

STATE OF MICHIGAN INVESTMENT BOARD MEETING

December 8, 2022

State of Michigan Retirement System
Quarterly Investment Review



Rachael Eubanks, State Treasurer
Prepared by Bureau of Investments
Michigan Department of Treasury

**STATE OF MICHIGAN INVESTMENT BOARD MEETING
DECEMBER 8, 2022**

Agenda



- 9:30 a.m. Call to Order and Opening Remarks
Approval of the 9/22/22 SMIB Meeting Minutes**
- 9:35 a.m. Executive Summary & Performance for Periods Ending 9/30/22**
- 9:40 a.m. Asset Allocation Review
Markets Review and Outlook**
- 9:50 a.m. Fixed Income Update**
- 10:15 a.m. Guest Speaker: Jeffrey Moore, CFA - Fidelity Investments**
- 10:55 a.m. Review of Investment Reports**
- **Private Equity – Receive and File**
 - **Domestic Equity – Receive and File**
 - **International Equity – Receive and File**
 - **Real Return & Opportunistic – Receive and File**
 - **Real Estate & Infrastructure – Receive and File**
 - **Absolute Return – Receive and File**
 - **Defined Contribution – Receive and File**
- Public Comment**
- 11:00 a.m. Closing Remarks ~ Adjournment**



2023 Meeting Schedule

**Thursday, March 23, 2023
Thursday, June 29, 2023
Thursday, September 28, 2023
Wednesday, December 13, 2023**

All meetings start at 9:30 a.m.

State of Michigan Retirement System

MINUTES

State of Michigan Investment Board Meeting

December 8, 2022



Robert L. Brackenbury
Deputy Chief Investment Officer
Bureau of Investments

STATE OF MICHIGAN INVESTMENT BOARD

September 22, 2022 Meeting Minutes

Board Members

Chairman - Treasurer Rachael Eubanks
Mr. Chris Harkins - State Budget Director
Mr. Reginald Sanders
Ms. Dina Richards

Members of the Public and Bureau of Investments Staff in Attendance:

| | | |
|--------------------|-------------|-----------------|
| Robert Brackenbury | Greg Parker | John Sullivan |
| Karl Borgquist | Max Kotary | Phil Kivarkis |
| Jon Braeutigam | Aaron Haftl | Dan Quigley |
| Jim Elkins | Janet Sudac | Richard Holcomb |
| Lan Chen | | |

Many others attended via Microsoft Teams.

Opening Remarks:

Rachael Eubanks called the meeting to order at 9:33 am.

Approval of Minutes:

Approval of the June 23, 2022 SMIB Meeting Minutes – Motion to approve by Chris Harkins.
Seconded: Reginald Sanders. The vote was unanimous to approve.

AGENDA

Executive Summary

Mr. Jon Braeutigam, Chief Investment Officer for the Bureau of Investments, began by introducing Ms. Lan Chen who has been selected as the new Senior Investment Manager of the Defined Contribution, Trusts & Agencies Division. He opened the floor to Lan who gave a brief personal background of herself. She was welcomed.

Diving into the executive summary performance section, Mr. Braeutigam pointed out the long-term returns of the SMRS, the 10-year performance of 10.3%, the 7-year of 9.4% and the 5-year return of 10.3%. These are excellent returns for these time periods.

One reason for the outperformance is that the SMRS added an absolute return strategy to the portfolio about ten years ago. This is a more bond-like structure worked into the asset allocation.

He thanked SMRS' staff for their hard work and SMRS' leaders for performing excellent due diligence.

Mr. Braeutigam stated that today's meeting will take a look at the Asset Allocation Study that was recently completed. We have this performed every two years. Most pension funds will have this study completed about every three to four years.

Asset Allocation Review

Mr. Gregory Parker, Director of Investments – Public Markets began with a few words on the current state of asset allocation. It is helpful to understand where the capital is allocated at the end of June 2022. We are heavily invested in equities. Comparing this to the asset allocation of June 2021, some changes can be identified. These changes come about two ways. One is differences in returns in the various asset classes and two is capital flow movements.

Mr. Parker stated that the Funds collectively paid out \$1.5 billion in the last 12 months and explained how this was accomplished.

He explained the current strategic target in the current allocation to the various asset classes. Private equity is over their target of 16% by a little over 9%. Domestic equity is under the target by about 6%. Everything else is plus or minus a percent or two. It is very difficult to dial in precisely period-to-period the asset allocation, so we use targets.

Great news on the over allocation to private equity. We got there because we had fantastic investment returns. It is difficult to make changes in the more illiquid private markets, so over time as distributions pick up, we will see this asset class trend back towards target, giving opportunities to rebalance excess capital to the other asset classes.

Guest Speakers:

Mr. Phil Kivarkis, Partner – U.S. Director of Investment Policy Services, AON
Mr. John Sullivan, Jr., Associate Partner – Asset-Liability Management, AON

Mr. Phil Kivarkis and Mr. John Sullivan presented the Asset-Liability Study Overview performed by AON. An asset liability study is a comprehensive toolkit for making decisions on a Fund's asset allocation and investment risk that align with the liabilities the Fund supports. Key topics of this study included the mix of return-seeking versus risk-reducing assets, liquidity, and funding interaction. This study and the conclusions of the study were explained and discussed at length.

Action Item:

Resolution Authorizing Asset Allocation Strategy

Motion by Dina Richard to approve, seconded by Reginald Sanders. The motion to adopt the new policy was unanimously approved.

Markets Review and Outlook:

As time remained, Mr. Gregory Parker, Director of Investments – Public Markets was called on to report on the current markets.

Public Comment:

One public comment was made by Mary Pollack. She asked if the resolution just passed applied to all funds or is it just designated for MPSERS? The Treasurer responded by stating that the resolution is intended for all Plans.

Adjournment:

Motion to adjourn by Dina Richard. Seconded: Reginald Sanders. The meeting concluded at 11:00 am.

Approved:

Rachael Eubanks, Chairman

State of Michigan Retirement System

EXECUTIVE SUMMARY

State of Michigan Investment Board Meeting

December 8, 2022



Robert L. Brackenbury
Deputy Chief Investment Officer
Bureau of Investments

EXECUTIVE SUMMARY

September 30, 2022

Performance

Great peer comparison.

| MPSERS Plan (9/30/22) | 1-Year | 3-Years | 5-Years | 7-Years | 10-Years |
|-----------------------|--------|---------|---------|---------|----------|
| Annualized Returns | -4.4% | 8.7% | 8.6% | 9.2% | 9.5% |
| Policy Returns | -7.6% | 6.5% | 7.2% | 8.5% | 8.8% |
| Peer Median Returns* | -7.3% | 6.7% | 6.6% | 7.8% | 7.4% |

*State Street Universe greater than \$10 billion.

- Over the past one, three, five, seven, and ten years, the returns are significantly higher than peer median returns. The peers are defined as the State Street Universe of public pension plans greater than \$10 billion. Notably, the standard deviation of the monthly returns is below average for the longer time horizons.
- Over a very long horizon, since 1979, the annualized rate of return on the plan assets has been approximately 9.3%.
- Compounding at higher than peer returns can add significant value. For example, based on the \$50.6 billion September 2012 market value, a ten-year annualized return of 9.5% compared to the 7.4% peer median return added approximately \$22.1 billion in excess value.

Asset Allocation

A low return environment.

- Given the investment return available in the capital markets for safe assets, and in order to earn the actuarial rate of return, investment risks (primarily equity risk) must be assumed. The spread between the required rate of return, and the risk-free rate is approximately 275 bps. At the end of September 2022, the equity risk (beta) is approximately 0.37; lower than peer median at approximately 0.55.
- Liquidity is another fundamental risk assumed and it is managed through asset allocation. The plans have outstanding capital commitments to fund approximately \$16.0 billion in illiquid assets, primarily in private equity. In the September 2022 quarter, \$200 million of new commitments were made.
- The combined systems paid out approximately \$1.3 billion net of contributions over the past twelve months ending in September 2022. Over the past year, the allocation to real return and opportunistic was reduced by \$2.2 billion, private equity and domestic equity were reduced by \$1.3 billion each, international equity by \$200 million, and long-term fixed income by approximately \$100 million. Over the past year, the allocation to absolute return increased by \$3.9 billion, and real estate by \$1.3 billion.

NEW COMMITMENTS

July 1, 2022 – September 30, 2022

(\$ Millions)

| Asset class | Fund Name / (Managed By) | Commitment |
|---------------------------------------|---|-------------------|
| Real Estate and Infrastructure | | |
| | Blackstone Energy Transition Partners IV, LP (Blackstone Management Partners, LLC) | \$ 100 |
| | Blackstone Green Private Credit Fund III, LP (Blackstone Alternative Credit Advisors, LP) | 100 |
| TOTAL | | \$200 |

State of Michigan Retirement System

PERFORMANCE

State of Michigan Investment Board Meeting

December 8, 2022



Robert L. Brackenbury
Deputy Chief Investment Officer
Bureau of Investments

Bureau of Investments

Mission Statement

The Bureau of Investments continually strives to provide quality investment management services, broad professional expertise, and independent advice to the State of Michigan Investment Board as fiduciary of the State of Michigan Retirement System, and independent of the Board, to the State Treasurer for various Michigan trust funds and the State's common cash, for which the State Treasurer is the fiduciary.

SMRS Goals

Maintain sufficient liquidity to pay benefits.

*Meet or exceed the actuarial assumption
over the long term.*

*Perform in the top half of the public plan
universe over the long term.*

Diversify assets to reduce risk.

