by the underlying portfolio companies of the funds, and therefore, are indirectly paid by MOSERS.

Asset Class Summary

In general, an improved growth outlook and continued economic improvement led to improved returns for equity assets during the fiscal year. There was a large divergence in asset class performance during the fiscal year with three asset classes delivering a negative return and two delivering a positive return. Global equities were up 18.8% during the year after being down 3.1% during the past fiscal year. Long U.S. treasury bonds were down approximately 7.2% after being up 19.3% the prior fiscal year. Commodities were down 9.0% after being down 26.1% the prior fiscal year. Inflation-linked bonds were down 0.6% after being up 4.4% during the prior fiscal year. Alternative betas were up approximately 3.6% during the fiscal year after being up 6.6% the prior fiscal year. The external beta-balanced portfolio returned 6.7% during the past year after returning a (0.9%) the prior fiscal year.

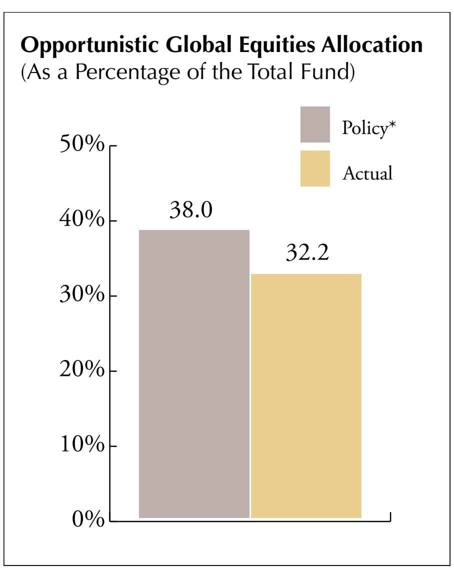
Opportunistic Global Equities

It is expected that investments in this class will perform well during periods of rising economic growth and/or falling inflation. Investments in this asset class 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, foreign currency exposure will be part of this portfolio.

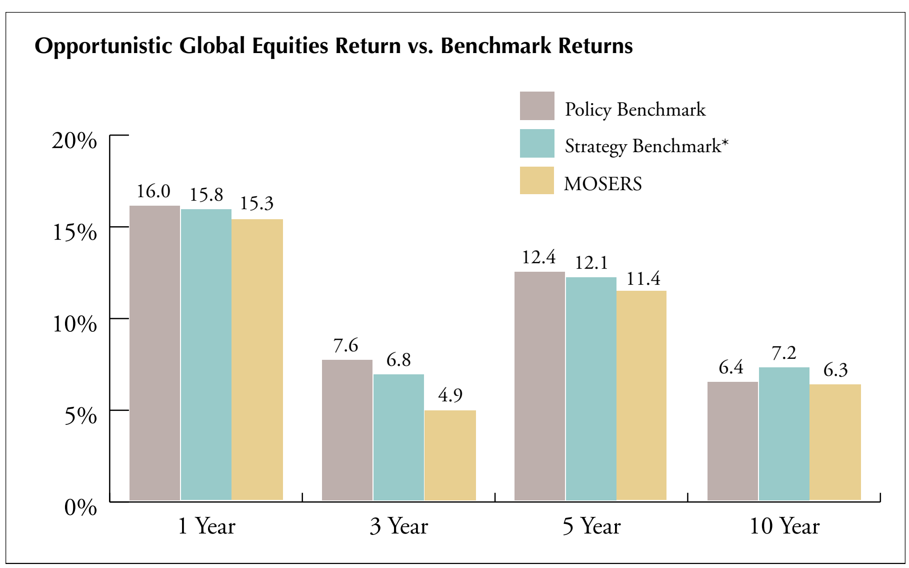
Global equities were up 18.8% during the fiscal year with most of it occurring in the eight months of the year after the presidential election in the United States. In a reversal from last year, equity returns were stronger abroad than they were at home with U.S. equities up 17.3% for the fiscal year while developed international equities were up 20.3% and emerging markets were up 23.8%.

Within the U.S equity market, the financials and information technology performed best with returns of 35.3% and 33.9% during the fiscal year, respectively. The telecom and energy sectors were the worst performing sectors with returns of (11.7%) and (4.1%), respectively. Within developed equity markets (after adjusting for currency changes to the U.S. dollar), Austria and Spain posted the best returns during the fiscal year with a 61.6% and 41.5% return, respectively. Belgium and Denmark returned the least with (0.2%) and 5.3% returns, respectively.

