Investment Section

Chief Investment Officer's Report

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MOSERS®
WE ARE HERE FOR YOUR BENEFIT.

October 19, 2018

Dear Members,

The MOSERS portfolio generated a time-weighted rate of return, based on market value, of 7.4% for fiscal year 2018. This was 2.6% better than the policy expectation of 4.8%. For the past two years, we have focused on achieving excess returns and reducing fees. Fiscal year 2018 continued the pattern of achievement around those goals.

We exceeded our expectations for the asset allocation by 2.6%. The overwhelming majority of the extra return came from our external alternative beta managers. However, staff's market positioning was additive to the result.

We also lowered management fees by $9 million in fiscal year 2018. This represents an approximate 15% year-over-year reduction in management fees. In addition, there was a $37 million year-over-year reduction in total fees paid because of a drop in incentive fees earned by external managers. Fiscal year 2018 fees reflected the work from prior years on reducing the number of illiquid alternative managers in the portfolio.

So, fiscal year 2018 was a good year. We earned more money than the asset allocation suggested possible at lower fees than the year before. In total, those efforts created about $260 million more than would have been expected by the asset allocation alone.

The negative for the year was simple – equity markets continued to perform well, which means diversification did not work in our favor this year. This year, more equities meant more return. However, the key to successful long-term portfolios is to diversify. Diversification simply is putting eggs into several baskets. While this year's results would have been better if we had put all of our eggs in the equity basket, that won't be the outcome in every year. We continue to remain confident that diversification will win in the long term.

As we plan for the future, our focus is on:

- Building a portfolio that better serves the needs of all of our stakeholders
- Continuing to reduce investment management fees
- Continuing to lead the industry in fee transparency

The investments staff continues working to set a higher standard for due diligence. We are implementing a due diligence process that equally incorporates the four distinct risk areas of manager/investment risk, quantitative risk, operational risk, and legal risk. The work product being created in the MOSERS investments department is second to none. This protects our fiduciary interests, because we can demonstrate that our processes are thorough and prudent.

I would like to thank the MOSERS Board of Trustees and Executive Director, Ronda Stegmann, for their continued support in all the above endeavors. As always, we are here for the benefit of our members and, in all ways, our efforts will continue to focus on strengthening MOSERS' already strong financial foundation.

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' internal investment staff and external general asset consultant have arrived at investment beliefs, which are the foundation for implementation of the investment portfolio to achieve the board's objectives. These beliefs guide every decision made within MOSERS' portfolio and are the fundamental concepts underlying the MOSERS investment program. These beliefs are:

- **Portfolio construction should focus first on the allocation and balancing of risk; it is the allocation of risk that drives portfolio returns.** While investment returns receive a lot of public attention, understanding and balancing 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. Therefore, it is rational to construct a portfolio that is believed to combat various economic conditions.
- **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. Exposures 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 while ensuring the RRO is achieved.

- **Flexibility to opportunistically alter the portfolio away from risk-balanced 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 is charged with the duties of establishing and maintaining broad policies and objectives for the investment program along with the recommendations of staff and the external asset consultants.

Chief Investment Officer (CIO) and Internal Staff

The CIO reports directly to the board with respect to the investment program, but in all other respects reports to the executive director. The CIO has primary responsibility for the overall direction of the investment program. The CIO works with the external asset consultants and the board investment consultant 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 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.

Investment Management Consultants

Summit Strategies Group serves at the pleasure of the board as the system's general asset consultant. Their primary duty is to provide an independent perspective and oversight of the system's investment program. The general asset consultant must approve all manager hiring and termination decisions, as well as strategic allocation decisions made by the CIO. The general asset consultant also provides advice and input to the CIO and internal investment staff on investment-related issues and money manager searches.

Blackstone Alternative Asset Management, LP, the system's hedge fund asset consultant, serves at the pleasure of the board to provide an independent perspective and oversight of the system's hedge fund investment program. The hedge fund asset consultant must approve all hedge fund manager hiring and termination decisions and, additionally, provides advice and input to the CIO and internal investment staff on hedge fund program issues and manager searches.

Verus Advisory, Inc. serves at the pleasure of the board as the system's board investment consultant to provide investment advisory and oversight services to the board. Specifically, the board investment consultant assists the board in developing investment policy, recommends asset allocation policy, and assists in oversight of the investment program.

Chief Auditor

The chief auditor reports administratively to the executive director and functionally 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 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 regarded as one of the most important decisions in the investment management process. The board, with advice from staff and external consultants, 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 general asset consultants, 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 shows 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[2]	Benchmark Weight
Opportunistic global equity	36%	25% - 47%	MSCI ACWI[3] + .75%	38%
Nominal bonds	24%	17% - 31%	Barclays Long Treasury	44%
Commodities	19%	13% - 25%	S&P GSCI/BCOM[4]	20%
Inflation-linked bonds	8%	5% - 10%	Barclays 1-10 TIPS	39%
Alternative beta	13%	9% - 17%	AQR DELTA[5]	31%

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 general asset consultant.

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 (5.0% in FY18) 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 return 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 general asset consultant, 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.

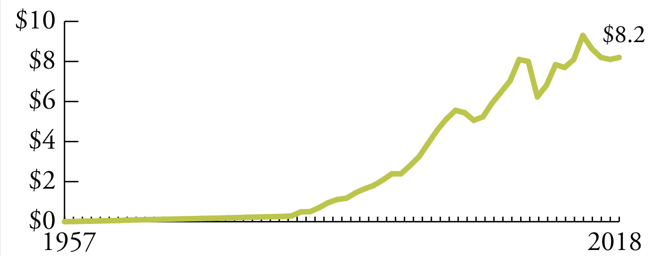
Implementation decisions are money manager selection choices made by the CIO with the approval of the appropriate external consultant that the decision was made in accordance with the board's adopted governance policy. The value added through these decisions is measured by the difference between the 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, 2018, the MOSERS investment portfolio had a fair value of $8.2 billion. The growth of MOSERS' portfolio since the system's inception is illustrated in the corresponding line graph.

Total Fund Growth (Billions)



Investment Performance

MOSERS' investments generated a time-weighted return of 7.4%, net of fees, for FY18. The total fund return exceeded the 1-year policy benchmark of 4.8%. This additional 2.6% investment return produced $200 million over what would have been earned if the fund had been invested passively in the policy benchmark.