*Exceed individual asset class benchmarks
over the long term.*

MPERS PENSION

Time-Weighted Rates of Return

Periods Ending September 30, 2022

| | % of Portfolio 9/30/22 | Ten Years ¹ | | Seven Years ¹ | | Five Years ¹ | | Three Years ¹ | | One Year | | Current Quarter | |
|--|---------------------------|------------------------|-----------|--------------------------|-----------|-------------------------|-----------|--------------------------|-----------|--------------|-----------|-----------------|-----------|
| | | Rate | Rank | Rate | Rank | Rate | Rank | Rate | Rank | Rate | Rank | Rate | Rank |
| TOTAL PLAN | 100.0 | 9.5 | 12 | 9.2 | 11 | 8.6 | 12 | 8.7 | 12 | -4.4 | 12 | -3.6 | 46 |
| Median - Greater than \$10 Billion ² | | 7.4 | | 7.8 | | 6.6 | | 6.7 | | -7.3 | | -3.8 | |
| MPERS Total Plan Policy | | 8.8 | | 8.5 | | 7.2 | | 6.5 | | -7.6 | | -5.3 | |
| PRIVATE EQUITY AND VENTURE CAPITAL | 25.6 | 16.7 | 8 | 16.4 | 11 | 19.2 | 17 | 21.9 | 13 | 9.5 | 56 | -3.5 | 79 |
| Median ² | | 11.1 | | 10.7 | | 11.2 | | 12.7 | | 9.9 | | -1.2 | |
| Private Equity and VC Benchmark ³ | | 16.3 | | 14.5 | | 14.6 | | 13.9 | | -7.9 | | -15.4 | |
| DOMESTIC EQUITIES | 18.1 | 10.9 | 30 | 9.9 | 32 | 7.6 | 40 | 5.2 | 66 | -21.1 | 90 | -6.4 | 90 |
| Median ² | | 8.4 | | 8.4 | | 6.3 | | 5.8 | | -16.3 | | -4.9 | |
| S&P 1500 Index | | 11.6 | | 11.2 | | 8.9 | | 8.0 | | -15.6 | | -4.8 | |
| INTERNATIONAL EQUITIES | 12.4 | 3.9 | 66 | 3.8 | 52 | -0.5 | 83 | -1.1 | 71 | -27.5 | 75 | -9.8 | 68 |
| Median ² | | 4.0 | | 3.8 | | -0.1 | | -0.7 | | -25.1 | | -9.5 | |
| MSCI ACWI ex USA Net Index ⁴ | | 3.1 | | 3.3 | | -0.8 | | -1.5 | | -25.2 | | -9.9 | |
| REAL RETURN AND OPPORTUNISTIC | 12.0 | 12.3 | | 12.1 | | 13.5 | | 14.2 | | 11.8 | | -1.1 | |
| 50% (CPI + 4%) + 50% (actuarial rate) ⁵ | | 7.4 | | 7.6 | | 7.6 | | 7.9 | | 9.2 | | 1.3 | |
| REAL ESTATE & INFRASTRUCTURE | 11.0 | 10.9 | 46 | 9.9 | 55 | 10.2 | 47 | 10.2 | 62 | 25.8 | 27 | 2.8 | 34 |
| Median ² | | 10.5 | | 10.0 | | 10.2 | | 10.9 | | 23.8 | | 0.7 | |
| NCREIF Property Index ⁶ | | 8.1 | | 7.1 | | 7.2 | | 8.5 | | 14.6 | | 0.3 | |
| NCREIF Open Fund Index Net | | 9.9 | | 8.9 | | 9.3 | | 11.4 | | 21.0 | | 0.3 | |
| ABSOLUTE RETURN | 10.3 | 5.9 | | 5.4 | | 6.3 | | 7.2 | | 3.5 | | -0.8 | |
| 1-Month T-Bill + 400 bps | | 4.6 | | 4.9 | | 5.1 | | 4.5 | | 4.6 | | 4.5 | |
| HFR Benchmark ⁷ | | 3.8 | | 3.3 | | 4.0 | | 4.9 | | 0.4 | | -0.5 | |
| FIXED INCOME | 9.4 | 2.3 | 17 | 2.2 | 24 | 1.0 | 22 | -1.8 | 28 | -11.8 | 28 | -3.5 | 26 |
| Median ² | | 1.3 | | 1.2 | | 0.3 | | -2.3 | | -14.5 | | -4.3 | |
| Bloomberg US Agg Index | | 0.9 | | 0.5 | | -0.3 | | -3.3 | | -14.6 | | -4.8 | |
| CASH EQUIVALENTS | 1.2 | 1.0 | | 1.3 | | 1.5 | | 0.9 | | 0.9 | | 0.6 | |
| 1 Month T-Bill | | 0.6 | | 0.9 | | 1.1 | | 0.5 | | 0.6 | | 0.5 | |

¹ Annualized Returns and Percentile Rank.

² Comparison universe is the State Street Universe comprised of Public Funds greater than \$10 billion on the total plan level and greater than \$1 billion for asset classes.

³ SP500 + 300 bps with a 3 month lag.

⁴ History from 10/1/2010 to 6/30/14 reflects MSCI ACWI ex USA (gross).

⁵ Current actuarial rate is 6%. History prior to 12/1/18 reflects 50% (CPI +5%) + 50% (actuarial rate).

⁶ NCREIF Property Index is NPI minus 130 bps.

⁷ FOF Conservative 1 month lagged.

Source: State Street Analytics; the NCREIF - NPI (Property Index) source is NCREIF.

Cumulative and Consecutive Total Fund Returns

MPSERS

Cumulative For Years Ending 9/30/22

| | 1 Year | 2 Year | 3 Year | 4 Year | 5 Year | 6 Year | 7 Year | 8 Year | 9 Year | 10 Year |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| MPSERS | -4.4 | 10.5 | 8.7 | 7.9 | 8.6 | 9.5 | 9.2 | 8.4 | 9.1 | 9.5 |
| Public Plan - Median (> \$10 billion)* | -7.3 | 6.5 | 6.7 | 6.4 | 6.6 | 7.5 | 7.8 | 6.6 | 6.8 | 7.4 |
| Rank | 12 | 16 | 12 | 12 | 12 | 11 | 11 | 12 | 12 | 12 |
| bp Difference - Median | 286 | 401 | 202 | 153 | 209 | 196 | 146 | 179 | 233 | 211 |

Consecutive For Years Ending

| | 09/22 | 09/21 | 09/20 | 09/19 | 09/18 | 09/17 | 09/16 | 09/15 | 09/14 | 09/13 |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| MPSERS | -4.4 | 27.7 | 5.3 | 5.6 | 11.6 | 13.8 | 7.6 | 2.6 | 15.6 | 12.5 |
| Public Plan - Median (> \$10 billion)* | -7.3 | 22.5 | 7.1 | 5.5 | 7.8 | 12.8 | 9.3 | -0.1 | 11.0 | 12.8 |
| Rank | 12 | 10 | 84 | 46 | 6 | 24 | 88 | 6 | 5 | 57 |
| bp Difference - Median | 286 | 521 | -183 | 12 | 380 | 103 | -173 | 270 | 459 | -32 |

MSERS

Cumulative For Years Ending 9/30/22

| | 1 Year | 2 Year | 3 Year | 4 Year | 5 Year | 6 Year | 7 Year | 8 Year | 9 Year | 10 Year |
|---------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| MSERS | -4.4 | 10.5 | 8.7 | 7.9 | 8.7 | 9.5 | 9.2 | 8.4 | 9.1 | 9.5 |
| Public Plan - Median (> \$1 billion)* | -9.1 | 5.4 | 6.1 | 5.6 | 6.1 | 7.2 | 7.6 | 6.5 | 6.7 | 7.4 |
| Rank | 8 | 11 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 9 |
| bp Difference - Median | 464 | 513 | 259 | 237 | 252 | 232 | 165 | 185 | 241 | 210 |

Consecutive For Years Ending

| | 09/22 | 09/21 | 09/20 | 09/19 | 09/18 | 09/17 | 09/16 | 09/15 | 09/14 | 09/13 |
|---------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| MSERS | -4.4 | 27.8 | 5.3 | 5.6 | 11.5 | 13.8 | 7.6 | 2.6 | 15.5 | 12.5 |
| Public Plan - Median (> \$1 billion)* | -9.1 | 22.3 | 7.1 | 5.0 | 7.8 | 12.7 | 9.8 | -0.1 | 10.3 | 12.6 |
| Rank | 8 | 6 | 81 | 36 | 7 | 28 | 86 | 4 | 5 | 53 |
| bp Difference - Median | 464 | 545 | -179 | 58 | 371 | 116 | -217 | 264 | 522 | -15 |

Cumulative and Consecutive Total Fund Returns

MSPRS

Cumulative For Years Ending 9/30/22

| | 1 Year | 2 Year | 3 Year | 4 Year | 5 Year | 6 Year | 7 Year | 8 Year | 9 Year | 10 Year |
|---------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| MSPRS | -4.5 | 10.5 | 8.7 | 7.9 | 8.6 | 9.5 | 9.2 | 8.4 | 9.1 | 9.4 |
| Public Plan - Median (> \$1 billion)* | -9.1 | 5.4 | 6.1 | 5.6 | 6.1 | 7.2 | 7.6 | 6.5 | 6.7 | 7.4 |
| Rank | 8 | 12 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 9 |
| bp Difference - Median | 461 | 509 | 257 | 234 | 250 | 230 | 164 | 183 | 239 | 207 |

Consecutive For Years Ending

| | 09/22 | 09/21 | 09/20 | 09/19 | 09/18 | 09/17 | 09/16 | 09/15 | 09/14 | 09/13 |
|---------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| MSPRS | -4.5 | 27.7 | 5.3 | 5.6 | 11.5 | 13.8 | 7.6 | 2.5 | 15.5 | 12.4 |
| Public Plan - Median (> \$1 billion)* | -9.1 | 22.3 | 7.1 | 5.0 | 7.8 | 12.7 | 9.8 | -0.1 | 10.3 | 12.6 |
| Rank | 8 | 7 | 80 | 37 | 7 | 28 | 86 | 4 | 5 | 53 |
| bp Difference - Median | 461 | 537 | -176 | 55 | 370 | 116 | -218 | 263 | 514 | -20 |