The market exposure of the equity portfolio on June 30, 2017, was $2,601,563,280, representing 32.2% of total fund market exposure. The bar graph below (left) illustrates the actual exposure compared to policy. For the fiscal year, the equity allocation returned 15.3% versus 16.0% for the global equity policy benchmark. The underperformance was driven by the opportunistic equity portfolio lagging its benchmark by 1.9%. The bar graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.



* As of June 30, 2017, the opportunistic global equities policy was MSCI ACWI Net +.75%.



* As of June 30, 2017, the total opportunistic global equities strategy benchmark was comprised of the following components: 17.7% actual return of domestic equity exposure, 4.9% S&P MLP, 53.9% MSCI World ex. U.S. (Net), 15.2% MSCI Emerging Markets (Net) and 8.3% MSCI China. This asset class commenced September 2002.

The tables below show the commission brokerage activity and statistical performance that occurred within the global equity portfolio in FY17.

Opportunistic Global Equities – Brokerage Activity

	Shares Traded	Volume of Trades	Commissions Paid
Baird, Robert W & Co., Inc.	4,647	$ 129,876	$ 46
Banco Bilbao Vizcaya	350,000	111,103	810
Barclays Capital, Inc.	27,413	977,006	380
BMO Capital Markets Corp.	6,711	131,537	49
BTIG, LLC	9,313	193,061	279
Citigroup Global Markets, Inc.	77,185	3,025,880	6,655
Credit Suisse	8,217	17,164,439	28,064
FBR Capital Markets & Co.	25,023	720,430	751
Goldman Sachs & Co.	3,158	128,578	95
J.P. Morgan Clearing Corp.	2,845	48,160	85
Jefferies & Co., Inc.	739,137	22,952,797	3,698
Merrill Lynch Pierce Fenner Smith, Inc.	318,411	10,598,430	5,758
Morgan Stanley & Co., Inc.	101,703	384,049,823	426,334
National Financial Services Corp.	1,202	22,387	36
Pershing, LLC	4,677	124,564	47
Raymond James & Associates, Inc.	6,620	88,794	199
RBC Capital Markets, LLC	151,718	4,055,919	776
UBS Securities, LLC	20,972	600,988	612
Weeden & Co.	3,276	207,867	78
Wells Fargo Securities, LLC	1,753,796	53,422,567	9,625
Total	3,616,024	$498,754,206	$484,377

Opportunistic Global Equities – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year	10 Year
Return	15.3%	4.9%	11.4%	6.3%
Annualized standard deviation	2.0%	5.5%	6.4%	10.6%
Sharpe ratio	7.57	0.86	1.78	0.55
Excess return*	(0.7)%	(2.7)%	(1.0)%	(0.1)%
Beta*	0.31	0.49	0.62	0.67
Annualized alpha*	9.8%	1.2%	3.5%	1.8%
Correlation*	0.78	0.85	0.86	0.94

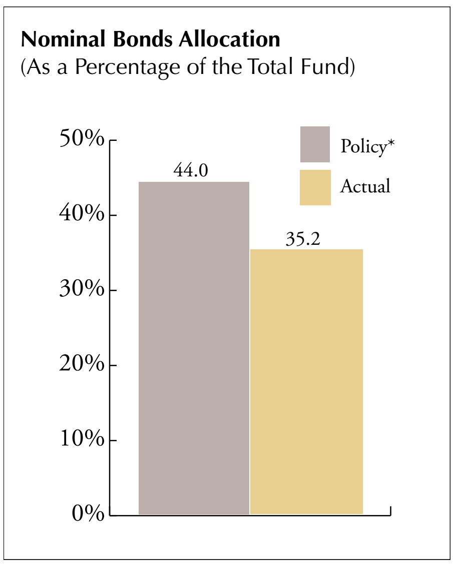
** As compared to the total opportunistic global equities policy benchmark.*