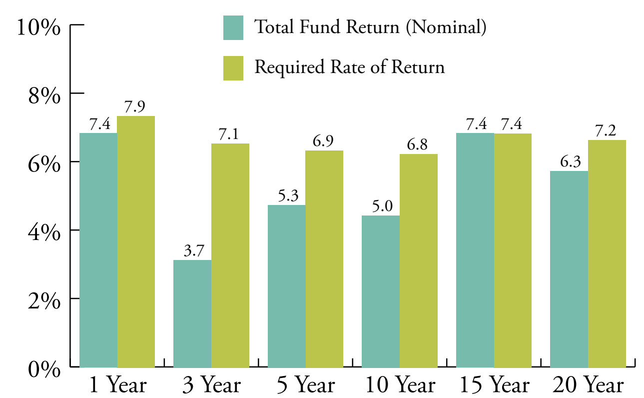
Investment Performance vs. Required Rate of Return

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 FY18 is equal to the RRO of 5.0% plus inflation. The best known measure of inflation is the Consumer Price Index (CPI).[2]

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 graph, MOSERS' investment returns trailed the required rate of return by 0.9% over the 20-year period ended June 30, 2018.[3]

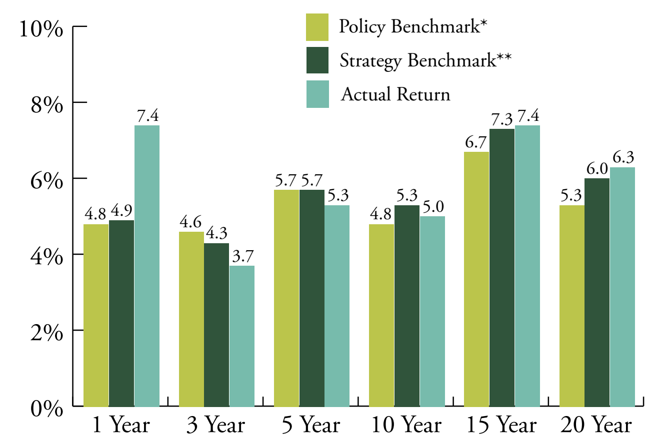
Total Fund Actual Return vs. Required Rate of Return



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 lower right graph.

Total Fund Actual Return vs. Benchmark Return



* As of June 30, 2018, 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.

** As of June 30, 2018, the strategy benchmark was comprised of the following components: 40.3% total opportunistic global equities strategy, 38.7% total nominal bonds strategy, 17.9% total commodities strategy, 36.7% total inflation-linked bonds strategy, and 27.8% total alternative beta strategy. All strategy return components are adjusted for financing cost associated with the beta-balanced program.

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

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

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-, 10-, 15-, and 20-year actual performance over performed its policy benchmark by 2.6%, 0.2%, 0.7% and 1.0% with the actual 3- and 5-year returns trailing the policy benchmarks by 0.9% and 0.4%, respectively.

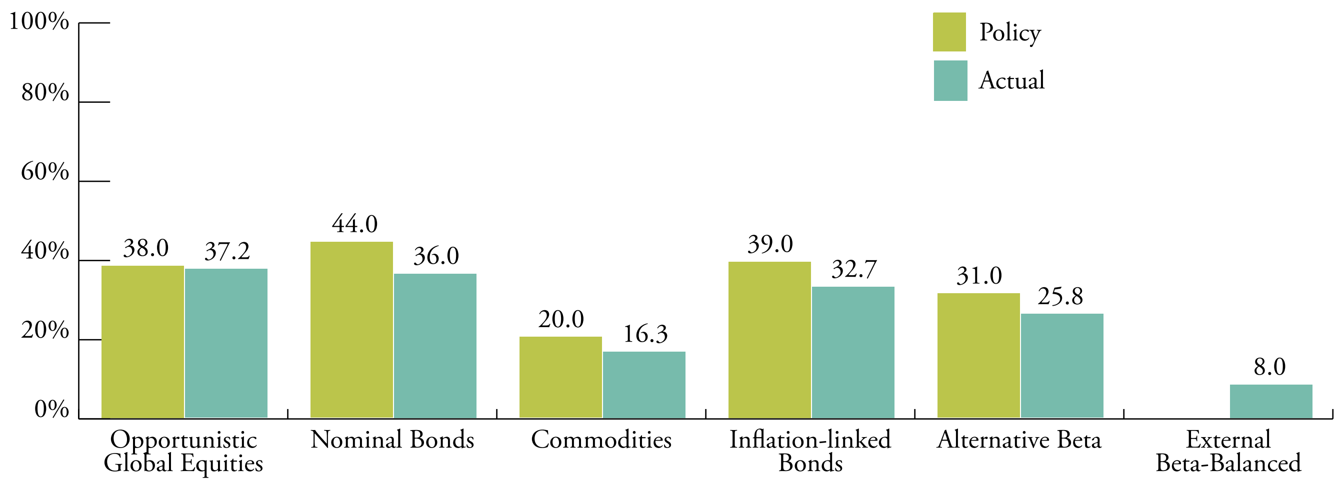
The strategy benchmark is more narrowly defined and focuses on sub-asset class allocation decisions made by the CIO. Comparison of the strategy benchmark to the policy benchmark reflects the component of value added or detracted which can be attributed to the strategic sub-class allocation decisions 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 firing) 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, 2018, 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, 2018, for each sub-asset class, along with the actual strategic allocation to each type of investment, is shown in the 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, 2018.

Total Fund – Correlation Table (5 Years)

	Opportunistic Global Equities	Nominal Bonds	Commodities	Inflation-Linked Bonds	Alternative Beta
Opportunistic global equities	1.00				
Nominal bonds	(0.23)	1.00			
Commodities	0.46	(0.37)	1.00		
Inflation-linked bonds	0.17	0.63	0.13	1.00	
Alternative beta	0.38	0.18	(0.20)	0.16	1.00

Total Fund – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year	10 Year	15 Year	20 Year
Annualized return	7.4%	3.7%	5.3%	5.0%	7.4%	6.3%
Annualized standard deviation	5.1%	5.7%	6.1%	8.7%	7.8%	9.1%
Sharpe ratio	1.20	0.53	0.80	0.54	0.78	0.49
Excess return*	2.6%	(0.9)%	(0.4)%	0.2%	0.7%	1.0%
Beta*	0.73	0.81	0.85	0.75	0.76	0.83
Annualized alpha*	3.7%	0.0%	0.4%	1.3%	2.1%	1.8%
Correlation*	0.98	0.92	0.94	0.96	0.95	0.96
Value added in dollars**	$200M	$(283)M	$(242)M	$226M	$1.1B	$2.1B

* *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, 2018

	Fair Value	Percentage of Investments at Fair Value	Market Exposure	Percentage of Investments at Market Exposure
Internal beta-balanced				
Opportunistic global equities	$ 2,901,667,761	35.6%	$ 3,040,786,070	37.2%
Nominal bonds	1,020,791,097	12.5	2,943,258,313	36.0
Commodities	446,412,239	5.5	1,327,951,329	16.3
Inflation-linked bonds	1,023,504,890	12.5	2,672,104,671	32.7
Alternative beta	2,110,615,527	25.8	2,110,615,527	25.8
Total internal beta-balanced	7,502,991,514	91.9	12,094,715,910	148.0
External beta-balanced	654,716,871	8.0	654,716,871	8.0
Residual accounts from old portfolio	2,132,751	0.0	2,132,751	0.0
Cash reserve	11,868,119	0.1	0	0.0
Grand total	$ 8,171,709,255	100.0%	$ 12,751,565,532	156.0%

Reconciliation to *Statements of Fiduciary Net Position*	
Total portfolio value	$ 8,171,709,255
Reverse repurchase agreements	3,853,968,794
Short-term investment fund (STIF)	(3,529,778,213)
Uninvested cash	(289,866)
Interest and dividends receivable	(49,694,604)
Other payables	2,915,084
Investment sales	(85,013,937)
Investment purchases payable	162,762,193
Fees payable	9,302,733
Investments per *Statements of Fiduciary Net Position*	$ 8,535,881,439