MJRS

Cumulative For Years Ending 9/30/22

| | 1 Year | 2 Year | 3 Year | 4 Year | 5 Year | 6 Year | 7 Year | 8 Year | 9 Year | 10 Year |
|---------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| MJRS | -4.9 | 9.7 | 8.2 | 7.5 | 8.3 | 9.2 | 9.0 | 8.2 | 8.9 | 9.2 |
| Public Plan - Median (> \$1 billion)* | -9.1 | 5.4 | 6.1 | 5.6 | 6.1 | 7.2 | 7.6 | 6.5 | 6.7 | 7.4 |
| Rank | 12 | 13 | 11 | 10 | 9 | 8 | 10 | 9 | 9 | 10 |
| bp Difference - Median | 419 | 428 | 204 | 195 | 217 | 205 | 142 | 164 | 215 | 183 |

Consecutive For Years Ending

| | 09/22 | 09/21 | 09/20 | 09/19 | 09/18 | 09/17 | 09/16 | 09/15 | 09/14 | 09/13 |
|---------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| MJRS | -4.9 | 26.4 | 5.3 | 5.6 | 11.5 | 13.9 | 7.6 | 2.5 | 14.9 | 12.1 |
| Public Plan - Median (> \$1 billion)* | -9.1 | 22.3 | 7.1 | 5.0 | 7.8 | 12.7 | 9.8 | -0.1 | 10.3 | 12.6 |
| Rank | 12 | 11 | 80 | 37 | 7 | 28 | 86 | 4 | 5 | 65 |
| bp Difference - Median | 419 | 406 | -175 | 56 | 368 | 124 | -217 | 261 | 457 | -54 |

State of Michigan Retirement System

ASSET ALLOCATION REVIEW

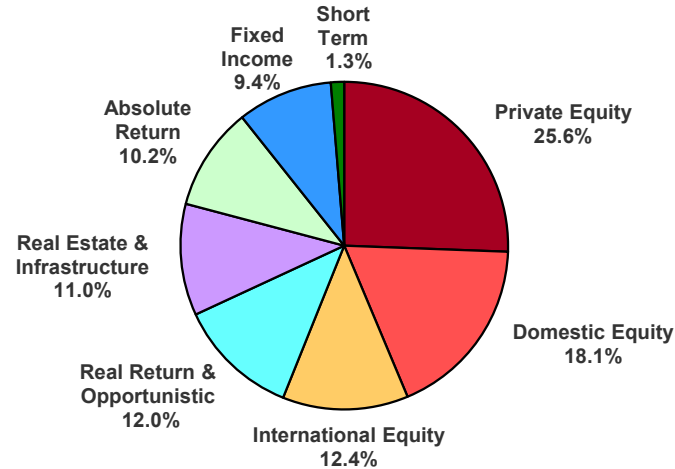
State of Michigan Investment Board Meeting
December 8, 2022



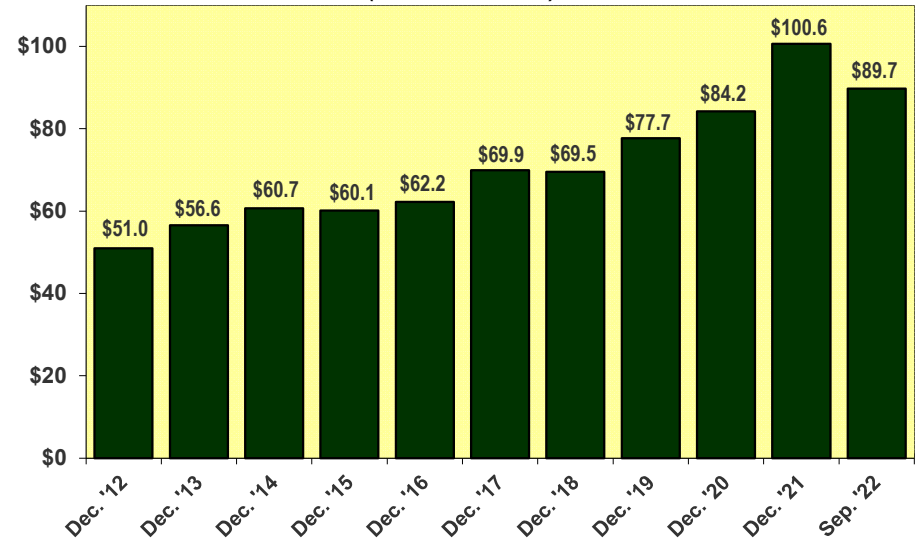
Gregory J. Parker, CFA
Director of Investments – Public Markets
Director of Asset Allocation
Bureau of Investments

STATE OF MICHIGAN RETIREMENT SYSTEM PROFILE - SEPTEMBER 2022

Asset Allocation ~ 9/30/22



**Market Value*
(Billions of Dollars)**



**Asset Allocation By Market Value
(In Millions)**

| Investment Strategies | 9/30/2022 | | 9/30/2021 | |
|------------------------------|-----------------|---------------|-----------------|---------------|
| | Mkt. Value | % | Mkt. Value | % |
| Private Equity | \$22,961 | 25.6% | \$22,255 | 23.3% |
| Domestic Equity | 16,271 | 18.1% | 21,958 | 23.0% |
| International Equity | 11,105 | 12.4% | 15,538 | 16.3% |
| Real Return & Opportunistic | 10,752 | 12.0% | 11,600 | 12.2% |
| Real Estate & Infrastructure | 9,853 | 11.0% | 6,710 | 7.0% |
| Absolute Return | 9,205 | 10.2% | 5,116 | 5.4% |
| Fixed Income | 8,399 | 9.4% | 9,656 | 10.1% |
| Short Term*** | 1,157 | 1.3% | 2,568 | 2.7% |
| TOTAL | \$89,703 | 100.0% | \$95,401 | 100.0% |

**Market Value By Plan ~ 9/30/22
(in Millions)**

| Pension Plan | OPEB** | | Combined | % |
|------------------|-----------------|-----------------|-----------------|---------------|
| | Mkt. Value | Mkt. Value | | |
| MPSERS | \$59,014 | \$10,475 | \$69,489 | 77.5% |
| MSERS - (closed) | 13,054 | 4,844 | 17,898 | 19.9% |
| MSPRS | 1,682 | 358 | 2,040 | 2.3% |
| MJRS - (closed) | 265 | 11 | 276 | 0.3% |
| TOTAL | \$74,015 | \$15,688 | \$89,703 | 100.0% |

MSERS includes the Military Pension Fund

Short Term Equivalents (in Billions)

| | | |
|-------------------------------------|--------------|----------------------------|
| Short Term Strategy*** | \$1.2 | |
| Short Term in Other Inv. Strategies | 1.3 | |
| TOTAL SHORT TERM | \$2.5 | 2.7% of Total Funds |

16th Largest State Public Retirement System in the U.S.

Pensions & Investments survey - February 14, 2022 issue

*The combined net payout for the plans for FY 2021 was \$1.5 billion with \$24.4 billion paid out FY 2010 thru FY 2021 (Pension ACFRs). This represents the amount paid to beneficiaries in excess of employer and employee contributions.

**OPEB - Other Post Employment Benefits

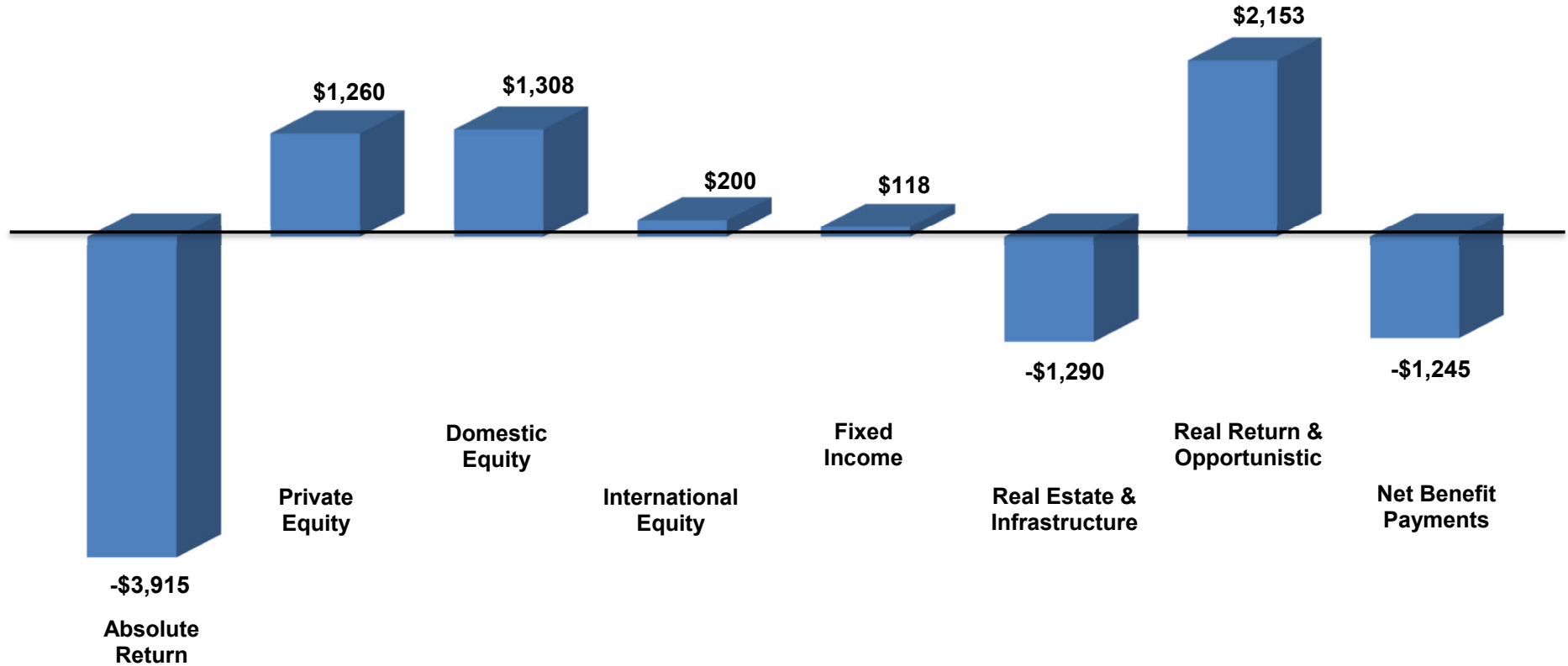
Sources and Uses of Cash

October 2021 ~ September 2022

10/01/21 Short-Term Cash Balance: \$ 2,570

9/30/22 Short-Term Cash Balance: 1,159

Net Short-Term Cash Decrease: \$ 1,411



A negative number in an asset category indicates a use of cash, a positive number indicates a source of cash.