Nominal Bonds

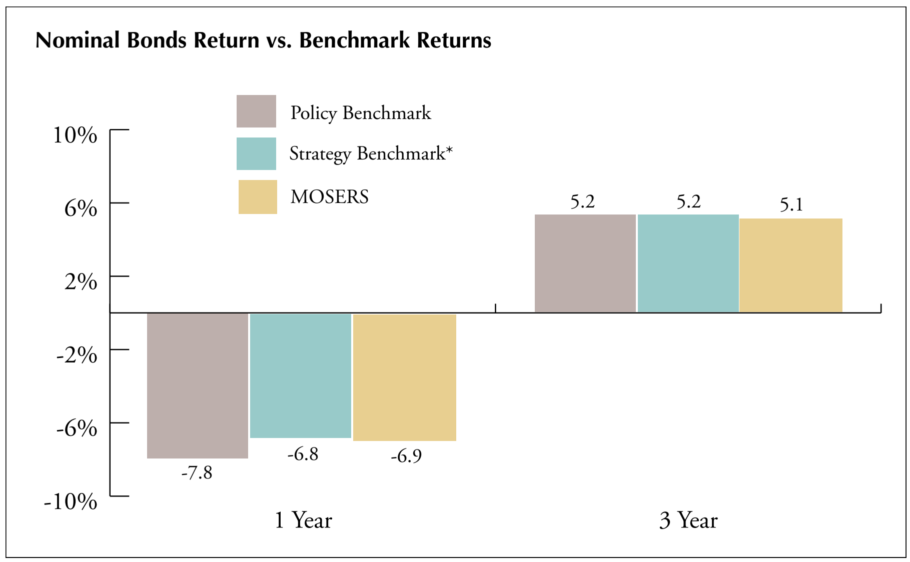
It is expected that investments in this asset class will perform well in periods of falling economic growth and falling inflation. Investments in this asset class include U.S. bonds that have been issued, collateralized or guaranteed by the U.S. Government, its agencies, or its instrumentalities. Because this asset class is invested in all U.S. bonds, there is currently not any foreign currency exposure as part of this portfolio.

Interest rates rose globally during the fiscal year leading to poor returns for nominal bonds. In the United States, the 10-year treasury rate increased approximately 0.8% as the Federal Reserve began tightening monetary policy by increasing short-term interest rates. Longer-term treasuries underperformed shorter-term treasuries during the fiscal year. For example, treasuries with a maturity of 20 years and longer returned (7.5%), while treasuries with a maturity in less than 10 years returned (1.3%). Among developed markets, Japan posted the worst 7- to 10-year maturity nominal bond performance with (10.9%), followed by Canada, (3.9%); U.S., (3.8)%; Great Britain, (3.0%); and Germany, (0.8%).

As of June 30, 2017, the market exposure of the nominal bond portfolio was $2,840,437,911, representing 35.2% of total market exposure. The bar graph below (left) illustrates the actual exposure compared to policy. For the fiscal year, the nominal bond allocation returned (6.9%) versus (7.8%) for the nominal bond policy benchmark. A strategic decision preferring to own U.S. Treasury Inflation Protected Securities (TIPS) in lieu of nominal treasuries was the cause of the outperformance this year. The bar graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.



* As of June 30, 2017, the total nominal bonds policy was Barclays Long Treasury.



* As of June 30, 2017, the total nominal bonds strategy benchmark was comprised of the following components: 95.0% total nominal bonds policy and 5.0 % Barclays U.S. Treasury Inflation Notes 10+ Year. This asset class commenced September 2012. Five-year data will be displayed when it becomes available.

The table below shows the statistical performance that occurred within the nominal bond portfolio in FY17. There was no commission brokerage activity within the nominal bond portfolio in FY17.

Nominal Bonds – Statistical Performance

Portfolio Characteristics	1 Year	3 Year
Return	(6.9)%	5.1%
Annualized standard deviation	9.0%	10.4%
Sharpe ratio	(0.81)	0.48
Excess return*	1.0%	(0.1)%
Beta*	0.93	0.95
Annualized alpha*	0.4%	0.2%
Correlation*	1.00	1.00

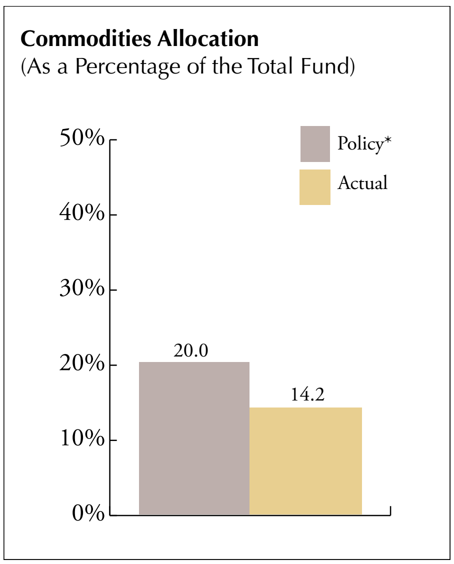
* *As compared to the total nominal bonds policy benchmark.*