Schedule of Investment Advisors

Investment Advisors	Style	Portfolio Fair Value
Actis Emerging Markets	Opportunistic global equities – emerging markets	$ 40,813,422
AQR Capital Management	Alternative beta – multi-strategy	327,665,811
AQR Capital Management	External beta-balanced – risk parity	297,528,042
Axiom Asia Private Capital Associates	Opportunistic global equities – emerging markets	89,699,530
Axxon Group	Opportunistic global equities – emerging markets	29,342,341
Bayview Asset Management	Opportunistic global equities – opportunistic mortgages	7,459,811
Blackstone Alternative Asset Management	Alternative beta – fund-of-funds	205,209,053
Blackstone Real Estate Partners	Opportunistic global equities – active real estate	91,474,830
Blakeney Management	Opportunistic global equities – emerging markets	1,762,816
Bridgewater Associates	Alternative beta – global macro	115,220,885
Bridgewater Associates	External beta-balanced – risk parity	299,911,948
CarVal Investors	Opportunistic global equities – distressed real estate debt	13,900,000
Catalyst Capital Group	Opportunistic global equities – Canadian distressed debt	85,493,405
Cornwall Capital	Alternative beta – multi-strategy	17,262,998
DRI Capital	Opportunistic global equities – intellectual property	12,988,292
EIG Energy Partners	Opportunistic global equities – energy – mezzanine	69,427,634
Elliott Management Corporation	Alternative beta – multi-strategy	231,123,000
Farallon Capital Partners	Alternative beta – multi-strategy	1,880,474
Gaoling Fund	Opportunistic global equities – long/short – equity	160,352,387
Gateway Energy Partners	Opportunistic global equities – energy – diversified	12,511,704
Glenview Capital Management	Opportunistic global equities – long/short – equity	41,942,363
Glenview Capital Management Sidecar	Opportunistic global equities – active equity	66,620,964
Global Forest Partners	Opportunistic global equities – timberland	120,756,797
Harvest Fund Advisors	Opportunistic global equities – active MLP	40,510,071
HBK Capital Management	Alternative beta – merger arbitrage	121,279,322
JLL Partners	Opportunistic global equities – corporate buyout	22,849,074
King Street Capital Management	Alternative beta – credit driven	2,234,416
Linden Capital Partners	Opportunistic global equities – corporate buyout	28,807,406
Mast Capital Management	Alternative beta – credit driven	14,607,205
Merit Energy Company	Alternative beta – energy – oil & gas	4,910,313
MHR Fund Management	Alternerative beta – distressed debt	79,955,083
Millennium Technology Value Partners	Opportunistic global equities – direct secondaries	23,521,371
NISA Investment Advisors	Opportunistic global equities – passive equities	589,645,464
NISA Investment Advisors	Nominal bonds – passive long term U.S. treasuries	124,322,238
NISA Investment Advisors	Commodities – passive commodities	(34,554,106)
NISA Investment Advisors	Alternative beta – strategy	707,077,287
NISA Investment Advisors	Inflation linked bonds – passive TIPS	292,939,855
Oaktree Capital Management	Opportunistic global equities – corporate buyout	6,934,984
Oaktree Capital Management	Opportunistic global equities – distressed debt	20,135,858
Pharo Management	Alternative beta – global macro	57,167,960
Resource Management Service – Wildwood Timberlands	Opportunistic global equities – timberland	71,550,098
Silchester International Investors	Opportunistic global equities – active international equity	853,114,524
Silver Creek Capital Management	Opportunistic global equities – fund-of-funds (special situations)	20,007,255
Silver Lake Management Company	Opportunistic global equities – corporate buyout	2,283,614
SIR Capital Management	Alternative beta – equity market neutral	99,758,765
Siris Capital Group	Opportunistic global equities – corporate buyout	13,415,512
State Street Global Advisors	Opportunistic global equities – passive emerging markets	93,558,689
StepStone Group	Alternative beta – fund-of-funds corporate buyouts	12,293,716
Stone Harbor Investment Partners	Alternative beta – emerging market debt	50,879,885
TPG–Axon Capital Management	Alternative beta – multi-strategy	1,096,083
Visium Asset Management	Alternative beta – long/short – equity	1,344,567
Miscellaneous (each less than $1M)		3,616,044
Total investment advisors		$ 5,665,611,060

Total Fund – Top Ten Publicly Traded Separate Account Holdings

Ten Largest Holdings as of June 30, 2018*	Fair Value	Percent of the Total Fund
U.S. Treasury CPI Inflation – 1.250%, 2020	$ 155,556,149	1.89%
U.S. Treasury CPI Inflation – 0.250%, 2025	136,976,754	1.66
U.S. Treasury Bond – 2.500%, 2045	134,893,989	1.64
U.S. Treasury CPI Inflation – 0.125%, 2022	132,651,500	1.61
U.S. Treasury CPI Inflation – 0.125%, 2023	131,490,944	1.60
U.S. Treasury CPI Inflation – 0.375%, 2025	130,253,916	1.58
U.S. Treasury CPI Inflation – 0.125%, 2024	123,009,951	1.49
U.S. Treasury Bond – 3.000%, 2045	121,229,316	1.47
U.S. Treasury CPI Inflation – 0.625%, 2021	118,882,593	1.44
U.S. Treasury CPI Inflation – 0.125%, 2021	117,521,305	1.43

** 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, 2018, 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, 2018, 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, 2018, the total nominal bonds policy was Bloomberg Barclays Long Treasury.
- *Commodities* – As of June 30, 2018, the total commodities policy was 36.1% S&P GSCI and 63.9% BCOM.
- *Inflation-linked bonds* – As of June 30, 2018, the total inflation-linked bonds policy was Bloomberg Barclays U.S. TIPS 1-10 YR.
- *Alternative beta* – As of June 30, 2018, the total alternative beta policy was AQR Delta.

	1 Year	3 Year	5 Year	10 Year	15 Year	20 Year
Total fund*	7.4%	3.7%	5.3%	5.0%	7.4%	6.3%
Total fund policy benchmark	4.8%	4.6%	5.7%	4.8%	6.7%	5.3%
Opportunistic global equities	11.9%	7.5%	9.8%	7.9%	9.9%	N/A
Opportunistic global equities benchmark	10.2%	9.5%	11.1%	8.2%	9.2%	N/A
Nominal bonds	(1.3)%	2.7%	4.0%	N/A	N/A	N/A
Nominal bonds policy benchmark	(1.3)%	2.7%	4.0%	N/A	N/A	N/A
Commodities	14.8%	(10.1)%	(12.3)%	(11.5)%	(1.5)%	N/A
Commodities policy benchmark	16.9%	(7.7)%	(11.3)%	(13.3)%	(3.0)%	N/A
Inflation-linked bonds	0.0%	0.6%	0.6%	2.7%	4.0%	N/A
Inflation-linked bonds policy benchmark	0.5%	0.9%	0.8%	2.7%	4.0%	N/A
Alternative beta	3.0%	3.7%	5.2%	N/A	N/A	N/A
Alternative beta policy benchmark	(6.5)%	1.0%	2.6%	N/A	N/A	N/A
External beta-balanced	9.0%	4.9%	6.0%	N/A	N/A	N/A
Total fund policy benchmark	4.8%	4.6%	5.7%	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, 2018