Dollars in millions

Asset Allocation Targets

As of 9/30/22

| | MPSERS | | MSERS | | MSPRS | | MJRS | | SMRS |
|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---------------|
| <i>Asset Class</i> | <i>9/30/22</i> | <i>Target*</i> | <i>9/30/22</i> | <i>Target*</i> | <i>9/30/22</i> | <i>Target*</i> | <i>9/30/22</i> | <i>Target*</i> | <i>Ranges</i> |
| Private Equity | 25.6% | 16.0% | 25.6% | 16.0% | 25.6% | 16.0% | 25.5% | 16.0% | 13% - 27% |
| Domestic Equity | 18.1% | 25.0% | 18.1% | 25.0% | 18.1% | 25.0% | 18.0% | 25.0% | 17% - 32% |
| International Equity | 12.4% | 15.0% | 12.4% | 15.0% | 12.4% | 15.0% | 12.2% | 15.0% | 12% - 22% |
| Real Return & Opportunistic | 12.0% | 10.0% | 12.0% | 10.0% | 12.0% | 10.0% | 11.8% | 10.0% | 8% - 18% |
| Real Estate & Infrastructure | 11.0% | 10.0% | 11.0% | 10.0% | 11.0% | 10.0% | 10.8% | 10.0% | 8% - 18% |
| Absolute Return | 10.3% | 9.0% | 10.3% | 9.0% | 10.3% | 9.0% | 10.1% | 9.0% | 5% - 11% |
| Long Term Fixed Income | 9.4% | 13.0% | 9.4% | 13.0% | 9.4% | 13.0% | 9.2% | 13.0% | 8% - 18% |
| Short Term Fixed Income | 1.2% | 2.0% | 1.2% | 2.0% | 1.2% | 2.0% | 2.4% | 2.0% | 1% - 8% |
| TOTAL | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | |

*Complies with basket clause and international restrictions.

State of Michigan Retirement System

MARKETS REVIEW AND OUTLOOK

State of Michigan Investment Board Meeting

December 8, 2022



Gregory J. Parker, CFA
Director of Investments – Public Markets
Director of Asset Allocation
Bureau of Investments

CAPITAL MARKETS

Return and Risk Assumptions, Benchmark and Outlook

A starting point.

| MPSERS Plan | Assumed Return* (Arithmetic) | Standard Deviation* | Trailing 10-Year (Benchmark**) |
|-------------------------|------------------------------|---------------------|--------------------------------|
| Private Equity | 12.6% | 25.0% | 16.3% |
| International Equity | 9.7% | 20.5% | 3.0% |
| Real Ret/Oppportunistic | 10.2% | 14.8% | 7.4% |
| Domestic Equity | 8.8% | 17.5% | 11.6% |
| Real Estate | 9.1% | 20.0% | 8.1% |
| Absolute Return | 7.9% | 9.0% | 3.8% |
| Long-Term Fixed Income | 4.8% | 4.0% | 0.9% |
| Short-Term | 3.8% | 1.0% | 0.6% |

* Aon Investment Consultants 2022 Long-Term Return/Risk Assumptions

** Investment Policy Statement; Annualized Returns

*** Actual investments may differ due to changing conditions and the availability of new information

Overview

A market update.

- During the September 2022 quarter, the U.S. Federal Reserve Board increased the policy interest rate twice by a combined 150 basis points. As a result of these actions, the yield curve from the 2-year maturity to the 10-year maturity is inverted by approximately 45 bps. This is the greatest differences in these two yields since April 2000. Market prices at the end of the quarter suggested the Fed would hike an additional 125 basis points over the next six months.
- The broad U.S. stock market return for the one year ending September 2022 was -15.6%, which is down over 25% from its high. Most of the loss occurred in the month of September when the S&P 500 lost -9.2% of value. A decline in the market more than 20% is sometimes referred to as a bear market.
- International equities dramatically underperformed domestic equities for the year ending September 2022 by -9.6%. Over the past three, five, seven, and ten years, the international market index, MSCI ACWI ex USA, underperformed the S&P 1500 index by -9.5%, -9.7%, -7.9%, and -8.5% annualized, respectively.
- There are two key variables that explain most of the under-performance of international vs. U.S. equities over the past decade; the appreciating value of the U.S. dollar and the valuation multiple changes of the markets. Each is responsible for explaining approximately half of the relative returns.
- Fed policy remains ultra-accommodative, and the attention has turned towards inflation. The September 2022 reading for non-seasonally adjusted year-over-year CPI was 8.2% which was down from 9.1% the quarter prior. For comparison, the 20-year average for CPI is 2.3%.

U.S. Fixed Income

Repricing within the fixed income markets

- The repricing happening within the fixed income market is remarkable. During the month of September 2022, the 10-year U.S. Treasury rate hit a high mark of 3.95%. This is the highest level since 2010. Coinciding with the high in long-term rates, the benchmark U.S. Aggregate index yield to maturity hit a high level of 4.86%. This is the highest yield since December 2008.
- During the September 2022 quarter, the U.S. Federal Reserve Board increased the policy interest rate twice by a combined 150 basis points. As a result of these actions, the yield curve from the 2-year maturity to the 10-year maturity is inverted by approximately 45 bps. This is the greatest differences in these two yields since April 2000. Market prices at the end of the quarter suggested the Fed would hike an additional 125 basis points over the next six months.
- Interest rates at both the long and short end are earning less than the year-over-year increase in CPI. In fact, going back to the mid 1950's, the Fed Funds rate relative to the year over year change in CPI has never been lower. This fact is indicative of extremely accommodative Federal Reserve policies and critics of the Fed are growing louder.
- Over the past year, investment grade corporate spreads have widened by approximately 70 bps. High yield spreads have also widened over the past year; by approximately 260 bps. Both spreads are higher than long-term averages, reflecting investor's concerns that the U.S. economy could be soon headed into a recession.

Domestic Equity

Correction in domestic equity prices.

- The broad U.S. stock market return for the one year ending September 2022 was -15.6%, which is down over 25% from its high. Most of the loss occurred in the month of September when the S&P 500 lost -9.2% of value. A decline in the market more than 20% is sometimes referred to as a bear market.
- With the correction in prices, many valuation metrics are near historical averages, suggesting the market is fairly priced. The concern is that the risk of a potential recession may not be fully priced in, and many strategists believe that if a recession were to actually materialize, valuations will continue to cheapen.
- Fundamentally, the market's returns on equity continue to be historically higher than average and some of the largest companies in the market today are less cyclical (economically sensitive) than past market leaders. These facts lend support to the argument that higher valuations are justified, and therefore the market could perhaps continue to deliver historical average rates of return in the future.

International Equity

Good relative valuations.

- International equities dramatically underperformed domestic equities for the year ending September 2022 by -9.6%. Over the past three, five, seven, and ten years, the international market index, MSCI ACWI ex USA, underperformed the S&P 1500 index by -9.5%, -9.7%, -7.9%, and -8.5% annualized, respectively.
- There are two key variables that explain most of the under-performance of international vs. U.S. equities over the past decade; the appreciating value of the U.S. dollar and the valuation multiple changes of the markets. Each is responsible for explaining approximately half of the relative returns.
- The DXY index is often referred to as a measure of U.S. dollar value relative to other developed nation currencies. At the end of September 2022, the index hit a value of 112, a twenty-year high. Year-over-year, the value rose 19% and over the past ten years the value has appreciated by approximately 3.5% annually. By several measures, the price is technically and fundamentally stretched.
- Based on a price-to-earnings valuation multiple, excluding non-earning companies, developed international markets trade at approximately a 37% discount to U.S. counterparts while emerging markets are at a 45% discount.

Real Estate

Comparing public vs. private real estate.

- Over the one year ending September 2022, the NAREIT index decreased by -16.3% including dividends, which was -38% lower than their private market counterparts. Over the medium to longer-term, publicly traded REITs have earned 0.5% - 1.5% higher return than their private market counterparts but they are about three times more volatile.
- Dividend yields on REITs at the end of September 2022 were estimated to be around 3.8%, which is nearly the same as the yield of the 10-year U.S. Treasury. This is approximately 1.2% below the historical metric.

Commodities

Inflation; supply and demand issues.

- Fed policy remains ultra-accommodative, and the attention has turned towards inflation. The September 2022 reading for non-seasonally adjusted year-over-year CPI was 8.2% which was down from 9.1% the quarter prior. For comparison, the 20-year average for CPI is 2.3%.
- The commodities prices broadly, as measured by the CRB index, are up 17% over the 12-month period ending September 2022. The price for crude oil was up 6% year-over-year and ended September 2022 at \$79.50 per barrel.
- An additional complication for assessing the inflation picture is the war between Russia and Ukraine which started on February 24, 2022. Ukraine is a major exporter of wheat, and the price of wheat has jumped 33% since the conflict began. Also, China's Covid-19 mitigation policies have had an impact on shipping.