Commodities

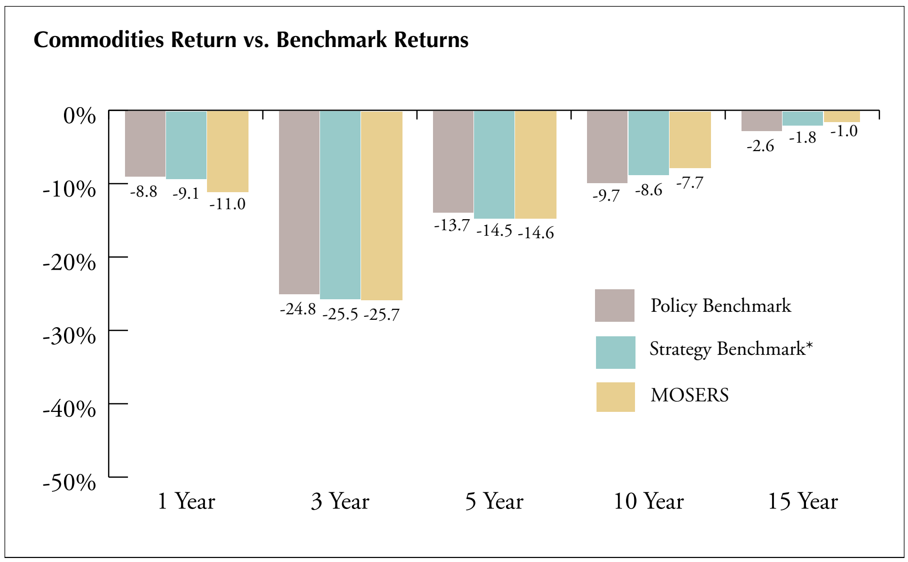
It is expected that investments in this asset class will perform well during periods of rising economic growth and rising inflation. Investments in the asset class may include investments in raw materials, materials required in the manufacturing of finished products, the owners of raw goods, and the producers of raw materials. Because this asset class is invested in all U.S. dollar commodities there is currently not any foreign currency exposure as part of this portfolio.

Commodities again had poor performance in the fiscal year as a result of three of the four commodity sectors producing negative returns. Energy produced the worst return for a second straight year with (14.8%) return, followed by agriculture with (13.1) and precious metals with (8.4%). The only positive return came from industrial metals with a 17.5% return. Within these sectors, zinc and copper performed best with 28.5% and 20.4% returns, respectively. The worse performing commodities during the fiscal year were sugar and soy meal with (35.0%) and (26.8%) returns, respectively.

As of June 30, 2017, the market exposure of the commodities portfolio was $1,144,649,079, representing 14.2% of the total market exposure. The bar graph below (left) illustrates the actual exposure compared to policy. For the fiscal year, the commodity allocation returned (11.0%) versus (8.8%) for the commodity policy benchmark. The primary driver of the underperformance was an overweight to energy via a strategic decision that was implemented with external active management. The bar graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.



* As of June 30, 2017, the commodities policy was S&P GSCI and BCOM.



* As of June 30, 2017, the total commodities strategy benchmark was comprised of the following components: 14.7% total commodities policy, 31.0% Goldman Sachs Commodity Index, 39.0% Bloomberg Commodity Index, 7.1% Bloomberg Roll Select Commodity Index, 5.4% S&P GSCI Crude Oil Index and 2.9% S&P GSCI Brent Crude Index. This asset class commenced November 1998.

The table below shows the statistical performance that occurred within the commodities portfolio in FY17. There was no commission brokerage activity within the commodities portfolio in FY17.