	Total Fees	Manager Fees	Fund Pass Through Expenses (1)	Incentive Fees Earned and Paid in FY18	Portfolio Company Charges (2)
Actis Emerging Markets III	$ 407,000	$ 377,000	$ 30,000	$ 0	$ 0
Actis Emerging Markets IV	627,000	525,000	102,000	0	0
African Development Partners I, LLC	358,944	179,548	83,366	96,030	0
African Development Partners II, LLC	2,036,486	567,748	130,254	1,338,484	0
Alinda Infrastructure Fund I, LP	94,889	69,549	25,340	0	0
AQR DELTA Sapphire Fund, LP	3,970,165	3,534,269	435,896	0	0
AQR Global Risk Premium Fund IV, LP	2,446,877	2,082,827	364,050	0	0
AQR Style Premia Fund, LP	1,770,663	0	26,406	1,744,257	0
Astenbeck Capital Management	261,477	261,477	0	0	0
Axiom Asia Private Capital Fund II, LP	537,293	284,310	62,464	190,519	0
Axiom Asia Private Capital Fund III, LP	1,376,080	487,500	46,034	842,546	0
Axxon Brazil Private Equity Fund II B, LP	259,538	219,471	40,067	0	0
Bayview Opportunity Domestic III b, LP	1,154,333	353,011	216,887	584,435	0
Bayview Opportunity Domestic, LP	150,475	36,812	46,903	66,760	0
BlackRock Financial Management Bank Loans	(1,454)	(1,454)	0	0	0
Blackstone Real Estate Partners IV	175,361	0	36,902	138,459	0
Blackstone Real Estate Partners V	777,025	0	12,786	764,239	0
Blackstone Real Estate Partners VI	1,003,948	118,634	20,865	864,449	0
Blackstone Real Estate Partners VII	3,134,249	623,252	42,048	2,468,949	0
Blackstone Topaz Fund, LP	2,691,315	2,069,695	270,242	351,378	0
Blakeney Onyx, LP	615,832	334,494	242,566	38,772	0
Bridgewater Associates - All Weather @ 12%, LLC	1,997,733	1,681,375	316,358	0	0
Bridgewater Associates - Diamond Ridge Fund, LLC	3,949,106	3,784,820	164,286	0	0
Campbell Timber Fund II A, LP	1,238	1,238	0	0	0
CarVal Investors CVI Global Value Fund A, LP – private debt	27,375	0	27,375	0	0
CarVal Investors CVI Global Value Fund A, LP – real estate	27,375	0	27,375	0	0
Catalyst Fund III, LP	(2,839,875)	935,827	39,942	(3,815,644)	0
Catalyst Fund IV, LP	(748,308)	447,239	68,707	(1,264,254)	0
Catalyst Fund V, LP	1,844,167	1,977,504	173,938	(307,275)	0
Catterton Partners V, LP	47,473	37,212	8,443	0	1,818
Cornwall Domestic, LP	914,089	609,189	294,282	10,618	0
Davidson Kempner Institutional Partners, LP	378,889	146,240	54,901	177,748	0
DRI Capital - LSRC	367,620	0	167,321	200,299	0
EIG Energy Fund XIV, LP	305,486	274,260	31,226	0	0
EIG Energy Fund XV, LP	499,388	429,518	69,870	0	0
EIG Energy Fund XVI, LP	1,597,416	500,000	64,301	1,033,115	0
Elliott International, Ltd.	9,751,652	3,122,865	2,214,796	4,413,991	0
Farallon Capital Institutional Partners, LP	(129,633)	0	0	(129,633)	0
Gaoling Fund, LP	12,999,620	2,152,766	129,966	10,716,888	0
Garnet Sky Investors Company, Ltd.	8,838,921	505,966	120,840	8,212,115	0
Gateway Energy & Resource Holdings, LLC	377,385	7,602	355,763	14,021	0
Glenview Capital Opportunity Fund, LP	511,465	320,220	191,245	0	0
Glenview Sidecar	198,121	0	198,121	0	0

Schedule of Investment Manager Fees continued on page 88

Schedule of Investment Manager Fees continued from page 87

	Total Fees	Manager Fees	Fund Pass Through Expenses (1)	Incentive Fees Earned and Paid in FY18	Portfolio Company Charges (2)
Global Forest Partners GTI7 Institutional Investors Company, Ltd.	121,244	58,520	62,724	0	0
Harvest Fund Advisors, LLC	570,086	570,086	0	0	0
HBK Merger Strategies Offshore Fund, Ltd.	2,505,462	879,225	313,587	1,312,650	0
JLL Partners Fund V, LP	(1,922)	60,570	13,730	(76,222)	0
JLL Partners Fund VI, LP	3,154,025	338,083	26,947	2,788,995	0
King Street Capital, LP	204,519	69,290	0	135,229	0
King Street Capital, Ltd.	38,741	3,494	0	35,247	0
Linden Capital Partners II, LP	477,694	379,158	15,627	82,909	0
Mast Credit Opportunities I, LP	486,593	284,357	202,237	0	0
Merit Energy Partners F-II, LP	92,544	56,410	36,134	0	0
MHR Institutional Partners II A, LP	160,951	0	19,751	141,200	0
MHR Institutional Partners III, LP	740,674	319,643	26,790	394,241	0
MHR Institutional Partners IV, LP	922,593	853,761	68,832	0	0
Millennium Technology Value Partners II	1,437,893	438,750	36,640	962,503	0
NISA Investment Advisors	5,126,448	5,126,448	0	0	0
OCM Opportunities Fund IV b, LP	3,711	0	3,967	(256)	0
OCM Opportunities Fund VII b, LP	354,192	130,528	37,178	186,486	0
OCM Opportunities Fund VIII b, LP	326,616	250,631	49,295	26,690	0
OCM Power Opportunities III, LP	964,847	140,632	14,910	809,305	0
OCM Real Estate Opportunities Fund III, LP	9,859	0	27,714	(17,855)	0
OCM/GFI Power Opportunities Fund II, LP	(14,260)	0	31,517	(45,777)	0
Perry Partners, LP	282	282	0	0	0
Pharo Macro Fund, Ltd.	5,238,065	2,230,246	92,611	2,915,208	0
Resource Management Service – Wildwood Timberlands, LLC	675,303	372,580	28,606	274,116	0
Silchester International Investors	4,854,922	4,854,922	0	0	0
Silver Creek Special Opportunities Fund I, LP	27,112	0	27,112	0	0
Silver Creek Special Opportunities Fund II, LP	34,550	0	34,550	0	0
Silver Lake Partners II, LP	17,287	0	2,153	15,134	0
State Street Global Advisors	149,497	149,497	0	0	0
Standard Investment Research Hedged Equity Fund	3,389,191	1,979,894	165,935	1,243,361	0
StepStone Capital Buyout Fund I, LP	109,553	21,294	120,140	(31,881)	0
StepStone Capital Buyout Fund II, LP	913,355	64,752	30,664	817,939	0
StepStone Opportunities Fund II, LP	155,250	4,379	52,366	98,505	0
Stone Harbor Investment Partners	202,105	202,105	0	0	0
Viking Global Equities III, Ltd.	227,365	211,133	16,232	0	0
Grand totals	$98,440,547	$49,107,655	$8,512,081	$40,818,993	$ 1,818

(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 positive returns for risk assets during the fiscal year. There was a divergence in asset class performance during the fiscal year with one asset class delivering a negative return and five delivering a positive return. Global equities returned 11.9% during the year after returning 15.3% during the past fiscal year. Nominal bonds were down 1.3% after being down 6.9% the prior fiscal year. Commodities were up 14.8% after being down 11.0% the prior fiscal year. Inflation-linked bonds returned just above 0% after being down 1.1% during the prior fiscal year. Alternative betas returned 3.0% during the fiscal year after being up 7.0% the prior fiscal year. The external beta-balanced portfolio returned 9.0% during the year after returning 6.7% the prior fiscal year.