Annual Total Returns of Key Asset Classes 2002 - 2021

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | |
|---------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|
| Best ↑ | Gov't Bonds | Int'l Equity | Int'l Equity | Real Estate | Int'l Equity | Int'l Equity | Gov't Bonds | Int'l Equity | U.S. Equity | Real Estate | Int'l Equity | U.S. Equity | U.S. Equity | Real Estate | U.S. Equity | Int'l Equity | Real Estate | U.S. Equity | U.S. Equity | U.S. Equity | Best ↑ |
| | 11.50% | 40.82% | 20.90% | 20.06% | 26.65% | 16.65% | 12.38% | 41.44% | 16.38% | 14.26% | 16.83% | 32.80% | 13.08% | 13.32% | 11.93% | 27.19% | 6.71% | 30.90% | 17.92% | 28.45% | |
| | Corp. Bonds | U.S. Equity | Real Estate | Int'l Equity | Real Estate | Real Estate | Cash | U.S. Equity | Real Estate | Gov't Bonds | U.S. Equity | Int'l Equity | Real Estate | U.S. Equity | Real Estate | U.S. Equity | Inflation | Int'l Equity | Int'l Equity | Real Estate | |
| | 10.52% | 29.58% | 14.48% | 16.62% | 16.59% | 15.84% | 2.05% | 27.24% | 13.11% | 9.02% | 16.17% | 15.29% | 11.81% | 1.01% | 7.97% | 21.13% | 1.91% | 22.13% | 10.65% | 17.70% | |
| | Real Estate | Hedge Funds | U.S. Equity | U.S. Equity | U.S. Equity | Gov't Bonds | Inflation | Corp. Bonds | Int'l Equity | Corp. Bonds | Real Estate | Real Estate | Corp. Bonds | Gov't Bonds | Corp. Bonds | Real Estate | Cash | Corp. Bonds | Corp. Bonds | Int'l Equity | |
| | 6.74% | 9.01% | 11.78% | 5.65% | 15.34% | 8.67% | 0.10% | 16.05% | 11.15% | 8.35% | 10.54% | 10.99% | 7.53% | 0.86% | 5.63% | 6.96% | 1.88% | 14.54% | 9.89% | 8.29% | |
| | Hedge Funds | Real Estate | Hedge Funds | Hedge Funds | Hedge Funds | Hedge Funds | Corp. Bonds | Hedge Funds | Corp. Bonds | Inflation | Corp. Bonds | Hedge Funds | Gov't Bonds | Inflation | Int'l Equity | Corp. Bonds | Gov't Bonds | Gov't Bonds | Gov't Bonds | Gov't Bonds | Hedge Funds |
| | 3.57% | 8.99% | 5.83% | 5.13% | 9.21% | 7.68% | -3.07% | 9.65% | 8.46% | 2.96% | 9.37% | 7.70% | 4.92% | 0.66% | 4.50% | 6.42% | 0.88% | 6.83% | 7.94% | 7.56% | |
| | Inflation | Corp. Bonds | Corp. Bonds | Inflation | Cash | U.S. Equity | Real Estate | Inflation | Gov't Bonds | U.S. Equity | Hedge Funds | Inflation | Hedge Funds | Hedge Funds | Inflation | Hedge Funds | Hedge Funds | Real Estate | Hedge Funds | Hedge Funds | Inflation |
| | 2.39% | 7.69% | 5.25% | 3.42% | 4.81% | 5.47% | -6.46% | 2.72% | 5.52% | 1.75% | 4.22% | 1.49% | 3.14% | 0.37% | 2.09% | 3.88% | -1.05% | 6.42% | 4.75% | 7.12% | |
| | Cash | Gov't Bonds | Gov't Bonds | Cash | Corp. Bonds | Corp. Bonds | Hedge Funds | Cash | Hedge Funds | Cash | Gov't Bonds | Cash | Inflation | Cash | Hedge Funds | Gov't Bonds | Corp. Bonds | Hedge Funds | Real Estate | Cash | |
| | 1.79% | 2.36% | 3.48% | 3.06% | 4.27% | 5.10% | -19.86% | 0.19% | 5.07% | 0.10% | 2.02% | 0.07% | 0.68% | 0.01% | 1.89% | 2.30% | -2.51% | 4.40% | 1.60% | 0.05% | |
| | Int'l Equity | Inflation | Inflation | Gov't Bonds | Gov't Bonds | Cash | U.S. Equity | Gov't Bonds | Inflation | Hedge Funds | Inflation | Corp. Bonds | Cash | Corp. Bonds | Gov't Bonds | Inflation | U.S. Equity | Inflation | Inflation | Corp. Bonds | |
| | -14.95% | 1.88% | 3.25% | 2.65% | 3.46% | 5.03% | -36.72% | -2.19% | 1.50% | -3.55% | 1.70% | -2.01% | 0.04% | -0.77% | 1.05% | 2.12% | -4.96% | 2.29% | 1.40% | -1.04% | |
| | U.S. Equity | Cash | Cash | Corp. Bonds | Inflation | Inflation | Int'l Equity | Real Estate | Cash | Int'l Equity | Cash | Gov't Bonds | Int'l Equity | Int'l Equity | Cash | Cash | Int'l Equity | Cash | Cash | Gov't Bonds | |
| Worst ↓ | -21.30% | 1.16% | 1.33% | 1.95% | 2.55% | 4.06% | -45.52% | -16.86% | 0.13% | -13.71% | 0.11% | -2.60% | -3.87% | -5.67% | 0.27% | 0.84% | -14.20% | 2.28% | 0.45% | -2.28% | Worst ↓ |

Annualized Returns 2002 - 2021

| | | | | | | | | | |
|--------|-------|---------|-------|--------|-------|--------|-------|--------|--------|
| Return | Cash | Inflat. | Hedge | Gov't. | Corp. | Int'l. | R.E. | US Eq. | Return |
| Risk | 1.28% | 2.31% | 3.41% | 3.85% | 5.52% | 7.26% | 8.69% | 9.68% | Risk |
| | 0.77% | 1.44% | 5.31% | 4.63% | 5.74% | 19.20% | 4.75% | 16.61% | |

- Hedge Funds are represented by the HFRI FOF Conservative Index
- Inflation is represented by the U.S. Consumer Price Index (SA)
- International Equity is represented by the MSCI - AC World EX-USA Index
- Cash is represented by 30-day T-Bills
- U.S. Equity is represented by the S&P 1500 Index
- Real Estate is represented by the NCREIF National Property Index
- Corporate Bonds are represented by the BBG Barclays - U.S. Corp. Inv. Gd. Index
- Government Bonds are represented by the BBG Barclays - U.S. Government Index

State of Michigan Retirement System

FIXED INCOME REVIEW

State of Michigan Investment Board Meeting
December 8, 2022



Daniel J. Quigley
Senior Investment Manager
Fixed Income Division

EXECUTIVE SUMMARY

Performance

| MPSERS Plan (9/30/22) | 1-Year | 3-Years | 5-Years | 7-Years | 10-Years |
|------------------------------|---------------|----------------|----------------|----------------|-----------------|
| Annualized Returns | -11.8% | -1.8% | 1.0% | 2.2% | 2.3% |
| Bloomberg Barclays US Agg | -14.6% | -3.3% | -0.3% | 0.5% | 0.9% |
| Peer Median Returns | -14.5% | -2.3% | 0.3% | 1.2% | 1.3% |
| Percentile Rank vs. Peers* | 28 | 28 | 22 | 24 | 17 |

*State Street Universe greater than \$1 billion

- The fixed income portfolio outperformed its benchmark and peer group across all time periods. Recent outperformance was driven by maintaining a shorter interest rate duration than the benchmark during a rising rate environment. The portfolio also benefitted from an overweight to structured fixed income and high yield bonds as coupon income helped to offset interest rate related losses.
- The U.S. Aggregate Bond Index returned it's worst 12-month performance in the history of the index with a year over year (YOY) return of -14.6%. All sectors of the core fixed income index also experienced negative performance during the year. Investment Grade Corporate bonds were the worst performing component of the index with a one-year return of -18.9%, driven by rate increases and credit spread widening. U.S. Treasuries and RMBS also had negative performance, returning -13.2% and -14.1% respectively on a one-year basis.
- The Structured Fixed Income sleeve was the main contributor to the portfolio's outperformance. This was mainly due to the floating rate exposure in this portfolio as well as the strong fundamental performance of mortgage credit. The Structured Fixed Income Credit sleeve returned -7.3% on a year-over-year (YOY) basis, outperforming the index by over 725 basis points (bp).
- The portfolio's allocation to High Yield (HY) credit also helped performance. This portion of the portfolio had a YOY performance of -12.1%, outperforming the index by 200 bp on a relative basis.

Strategy Update

- The objective of the Fixed Income Division portfolio is to meet or exceed the returns of the Bloomberg U.S. Aggregate Bond Index while satisfying the overall characteristics of a core fixed income portfolio. These characteristics are: income, liquidity, principal preservation, and diversification from equity market risk. The portfolio has a higher yield than the benchmark while having a risk profile that is similar to the long-term volatility experienced in traditional core fixed income. The yield-to-maturity of the portfolio is currently 6.6% versus a benchmark yield of 4.7%. In addition to this, the portfolio exhibits risk characteristics that are in line with the historical volatility of traditional fixed income benchmarks and has an equity beta of 0.1.
- The Core-plus strategy implemented to achieve this goal includes:
 - Core: As of September 30, 2022, the portfolio's allocation to U.S. Treasuries, Investment Grade corporate bonds, government-guaranteed U.S. Agency Debentures, RMBS, and Commercial Mortgage-Backed Securities (CMBS) was 63.9%. This includes a 24.1% allocation to U.S. Treasuries, TIPS, and cash.

- **Plus:** The portfolio maintains a strategic out-of-benchmark allocation to HY corporate debt, securitized credit, and global fixed income strategies as market opportunities allow. This allocation increases the portfolio yield and total return potential but results in lower liquidity and higher volatility. The allocation to the Plus portfolio was 36.1% as of September 30, 2022.

Tactical Update

- The allocation to securitized credit, primarily in CMBS, ABS, non-agency RMBS, and CLO securities, was 22.1% of the portfolio at the end of the quarter. The combination of low interest rate duration and high coupon income (often floating rate) offers attractive characteristics for the overall fixed income portfolio in this low interest rate environment. The one-year return on this portfolio was -7.7%.
- The allocation to HY strategies was 4.1% at the end of the quarter. This out-of-benchmark position has outperformed since it has been added to the portfolio. Recent outperformance has been driven by the shorter duration of this portfolio versus the benchmark as well as the higher coupon income in a rising rate environment. The one-year performance of this allocation was -12.1%, outperforming the core index by roughly 240 bp.
- The portfolio has a meaningful allocation to floating rate securities, including AAA CLO investments and investment-grade floating rate corporate bonds. This allocation accounts for approximately 16% of portfolio assets. This allocation will underperform during risk-off markets when interest rates decline, however, it should exhibit strong risk-adjusted return characteristics on a go forward basis in this low interest rate environment.