Commodities – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year	10 Year	15 Year
Return	(11.0)%	(25.7)%	(14.6)%	(7.7)%	(1.0)%
Annualized standard deviation	13.1%	22.2%	18.9%	24.4%	23.7%
Sharpe ratio	(0.87)	(1.17)	(0.78)	(0.34)	(0.09)
Excess return*	(2.2)%	(0.9)%	(0.8)%	2.0%	1.7%
Beta*	1.00	1.07	1.05	1.02	1.01
Annualized alpha*	(2.4)%	1.1%	(0.1)%	2.4%	1.9%
Correlation*	0.99	0.99	0.99	0.98	0.99

** As compared to the total commodities policy benchmark.*

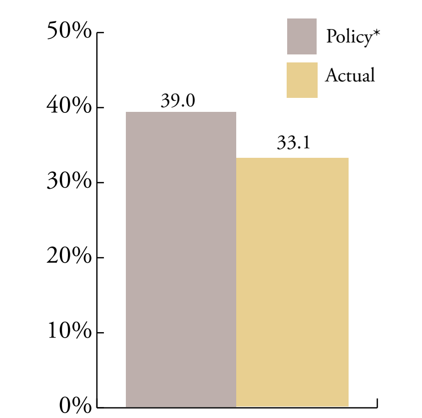
Inflation-Linked Bonds

It is expected that investments in this asset class will perform well during periods of falling economic growth and rising 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. All such securities must derive a significant portion of their value from changes in the respective issuer's domestic inflation. Because this asset class is invested in all U.S. bonds, there is currently not any foreign currency exposure as part of this portfolio.

Inflation in the U.S. increased during the fiscal year to 1.6% year-over-year versus 1.0% as of June 30, 2016. Inflation continued to stay below the Federal Reserve's target inflation rate of 2.0%. The 10-year real rate (the interest rate after subtracting the inflation rate) on TIPS increased by 0.5% during the fiscal year resulting in poor performance for inflation-linked bonds. U.S. TIPS returned (0.6%) as compared to Japan, (10.2%); Canada, (3.2%); Germany, 0.5%; and Great Britain, 3.7%.

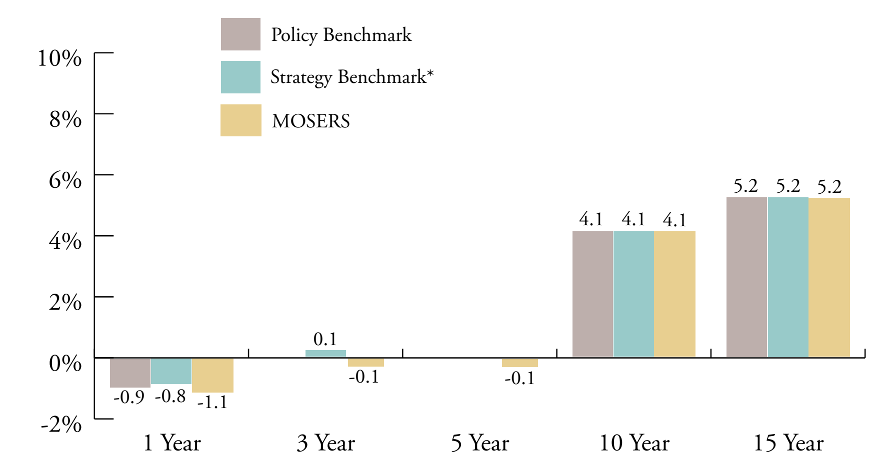
As of June 30, 2017, the market exposure of the inflation-linked bond portfolio was $2,673,386,121, representing 33.1% of total notional exposure. The bar graph below (left) illustrates the actual exposure compared to policy. For the fiscal year, the inflation-linked bond allocation returned (1.1%) versus (0.9%) for the inflation-linked bond policy benchmark. There was no internal or external active management strategy during the year; thus providing a return that closely matched the benchmark. The bar graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.

Inflation-Indexed Bonds Allocation
(As a Percentage of the Total Fund)



* As of June 30, 2017, the inflation-linked bonds policy was U.S. TIPS 1-10 YR.

Inflation-Indexed Bonds Return vs. Benchmark Returns



* As of June 30, 2017, the inflation-linked bonds strategy benchmark is equal to the inflation-linked bonds policy. This asset class commenced November 1998.

The table below shows the statistical performance that occurred within the inflation-linked bond portfolio in FY17. There was no commission brokerage activity within the inflation-linked bond portfolio in FY17.