Opportunistic Global Equities

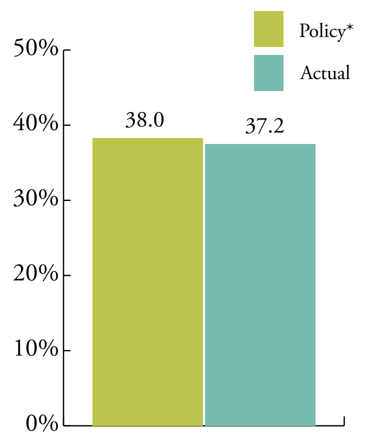
It is expected that investments in this asset class will perform well during periods of rising economic growth and/or falling inflation. Investments in this asset class include U.S. and non-U.S. equity investments with varying characteristics related to market capitalization and investment style. Because of the non-U.S. nature of some of these investments, foreign currency exposure will be part of this portfolio.

Global equities were up 11.9% during the fiscal year with most of it occurring in the first five months of the fiscal year. In a reversal from last year, equity returns were stronger in the U.S. than they were in international markets with U.S. equities up 14.5% for the fiscal year while developed international equities were up 7.0% and emerging markets were up 8.2%.

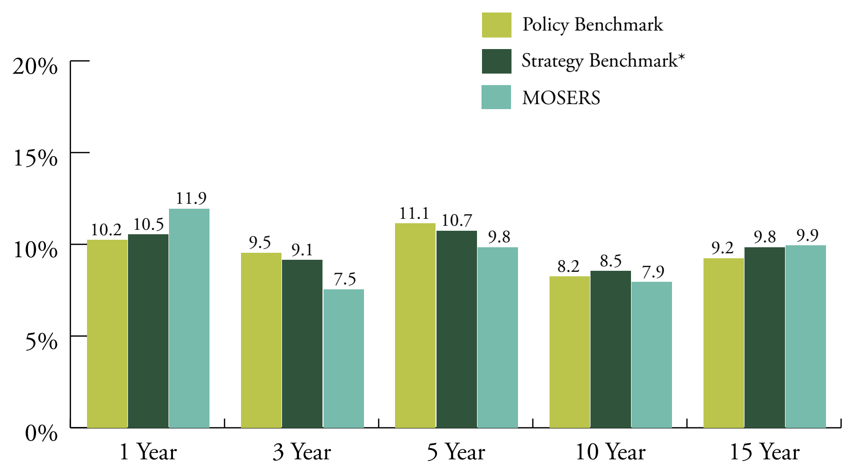
Within the U.S equity market, the information technology and consumer discretionary sectors performed best with returns of 31.3% and 23.5% during the fiscal year, respectively. The consumer staples and telecom sectors were the worst performing sectors with returns of negative 3.9% and positive 1.4%, respectively. Within developed equity markets (after adjusting for currency changes to the U.S. dollar), Norway and Portugal posted the best returns during the fiscal year with a 28.0% and 16.7% return, respectively. Israel and Sweden returned the least with (5.9%) and (3.8%), respectively.

The market exposure of the equity portfolio on June 30, 2018, was $3,040,786,070, representing 37.2% of total fund market value. The graph below (left) illustrates the actual exposure compared to policy. For the fiscal year, the equity allocation returned 11.9% versus 10.2% for the global equity policy benchmark. The outperformance was driven by the opportunistic equity portfolio beating its benchmark by 4.2%. The graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.

Opportunistic Global Equities Allocation
(As a Percentage of the Total Fund)



Opportunistic Global Equities Return vs. Benchmark Returns



* As of June 30, 2018, the opportunistic global equities policy was MSCI ACWI Net + .75%.

* As of June 30, 2018, the total opportunistic global equities strategy benchmark was comprised of the following components: 32.6% actual return domestic equity exposure/MSCI US, 1.3% S&P MLP, 40.7% MSCI World ex. US (Net), 7.3% MSCI Emerging Markets (Net), 5.4% MSCI China, 6.4% Dow Jones Wilshire REIT, and 6.3% NCREIF Timber.

The tables below shows the schedule of brokerage activity and statistical performance that occurred within the opportunistic global equity portfolio in FY18.

Opportunistic Global Equities – Schedule of Brokerage Activity

	Shares Traded	Volume of Trades	Commissions Paid
Barclays Capital, Inc.	3,782	150,424	$ 106
Berstein Sanford C & Co.	214,541	5,357,899	1,073
Cantor Fitzgerald & Co.	100,000	1,649,962	3,000
Citigroup Global Markets, Inc.	1,037	32,418	31
Cowen and Co.	15,813	460,774	149
Credit Suisse	6,162	33,934,551	95,939
FBR Capital Markets	273,279	6,021,469	8,198
Goldman Sachs & Co.	2,863	68,032	59
Jefferies & Co., Inc.	889,815	22,475,044	4,449
Jonestrading Inst. Services	322	6,981	10
Merril Lynch Pierce Fenner Smith, Inc.	115,655	3,467,284	2,756
Morgan Stanley & Co., Inc.	64,418	341,348,395	488,853
National Financial Services Co.	229,507	3,552,008	6,885
RBC Capital Markets, LLC	592,755	17,201,485	3,214
UBS Securities, LLC	12,452	236,640	374
Weeden & Co.	40,435	1,168,091	447
Wells Fargo Securities, LLC	1,268,896	31,650,488	6,816
Total	3,831,732	468,781,946	$ 622,359

Opportunistic Global Equities – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year	10 Year	15 Year
Return	11.9%	7.5%	9.8%	7.9%	9.9%
Annualized standard deviation	6.9%	6.2%	6.2%	10.4%	9.6%
Sharpe ratio	1.53	1.11	1.51	0.73	0.90
Excess return*	1.7%	(2.0)%	(1.3)%	(0.3)%	0.7%
Beta*	0.91	0.59	0.60	0.68	0.70
Annualized alpha*	2.4%	1.9%	2.9%	2.1%	3.2%
Correlation*	0.92	0.85	0.87	0.94	0.93

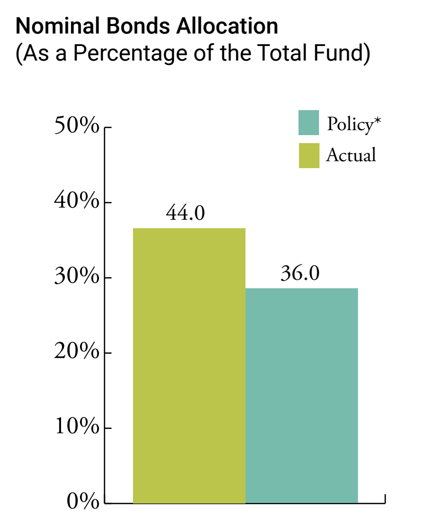
** As compared to the total opportunistic global equities policy benchmark.*