Market Environment and Outlook

- The yield curve for U.S. Treasury securities flattened during the quarter and continue to experience inversion across the curve. The spread between 2-year and 10-year U.S. Treasury Notes decreased by 123 bp on a YTD basis, ending the quarter at -45 bp. This has been driven primarily by a 300 bp increase in the Fed Funds rate on a YTD basis as the Federal Reserve has started an aggressive tightening cycle to fight high inflation pressures.
- Inflation expectations decreased during the quarter with ten-year breakeven inflation ending the quarter at 2.15%, dropping by 30bp during the quarter. This is approximately 15 bp above the 5-year average for this metric.
- Credit markets are down this year as investment grade (IG) and HY spreads widened. IG spreads have increased by 67 bp on a YTD basis, ending the period at 159 bp. HY spreads ended the quarter at 552 bp, 270 bp higher on a YTD basis. IG spreads are higher than their 5-year moving average of 114 bp.
- Emerging Markets (EM) credit spreads ended the quarter at 405 bp after widening by 108 bp on a YTD basis.

Conclusion

- The portfolio currently has a slight underweight to interest rate duration versus the benchmark and remains overweight to corporate and structured debt securities. This positioning increases the income of the portfolio while also increasing the potential for price volatility. The portfolio will continue to look for attractive risk-adjusted opportunities within the fixed income opportunity set.

SMRS

Fixed Income Holdings Portfolio Characteristics

Benchmark: Barclays Aggregate

9/30/22

| <u>Characteristic</u> | <u>Portfolio</u> | <u>Benchmark</u> |
|------------------------|------------------|------------------|
| Average Maturity (Yrs) | 9.3 | 8.5 |
| Duration (Yrs) | 5.8 | 6.1 |
| Spread Duration (Yrs) | 6.2 | 6.1 |
| Coupon (%) | 3.7 | 2.6 |
| Yield to Maturity (%) | 6.6 | 4.7 |
| Credit Rating | A | AA |
| VaR (%) | 9.4 | 10.2 |
| Tracking Error (%) | 3.0 | NA |
| Beta (vs S&P 500) | 0.13 | 0.10 |

Commentary

Objectives

Income:

Liquidity:

Principal Preservation:

Diversification:

Highlights

The coupon of the portfolio is approximately 110 bps higher than the benchmark. Interest rate movement has been the main driver of U.S. bond market returns for the year, but Income is the primary driver of long-term performance.

24.1% of the portfolio is invested in cash, U.S. Treasuries, and TIPS. These investments can be liquidated via same-day trading.

The portfolio has a large allocation to U.S. Treasuries and carries an investment-grade credit rating.

The equity beta of the portfolio is roughly 0.1 meaning that the portfolio returns have a low correlation with equity market movements.

SMRS

Fixed Income Strategies

9/30/22

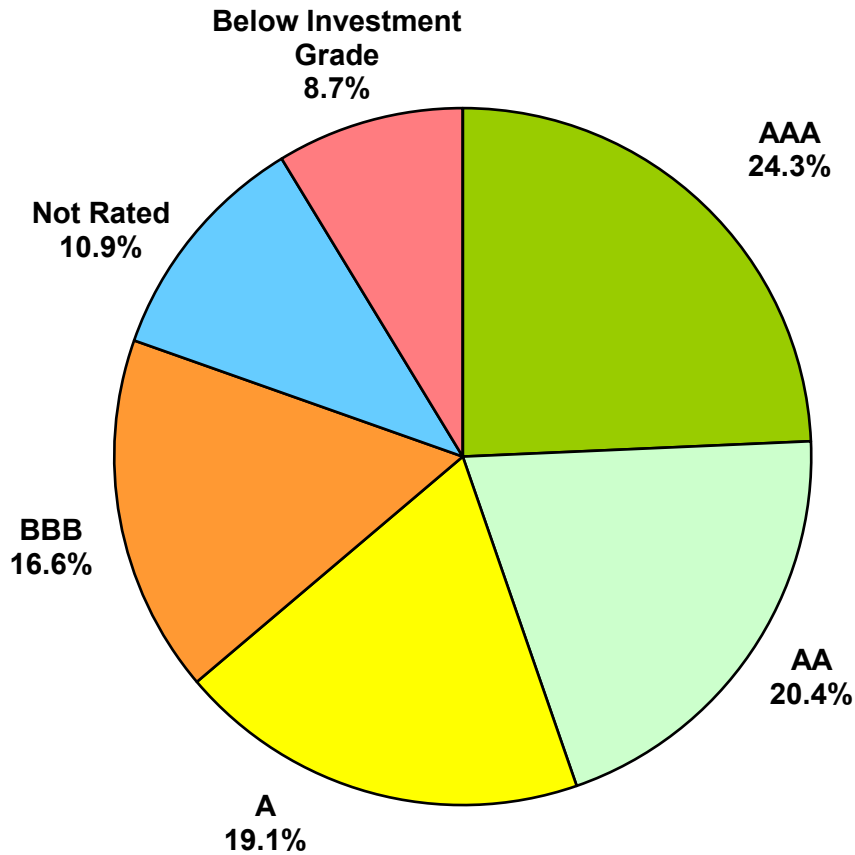
| | Amount | Total | % of Total |
|-------------------------------|---------|-----------------------|----------------------|
| Core (\$ in Millions) | | | |
| FID Internal | \$4,062 | | |
| PIMCO Mortgage Fund | 509 | | |
| TCW Core Plus | 378 | | |
| PGIM Investment Grade Credit | 189 | | |
| Total Core | | \$5,137 | 61.2% |
| Tactical | | | |
| Fidelity Tactical | \$462 | | |
| Guggenheim Core Plus | 368 | | |
| Total Tactical | | \$831 | 9.9% |
| Securitized Debt | | | |
| TICP CLO Debt | \$678 | | |
| Met West Securitized Ops | 624 | | |
| Principal CMBS | 485 | | |
| Napier Park ABS Income | 43 | | |
| Napier Park Strategic Loan | 25 | | |
| Total Securitized Debt | | \$1,855 | 22.1% |
| High Yield | | | |
| PGIM High Yield | \$312 | | |
| Crescent Direct Lending | 32 | | |
| Total High Yield | | \$345 | 4.1% |
| Global | | | |
| T. Rowe Global Multi-Sector | \$231 | | |
| Total Global | | \$231 | 2.8% |
| TOTAL | | <u>\$8,399</u> | <u>100.0%</u> |

NOTE: Totals may not be exact due to rounding.

SMRS

Fixed Income By Rating

9/30/22



| Market Value in Millions | | | | |
|---------------------------------|-----------------------|----------------------|----------------------|-------------------|
| 9/30/22 | | | | |
| | <u>Assets</u> | <u>Percent</u> | <u>Benchmark</u> | <u>Difference</u> |
| AAA | \$2,037 | 24.3% | 72.3% | -48.0% |
| AA | 1,712 | 20.4% | 2.3% | 18.1% |
| A | 1,608 | 19.1% | 10.7% | 8.4% |
| BBB | 1,396 | 16.6% | 12.0% | 4.6% |
| Not Rated | 915 | 10.9% | 2.5% | 8.4% |
| * Below Investment Grade | 731 | 8.7% | 0.2% | 8.5% |
| Total Investments | <u>\$8,399</u> | <u>100.0%</u> | <u>100.0%</u> | |

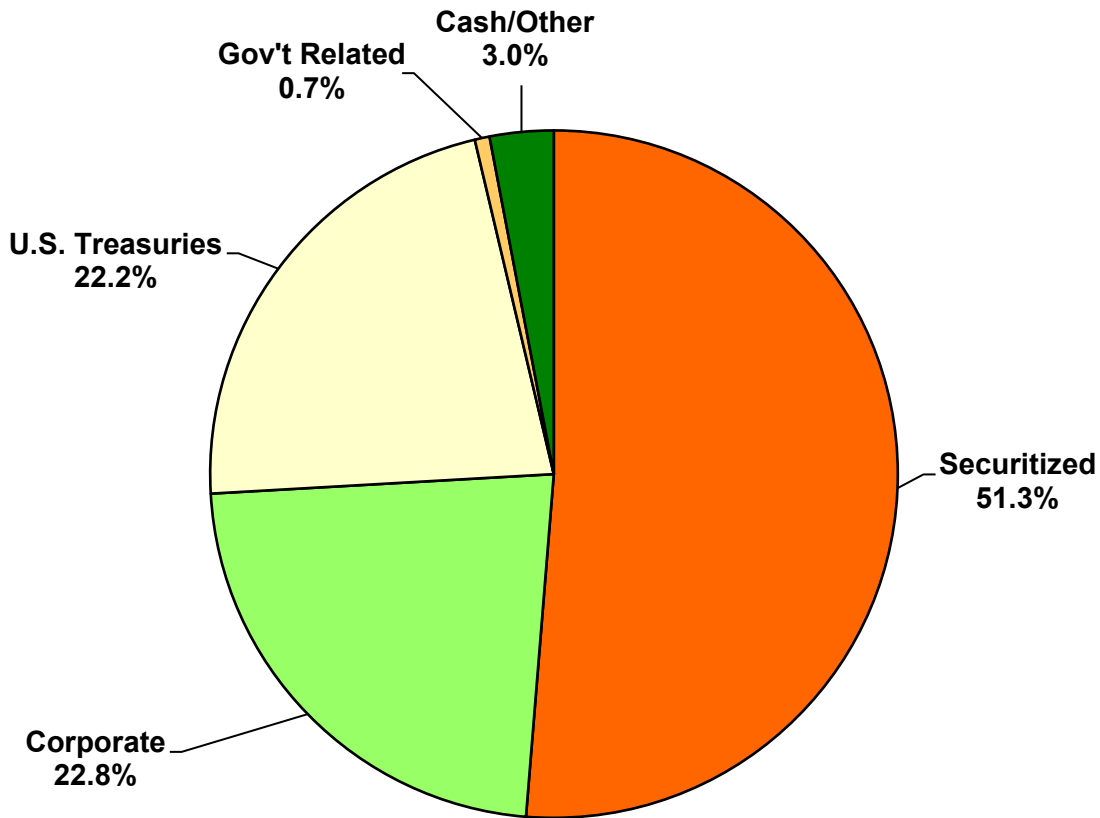
* Comprised of approximately 4.1% High Yield Credit and 4.6% High Yield RMBS/ABS