Inflation-Linked Bonds – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year	10 Year	15 Year
Return	(1.1)%	(0.1)%	(0.1)%	4.1%	5.2%
Annualized standard deviation	2.2%	3.0%	3.6%	6.0%	7.3%
Sharpe ratio	(0.76)	(0.13)	(0.08)	0.60	0.55
Excess return*	(0.3)%	(0.2)%	(0.2)%	0.0%	0.1%
Beta*	0.99	1.00	0.99	1.00	1.01
Annualized alpha*	(0.4)%	(0.2)%	(0.2)%	0.0%	0.0%
Correlation*	1.00	1.00	1.00	1.00	1.00

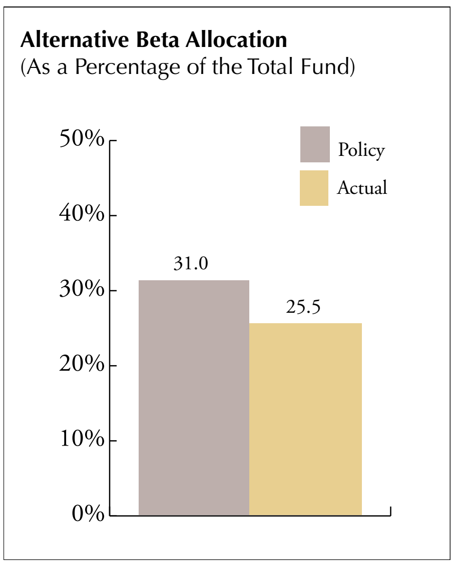
** As compared to the total inflation-linked bonds policy benchmark.*

Alternative Beta

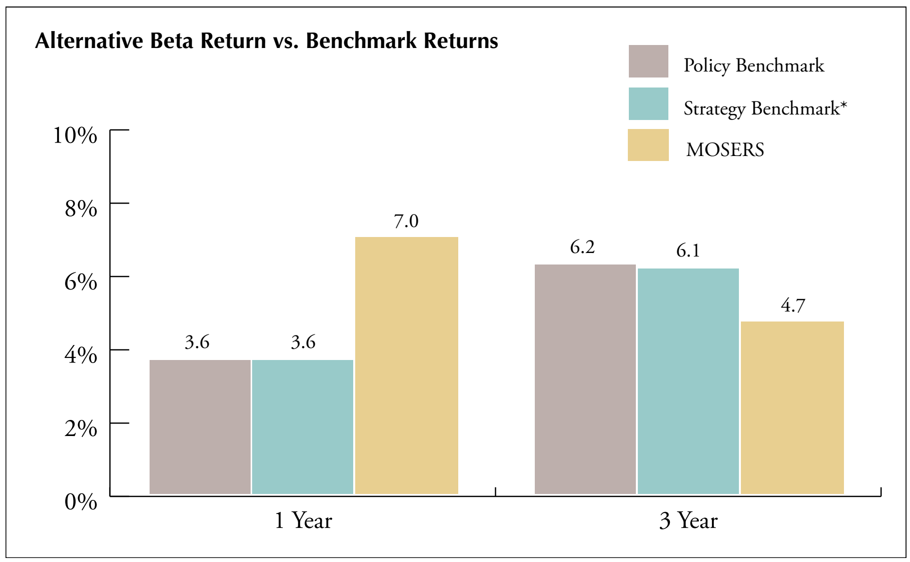
This asset class represents multiple hedge funds, and alternative betas. The hedge funds have been selected because they invest in difficult to obtain risk premiums or they are expected to produce alpha over an otherwise easy to obtain risk premium. Hedge fund betas are expected to produce positive risk premia and are obtained passively at fees lower than active management fees. 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 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, foreign currency exposure will be part of this portfolio.

The alternative beta portfolio performed well during the fiscal year led by strong performance from event driven and equity market neutral which returned 11.8% and 11.3%, respectively. Managed futures and global macro were drags on performance as they returned (16.0%) and (6.5%), respectively, during the fiscal year.

As of June 30, 2017, the market exposure of the alternative beta portfolio was $2,060,111,457, representing 25.5% of total market exposure. The bar graph below (left) illustrates the actual exposure compared to policy. The alternative beta allocation returned 7.0% for the fiscal year versus 3.6% for alternative beta policy benchmark. The outperformance was attributable to active hedge fund managers who collectively represented approximately 69% of the allocation and returned 8.4% for the year. The bar graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.