Nominal Bonds

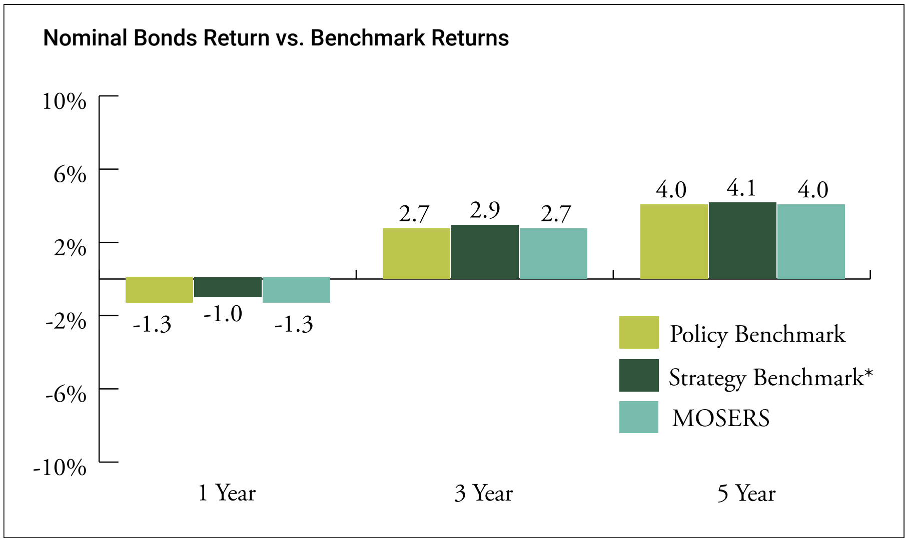
It is expected that investments in this asset class will perform well in periods of falling economic growth and falling inflation. Investments in this asset class include U.S. bonds that have been issued, collateralized or guaranteed by the U.S. Government, its agencies, or its instrumentalities. Because this asset class is invested in all U.S. bonds, there is currently no foreign currency exposure as part of this portfolio.

The United States underperformed other developed countries' nominal bond markets over the past year. In the United States, the 10-year treasury rate increased a little over 0.5% as the Federal Reserve continued tightening monetary policy by increasing short-term interest rates. Longer-term treasuries outperformed shorter-term treasuries during the fiscal year. For example, treasuries with a maturity of 20 years and longer returned 0.03%, while treasuries with a maturity under 10 years returned (.76%). Among developed markets, Canada posted the worst 7- to 10-year maturity nominal bond performance with (2.5%), followed by South Africa with a (2.0%) return. The best performing developed markets were Spain and France with returns of 6.3% and 5.6%, respectively. This compares to the United States that returned (1.8%), which was below the global bond return of 2.2%.

As of June 30, 2018, the market exposure of the nominal bond portfolio was $2,943,258,313, representing 36.0% of total market value. The graph below (left) illustrates the actual exposure compared to policy. For the fiscal year, the nominal bond allocation matched the nominal bond policy benchmark at (1.3%). A strategic decision preferring to own TIPS in lieu of nominal treasuries improved performance while implementation decisions were a small drag on performance, resulting in performance being in line with the benchmark. The graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.



* As of June 30, 2018, the total nominal bonds policy was Bloomberg Barclays Long Treasury.



* As of June 30, 2018, 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.

The table below shows the statistical performance that occurred within the nominal bond portfolio in FY18. There was no commission brokerage activity within the nominal bond portfolio in FY18.

Nominal Bonds – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year
Return	(1.3)%	2.7%	4.0%
Annualized standard deviation	7.7%	8.5%	9.3%
Sharpe ratio	(0.35)	0.24	0.39
Excess return*	0.0%	0.0%	0.0%
Beta*	0.97	0.95	0.96
Annualized alpha*	(0.1)%	0.2%	0.1%
Correlation*	1.00	1.00	1.00

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

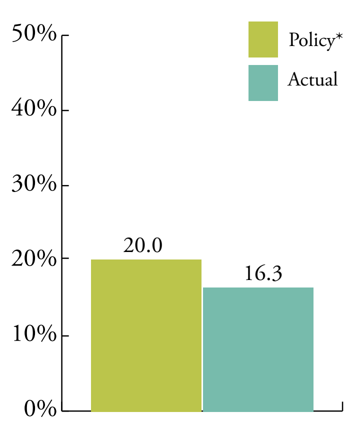
Commodities

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 denominated commodities there is no currency exposure as part of this portfolio.

Commodities reversed last year's poor performance as a result of two of the four commodity sectors producing positive returns this fiscal year. Energy, after producing the worst return in FY17 (14.8%), produced the best return in FY18 up 32.8%, followed by industrial metals at 13.6%. The two commodity sectors that were negative for the fiscal year were precious metals (2.2%) and agriculture (14.5%). Within these sectors, Brent crude oil and WTI crude oil performed best with 67.2% and 56.7% returns, respectively. The worst performing commodities during the fiscal year were wheat and natural gas with (22.1%) and (19.0%) returns respectively.

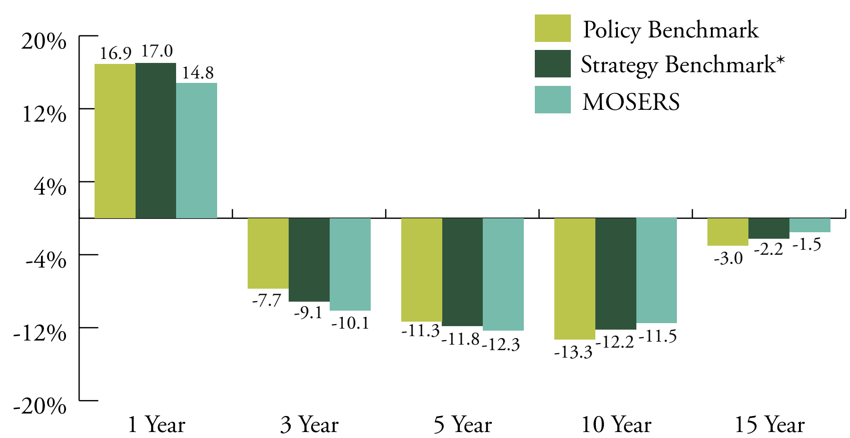
As of June 30, 2018, the market exposure of the commodities portfolio was $1,327,951,329, representing 16.3% of the total market value. The graph below (left) illustrates the actual exposure compared to policy. For the fiscal year, the commodity allocation returned 14.8% versus 16.9% for the commodity policy benchmark. The primary driver of the underperformance was an underweight to energy via an external active manager. The graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.

Commodities Allocation
(As a Percentage of the Total Fund)



* As of June 30, 2018, the commodities policy was S&P GSCI and BCOM.

Commodities Return vs. Benchmark Returns



* As of June 30, 2018, the total commodities strategy benchmark was comprised of the following components: 19.2% Goldman Sachs Commodity Index, 10.0% Bloomberg Commodity Index, 60.8% Bloomberg Roll Select Commodity Index, 6.3% S&P GSCI Crude Oil Index and 3.7% S&P GSCI Brent Crude Index.