Benchmark: Barclays US Aggregate

SMRS

Fixed Income By Asset Type

9/30/22



| Market Value in Millions | | | | |
|---------------------------------|-----------------------|----------------------|----------------------|-------------------|
| 9/30/22 | | | | |
| | <u>Assets</u> | <u>Percent</u> | <u>Benchmark</u> | <u>Difference</u> |
| Securitized | \$4,305 | 51.3% | 29.9% | 21.4% |
| Corporate | 1,911 | 22.8% | 24.0% | -1.2% |
| U.S. Treasuries | 1,868 | 22.2% | 40.8% | -18.6% |
| Government Related | 62 | 0.7% | 5.3% | -4.6% |
| Cash/Other | 253 | 3.0% | 0.0% | 3.0% |
| Total Investments | <u>\$8,399</u> | <u>100.0%</u> | <u>100.0%</u> | |

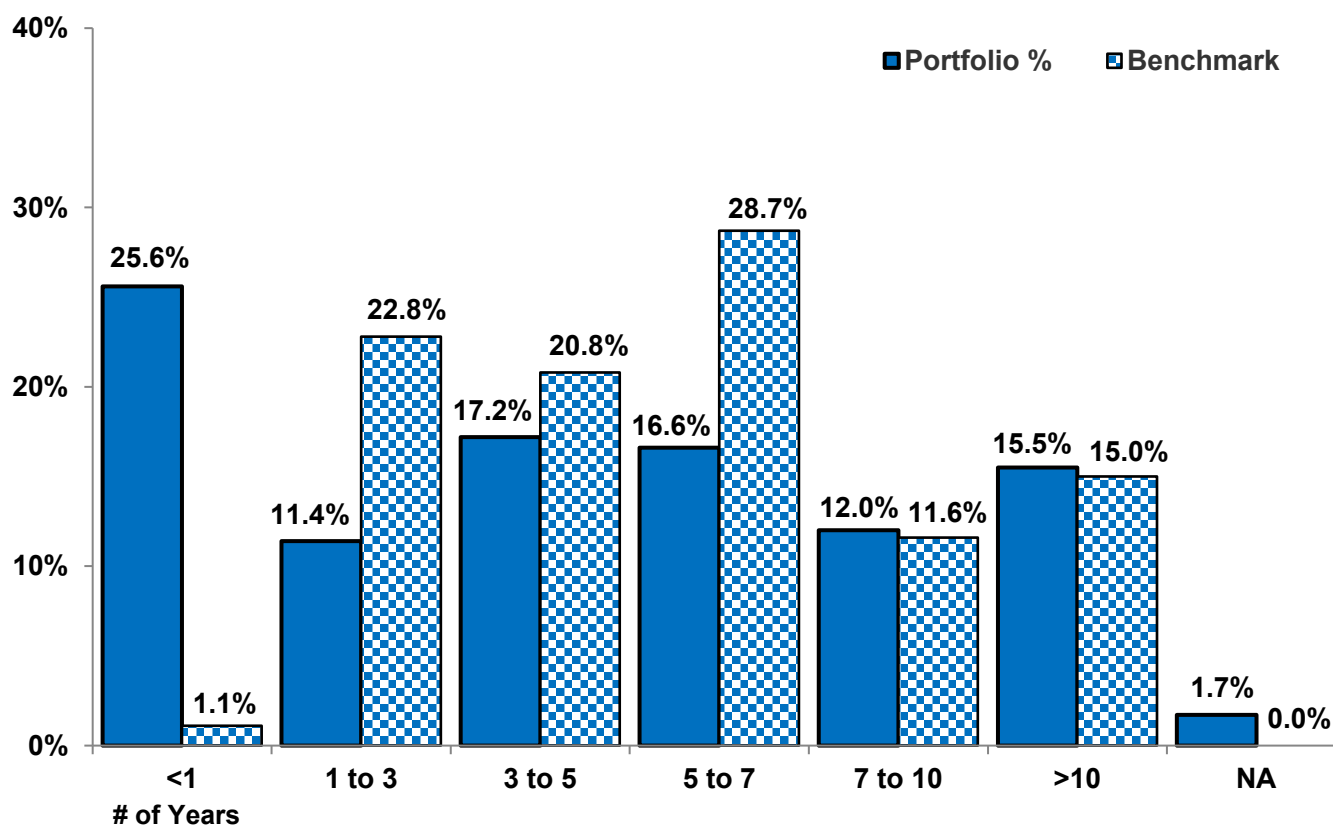
Benchmark: Barclays US Aggregate

SMRS

Duration Distribution

Fixed Income Composite Versus Benchmark

9/30/22



Source: Factset

| Market Value in Millions | | | | | |
|---------------------------------|----------------|-------------------------|-------------------------|----------------------------|----------------------------|
| Duration | Assets | Portfolio Weight | Benchmark Weight | Portfolio Duration* | Benchmark Duration* |
| <1 | \$2,147 | 25.6% | 1.1% | -0.1 | 0.9 |
| 1 to 3 | 959 | 11.4% | 22.8% | 2.1 | 1.9 |
| 3 to 5 | 1,445 | 17.2% | 20.8% | 4.1 | 4.0 |
| 5 to 7 | 1,390 | 16.6% | 28.7% | 6.1 | 6.0 |
| 7 to 10 | 1,012 | 12.0% | 11.6% | 7.9 | 7.6 |
| >10 | 1,306 | 15.5% | 15.0% | 16.8 | 14.9 |
| NA | 140 | 1.7% | 0.0% | NA | NA |
| Total | \$8,399 | 100.0% | 100.0% | 5.8 | 6.1 |

* Effective Duration

Benchmark: Barclays US Aggregate

Total Fixed Income Performance - Net of Fees (MPSEERS)

9/30/22

| | <u>Market Value</u> | <u>1-Year</u> | <u>3-Years</u> | <u>5-Years</u> | <u>7-Years</u> | <u>10-Years</u> |
|--|------------------------|----------------|----------------|----------------|----------------|-----------------|
| Total Fixed Income | \$8,399,088,092 | -12.00% | -1.97% | 0.83% | 1.98% | 2.09% |
| <i>Bloomberg Aggregate Bond Index</i> | <i>N/A</i> | <i>-14.60%</i> | <i>-3.26%</i> | <i>-0.27%</i> | <i>0.54%</i> | <i>0.89%</i> |
| Internal Core Fixed Income | \$4,062,300,048 | -12.95% | -2.54% | 0.60% | 1.56% | 1.78% |
| Externally Managed Fixed Income | \$4,336,788,044 | -10.86% | -1.39% | 1.05% | 2.54% | 2.41% |
| External Core Fixed Income | 508,700,039 | -14.21% | -3.67% | -0.83% | 0.70% | 0.94% |
| PIMCO Mortgage Fund | 508,700,039 | -14.21% | -3.67% | | | |
| <i>Bloomberg US MBS Agy Fixed Indx</i> | <i>N/A</i> | <i>-9.03%</i> | <i>-1.44%</i> | | | |
| Investment Grade Credit | \$188,890,980 | -18.81% | -3.14% | 0.24% | 1.84% | 2.03% |
| PGIM Investment Grade | 188,890,980 | -18.81% | -3.14% | 0.24% | 1.84% | 2.09% |
| <i>Bloomberg Credit Index</i> | <i>N/A</i> | <i>-17.89%</i> | <i>3.61%</i> | <i>-0.05%</i> | <i>1.39%</i> | <i>1.58%</i> |
| Tactical Fixed Income | \$1,208,381,585 | -12.57% | -0.92% | 1.48% | 2.41% | 3.90% |
| Fidelity Tactical Bond Fund | 462,346,103 | -12.54% | -0.85% | 1.75% | 3.06% | |
| Guggenheim Core Plus | 368,464,809 | NA | | | | |
| TCW Core Plus | 377,570,673 | NA | | | | |
| <i>Bloomberg Aggregate Bond Index</i> | <i>N/A</i> | <i>-14.60%</i> | <i>-3.26%</i> | <i>-0.27%</i> | <i>0.54%</i> | <i>0.89%</i> |
| High Yield Fixed Income | \$344,594,653 | -12.14% | 0.47% | 2.33% | 4.33% | |
| PGIM High Yield | 312,107,316 | -14.07% | 0.52% | 2.52% | 4.47% | |
| Crescent Direct Lending | 32,487,338 | 7.06% | 6.34% | | | |
| <i>Bloomberg US HY BA/B 1% Cap</i> | <i>N/A</i> | <i>-13.75%</i> | <i>-0.58%</i> | <i>1.67%</i> | <i>3.89%</i> | |
| Structured Fixed Income | \$1,854,889,563 | -7.70% | -0.81% | 1.48% | | |
| TICP CLO Debt | 678,138,836 | -6.85% | 2.59% | 2.75% | | |
| MetWest Securitized Opportunities | 624,449,561 | -6.64% | -0.05% | 1.76% | 2.74% | |
| Principal CMBS | 485,171,092 | -12.42% | -2.41% | 1.19% | 1.93% | 4.04% |
| Napier Park ABS Income | 42,550,825 | 0.41% | 10.36% | 9.70% | 10.24% | |
| Napier Park Strategic Loan LP | 24,579,248 | 11.02% | 5.18% | 5.81% | | |
| <i>Bloomberg Aggregate Bond Index</i> | <i>N/A</i> | <i>-14.60%</i> | <i>-3.26%</i> | <i>-0.27%</i> | <i>0.54%</i> | <i>0.89%</i> |
| <i>Blended CMBS Benchmark</i> | <i>N/A</i> | <i>-12.35%</i> | <i>-2.12%</i> | <i>0.65%</i> | <i>1.39%</i> | <i>1.82%</i> |
| Global Fixed Income | \$231,331,222 | -13.22% | -2.25% | 0.24% | | |
| T. Rowe Global Multi-Sector | 231,331,222 | -13.22% | -2.16% | 0.58% | | |
| <i>Custom GMS Benchmark</i> | <i>N/A</i> | <i>-14.12%</i> | <i>-3.21%</i> | <i>0.16%</i> | | |