* As of June 30, 2017, the alternative beta policy was AQR Delta.



* As of June 30, 2017, the total opportunistic global equities strategy benchmark was comprised of the following components: 86.3% total alternative beta policy, 4.7% actual return of several managers, 2.51% JPM GBI-EM Global Diversified and 6.5% S&P Systematic Global Macro Index. This asset class commenced September 2012. Five-year data will be displayed when it becomes available.

The table below shows the statistical performance that occurred within the alternative betas portfolio in FY17. There was no commission brokerage activity within the alternative betas portfolio in FY17.

Alternative Beta – Statistical Performance

Portfolio Characteristics	1 Year	3 Year
Return	7.0%	4.7%
Annualized standard deviation	1.3%	2.5%
Sharpe ratio	4.88	1.84
Excess return*	3.4%	(1.4)%
Beta*	0.16	0.23
Annualized alpha*	6.2%	3.3%
Correlation*	0.47	0.54

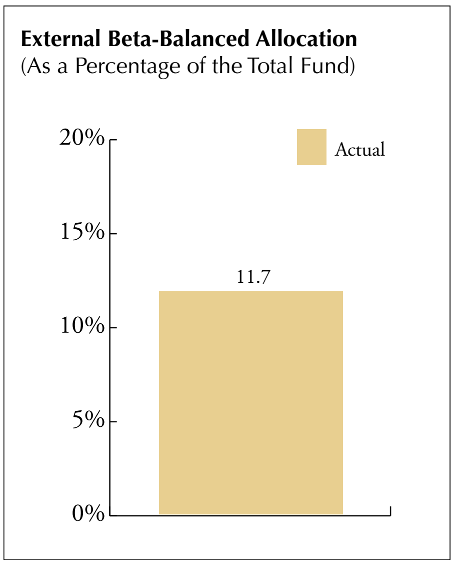
** As compared to the total alternative betas policy benchmark.*

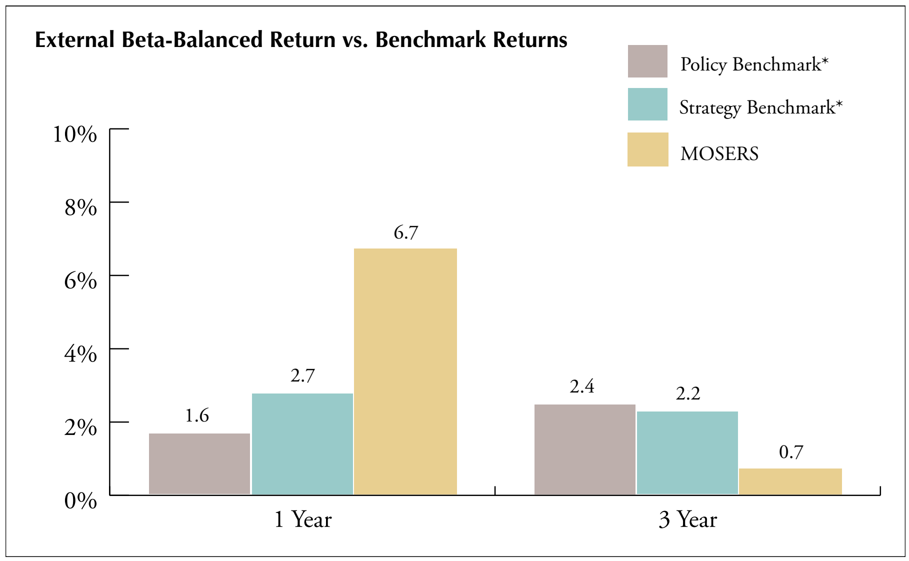
External Beta-Balanced

Bridgewater All-Weather and AQR Global Risk Premium are utilized for the external portion of the risk balanced portfolio, while the internal portion is managed by staff utilizing NISA Investment Advisors to implement the trading and operational aspects of the program.

Bridgewater returned 6.2% for the fiscal year after returning 0.5% last fiscal year. AQR returned 7.1% for the fiscal year after returning (2.2%) last fiscal year. This fiscal year performance of both mangers was above median compared with other risked balanced managers. These active managers invest in similar asset classes as the internal portfolio but hold them in different weights and implement different active portfolio management decisions.