The table below shows the statistical performance that occurred within the commodities portfolio in FY18. There was no commission brokerage activity within the commodities portfolio in FY18.

Commodities – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year	10 Year	15 Year
Return	14.8%	(10.1)%	(12.3)%	(11.5)%	(1.5)%
Annualized standard deviation	7.1%	17.7%	18.6%	23.0%	22.8%
Sharpe ratio	1.89	(0.61)	(0.68)	(0.51)	(0.12)
Excess return*	(2.1)%	(2.4)%	(1.0)%	1.8%	1.5%
Beta*	0.94	1.07	1.06	1.02	1.01
Annualized alpha*	(1.0)%	(1.9)%	(0.3)%	2.4%	1.7%
Correlation*	0.99	0.99	0.99	0.98	0.98

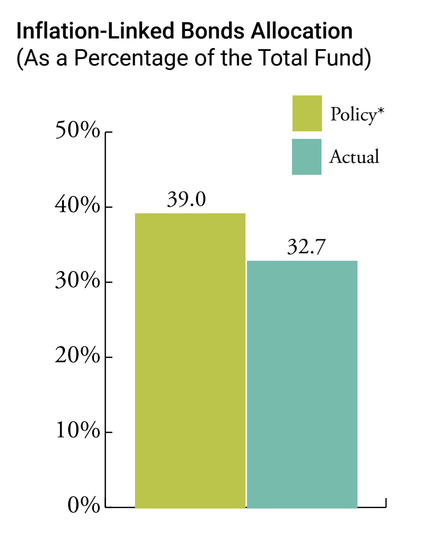
** As compared to the total commodities policy benchmark.*

Inflation-Linked Bonds

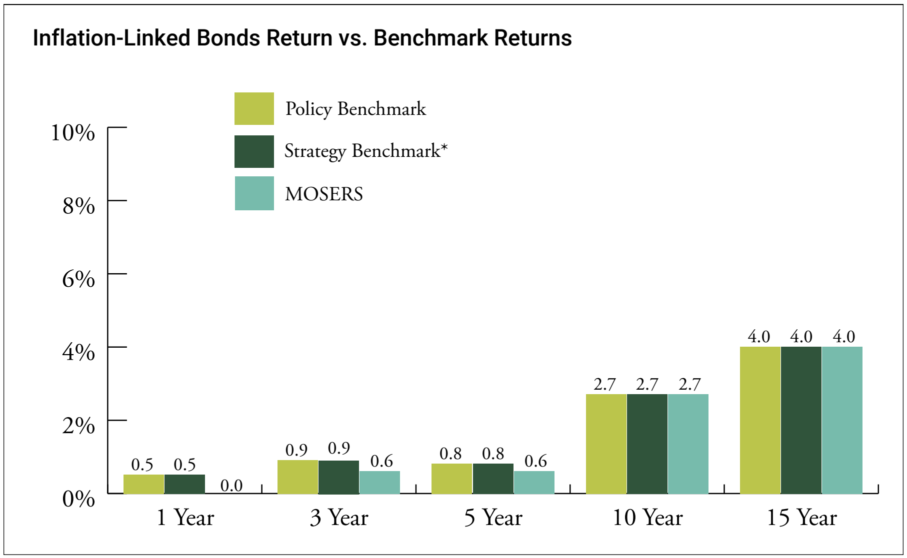
It is expected that investments in this asset class will perform well during periods of falling economic growth and rising inflation. Investments in this asset class include U.S. bonds that have been issued, collateralized or guaranteed by the U.S. Government, its agencies, or its instrumentalities. 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 no foreign currency exposure as part of this portfolio.

The United States underperformed other developed countries' inflation-linked bond markets over the past year. Inflation in the U.S. increased during the fiscal year to 2.9% year-over-year versus 1.6% as of June 30, 2017. The 10-year real rate (the interest rate after subtracting the inflation rate) on U.S. Treasury Inflation Protected Securities ("TIPS") increased about 0.2% during the fiscal year resulting in slightly lower performance for inflation-linked bonds. U.S. TIPS returned 2.1% as compared to inflation-linked bonds in Canada, 2.8%; Germany, 7.4%; Great Britain, 3.5%; and Japan, 3.0%.

As of June 30, 2018, the market exposure of the inflation-linked bond portfolio was $2,672,104,671, representing 32.7% of total market value. The graph below (left) illustrates the actual exposure compared to policy. For the fiscal year, the inflation-linked bond allocation returned just above 0% versus 0.5% for the inflation-linked bond policy benchmark. There was no internal or external active management strategy utilized during the year; thus providing a return that closely matched the benchmark. The graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.



* As of June 30, 2018, the inflation-linked bonds policy was Bloomberg Barclays U.S. TIPS 1-10 YR.



* As of June 30, 2018, the inflation-linked bonds strategy benchmark is equal to the inflation-linked bonds policy.

The table below shows the statistical performance that occurred within the inflation-linked bond portfolio in FY18. There was no commission brokerage activity within the inflation-linked bond portfolio in FY18.

Inflation-Linked Bonds – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year	10 Year	15 Year
Return	0.0%	0.6%	0.6%	2.7%	4.0%
Annualized standard deviation	1.7%	2.3%	2.9%	5.7%	6.1%
Sharpe ratio	(0.76)	(0.04)	0.06	0.41	0.45
Excess return*	(0.4)%	(0.4)%	(0.2)%	(0.1)%	0.0%
Beta*	0.98	0.99	1.00	1.00	1.00
Annualized alpha*	(0.4)%	(0.4)%	(0.2)%	(0.1)%	0.0%
Correlation*	1.00	1.00	1.00	1.00	1.00

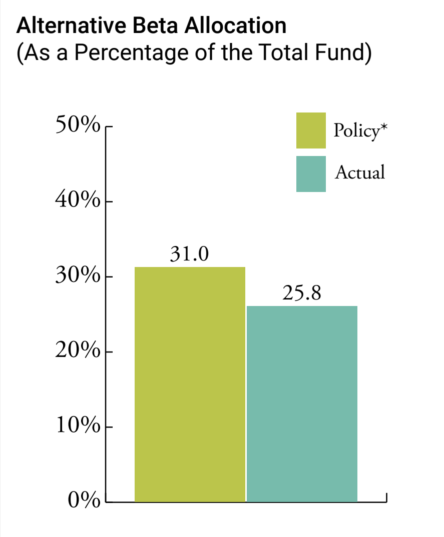
** As compared to the total inflation-linked bonds policy benchmark.*

Alternative Beta

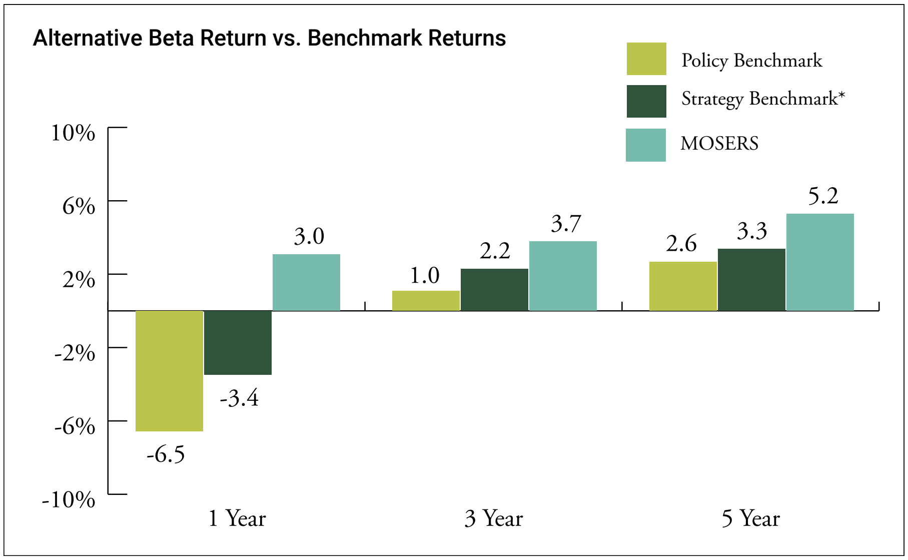
This asset class represents multiple hedge funds and alternative betas. The hedge funds have been selected because they invest in difficult to obtain risk premiums or they are expected to produce excess return over an otherwise easy to obtain risk premium. Hedge fund betas are expected to produce positive 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 benchmark performed poorly during the fiscal year led by weak performance from dedicated short bias and equity market neutral strategies which returned (26.7%) and (17.8%), respectively. Long/short equity and event driven strategies had the best performance as they returned 19.9% and 4.9% during the fiscal year, respectively.

As of June 30, 2018, the market exposure of the alternative beta portfolio was $2,110,615,527, representing 25.8% of total market value. The graph below (left) illustrates the actual exposure compared to policy. The alternative beta allocation returned 3.0% for the fiscal year versus (6.5%) for the alternative beta policy benchmark. The outperformance was attributable to active hedge fund managers who collectively represented approximately 40% of the allocation and returned 7.6% for the year. There was also outperformance due to the passive alternative beta strategies that returned (0.5%) for the fiscal year. The graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.



* As of June 30, 2018, the alternative beta policy was AQR Delta.



* As of June 30, 2018, the total alternative beta strategy benchmark was comprised of the following components: 70.3% total alternative beta policy, 2.5% JPM GBI-EM Global Diversified, 11.3% S&P Systematic Global Macro Index, 15.3% Bloomberg Barclays U.S. Aggregate Excess Return plus 90-day T-bill and 0.7% actual return of one strategy.

The table below shows the statistical performance that occurred within the alternative betas portfolio in FY18. There was no commission brokerage activity within the alternative betas portfolio in FY18.

Alternative Beta – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year
Return	3.0%	3.7%	5.2%
Annualized standard deviation	2.5%	2.2%	2.5%
Sharpe ratio	0.65	1.41	1.94
Excess return*	9.5%	2.6%	2.6%
Beta*	0.30	0.19	0.25
Annualized alpha*	4.9%	3.4%	4.4%
Correlation*	0.87	0.53	0.62

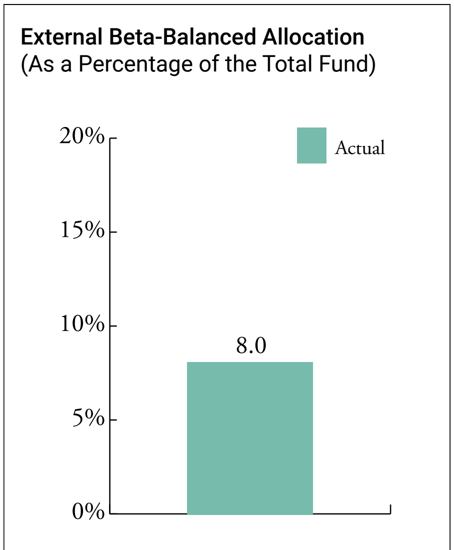
**As compared to the total alternative betas policy benchmark.*

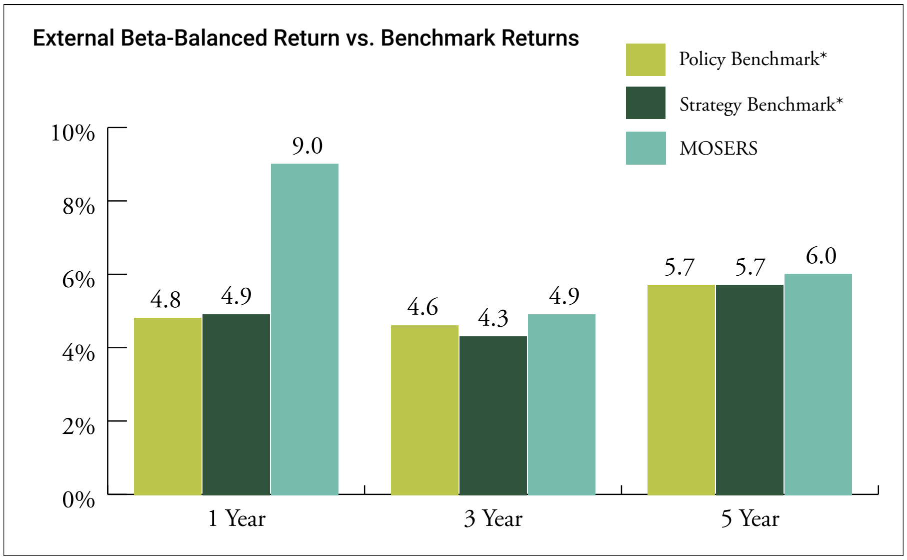
External Beta-Balanced

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 8.9% for the fiscal year after returning 6.2% last fiscal year. AQR returned 9.1% for the fiscal year after returning 7.1% last fiscal year. This fiscal year performance of both managers was above median compared with other risk parity 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, 2018, the external beta-balanced portfolio returned 9.0% for the fiscal year and represented 8.0%, or $654,716,871 of market value. The 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 4.2%. The graph below (right) illustrates actual performance as compared to the policy and strategy benchmarks.





* As of June 30, 2018, 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.

The table below shows the statistical performance that occurred within the external risk parity portfolio in FY18. There was no commission brokerage activity within the external risk parity portfolio in FY18.

External Beta-Balanced – Statistical Performance

Portfolio Characteristics	1 Year	3 Year	5 Year
Return	9.0%	4.9%	6.0%
Annualized standard deviation	6.0%	8.0%	8.5%
Sharpe ratio	1.28	0.53	0.67
Excess return*	4.2%	0.3%	0.3%
Beta*	0.83	1.10	1.17
Annualized alpha*	4.7%	(0.1)%	(0.5)%
Correlation*	0.95	0.90	0.92

**As compared to the total policy benchmark.*

Securities Lending Program

During the fiscal year ending June 30, 2018, MOSERS did not earn any income through its securities lending program. 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 2018, there was no income from domestic equity, international equity or fixed income. There were no loans outstanding during the fiscal year. 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)
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
2018	0	0	0.0	0.0	0

International Equity

Fiscal Year	Average Lendable	Average on Loan	Average Utilization	Lending Margin (Basis Points)	Net Income
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
2018	0	0	0.0	0.0	0

Fixed Income

Fiscal Year	Average Lendable	Average on Loan	Average Utilization	Lending Margin (Basis Points)	Net Income
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
2018	0	0	0.0	0.0	0