As of June 30, 2017, the external beta-balanced portfolio returned 6.7% for the fiscal year and represented 11.7%, or $943,582,998 of market exposure. The bar graph below (left) illustrates the actual exposure of the allocation. There is no policy allocation to the external beta-balance. These managers hold similar asset classes but can have different weights to those asset classes as compared to their benchmark. As a portfolio, these two managers outperformed their benchmark for the year by 5.1%. The bar graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.





* As of June 30, 2017, the external beta-balanced policy benchmark was equal to the MOSERS' total fund policy benchmark and the strategy benchmark was equal to the MOSERS' total fund strategy benchmark. This asset class commenced October 2012. Five-year data will be displayed when it becomes available.

The table below shows the statistical performance that occurred within the external beta-balanced portfolio in FY17. There was no commission brokerage activity within the external beta-balanced portfolio in FY17.

External Beta-Balanced – Statistical Performance

Portfolio Characteristics	1 Year	3 Year
Return	6.7%	0.7%
Annualized standard deviation	6.7%	9.2%
Sharpe ratio	0.94	0.05
Excess return*	5.1%	(1.7)%
Beta*	1.09	1.25
Annualized alpha*	4.8%	(2.1)%
Correlation*	0.94	0.93

* *As compared to the total policy benchmark.*

Securities Lending Program

During the fiscal year ended June 30, 2017, MOSERS' net income through its securities lending program was $21,896. MOSERS lends its domestic equity, international equity and fixed income securities through Deutsche Bank which manages the program in an agent capacity. In an agent lending program, the agent lender is responsible for making the loans to various broker-dealers, investing the cash collateral associated with the loaned securities, marking the loans and collateral to market on a daily basis, and, in most cases, indemnifying the lender against the default of a broker-dealer to whom they have loaned securities on behalf of the beneficial owner.

In fiscal year 2017, income from domestic equity increased due to an increase in lending margin. During the fiscal year, all loans were repaid and there were no loans outstanding as of June 30, 2017. There was no income from international equity or fixed income as there were no securities to lend during the period. The tables as titled below show the last 10 years of activity for the securities lending program.

Domestic Equity

Fiscal Year	Average Lendable	Average on Loan	Average Utilization	Lending Margin (Basis Points)	Net Income (Loss)
2008	$440,025,347	$195,971,154	44.5%	36.6	$1,611,536
2009	307,082,718	114,261,769	37.2	52.0	1,596,245
2010	321,114,801	83,944,408	26.1	26.9	864,401
2011	376,047,357	111,263,248	29.6	16.5	619,648
2012	424,041,044	145,373,164	34.3	19.1	810,972
2013	238,024,131	69,543,634	29.2	25.1	596,941
2014	187,154,236	62,768,614	33.5	22.6	422,422
2015	168,456,525	53,517,452	31.8	6.9	116,204
2016	117,553,687	36,503,528	31.1	0.0	(49)
2017	36,343,073	4,063,557	11.2	6.0	21,896

International Equity

Fiscal Year	Average Lendable	Average on Loan	Average Utilization	Lending Margin (Basis Points)	Net Income
2008	$467,893,205	$56,994,925	12.2%	15.5	$726,565
2009	342,215,198	32,267,851	9.4	14.9	510,622
2010	277,251,343	19,736,528	7.1	4.0	109,946
2011	320,082,404	88,623,017	27.7	10.4	333,000
2012	309,052,299	47,666,253	15.4	7.5	230,655
2013	192,359,434	49,525,171	25.7	5.6	108,379
2014	0	0	0.0	0.0	0
2015	0	0	0.0	0.0	0
2016	0	0	0.0	0.0	0
2017	0	0	0.0	0.0	0

Fixed Income

Fiscal Year	Average Lendable	Average on Loan	Average Utilization	Lending Margin (Basis Points)	Net Income
2008	$1,082,813,165	$894,372,380	82.6%	56.4	$6,104,526
2009	859,512,525	517,356,516	60.2	43.3	3,722,523
2010	836,242,270	190,547,907	22.8	2.8	230,031
2011	805,579,308	505,690,676	62.8	7.2	581,875
2012	776,256,144	516,553,974	66.5	6.4	496,074
2013	622,620,959	427,442,773	68.7	5.1	315,060
2014	247,256,630	185,527,243	75.0	4.4	108,552
2015	0	0	0.0	0.0	0
2016	0	0	0.0	0.0	0
2017	0	0	0.0	0.0	0