State of Michigan Retirement System

PRIVATE EQUITY REVIEW

State of Michigan Investment Board Meeting
December 8, 2022



Peter A. Woodford
Senior Investment Manager
Private Equity Division

EXECUTIVE SUMMARY

Performance

| MPSERS Plan (9/30/22) | 1-Year | 3-Years | 5-Years | 7-Years | 10-Years |
|----------------------------|--------|---------|---------|---------|----------|
| Annualized Returns | 9.5% | 21.9% | 19.2% | 16.4% | 16.7% |
| PE Benchmark Returns | -7.9% | 13.9% | 14.6% | 14.5% | 16.3% |
| Peer Median Returns | 9.9% | 12.7% | 11.2% | 10.7% | 11.1% |
| Percentile Rank vs. Peers* | 56 | 13 | 17 | 11 | 8 |

*State Street Universe greater than \$1 billion

- Private equity returns have been strong relative to peer median returns, ranking in the top 8% of peers over the past ten years. Outperformance to peers is attributable to strategy as well as fund and co-investment selectivity.
- It is not unusual for private equity returns to lag the public benchmark returns during periods of expansion and lead the public benchmark during periods of contraction. Over the last 10 years, the Private Equity Division outperformed the S&P by 5.0% (ten-year S&P 500 return 11.7%) and outperformed the benchmark by 0.4%.
- Commitments closed during the quarter:
 - None

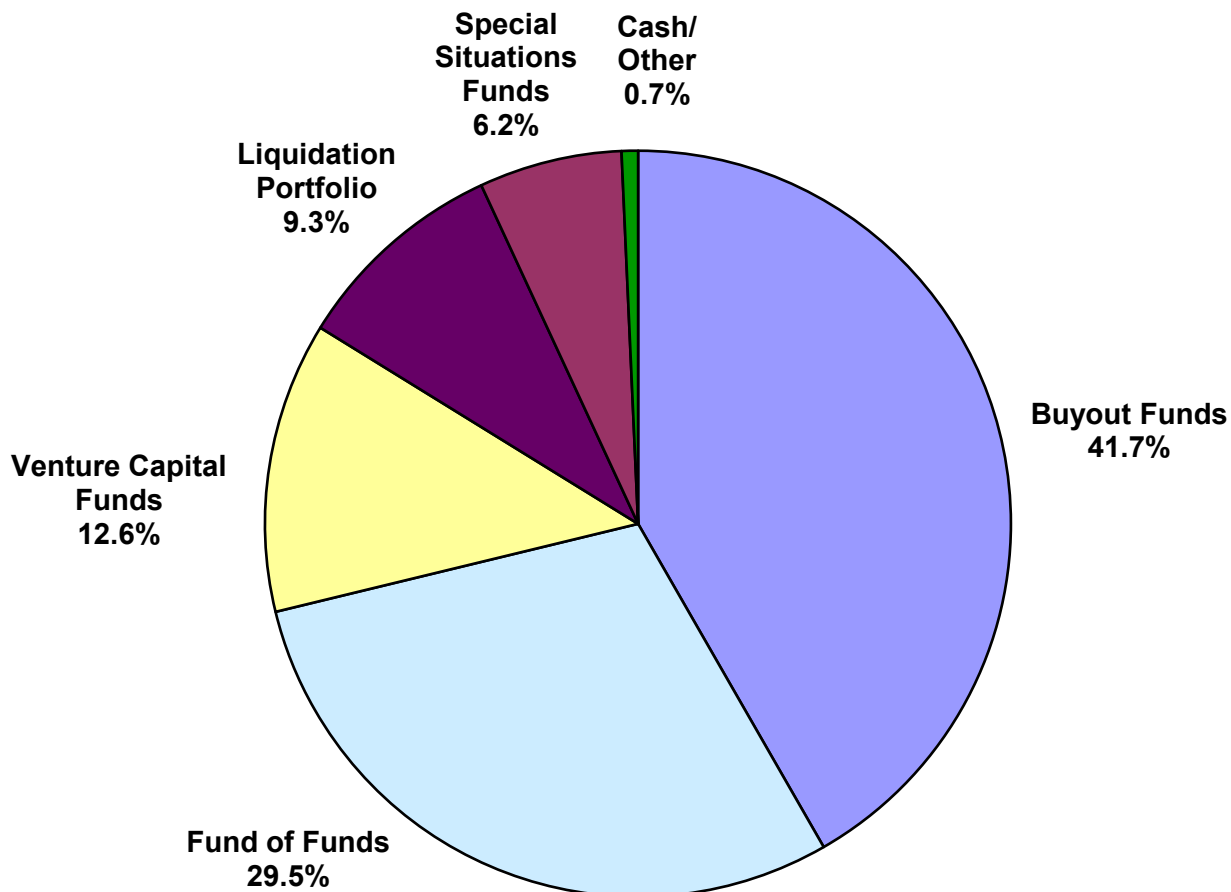
Strategy Update

The strategy for the next twelve months will focus on existing sponsors raising successor funds. This may be a combination of buyout, venture capital, secondary, and growth equity funds seeking new commitments. Co-investments continue to play an important role in both averaging down costs and targeting specific investments with attractive risk/return characteristics.

SMRS

Private Equity

9/30/22



| Market Value in Millions | | | | |
|---------------------------------|------------------------|----------------------|------------------------|----------------------|
| | <u>9/30/22</u> | | <u>9/30/21</u> | |
| Buyout Funds | \$9,568 | 41.7% | \$10,445 | 46.9% |
| Fund of Funds | 6,785 | 29.5% | 5,516 | 24.8% |
| Venture Capital Funds | 2,900 | 12.6% | 2,878 | 12.9% |
| Liquidation Portfolio | 2,130 | 9.3% | 681 | 3.1% |
| Special Situations Funds | 1,422 | 6.2% | 2,084 | 9.4% |
| Cash/Other | 156 | 0.7% | 319 | 1.4% |
| Total | <u>\$22,961</u> | <u>100.0%</u> | <u>\$22,255</u> | <u>100.0%</u> |

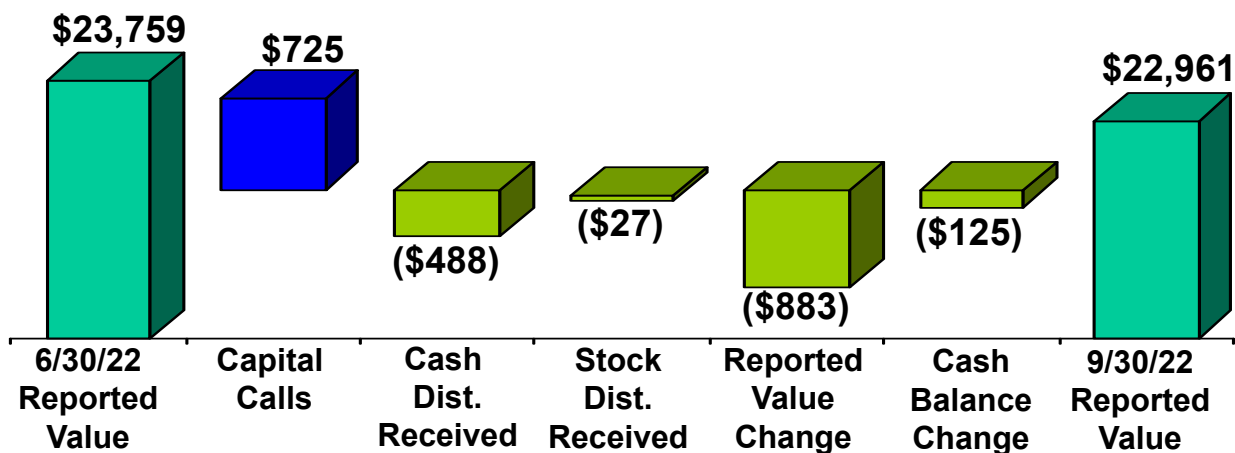
* 9/30/21 total includes \$332M in Mezzanine Funds

SMRS Private Equity

9/30/22

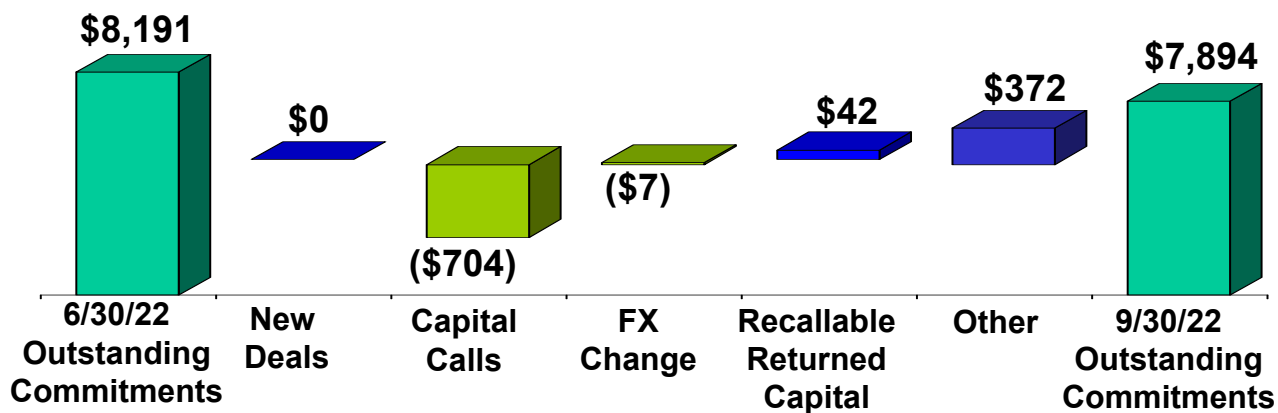
Invested commitments

(\$ in Millions)



Outstanding Commitments

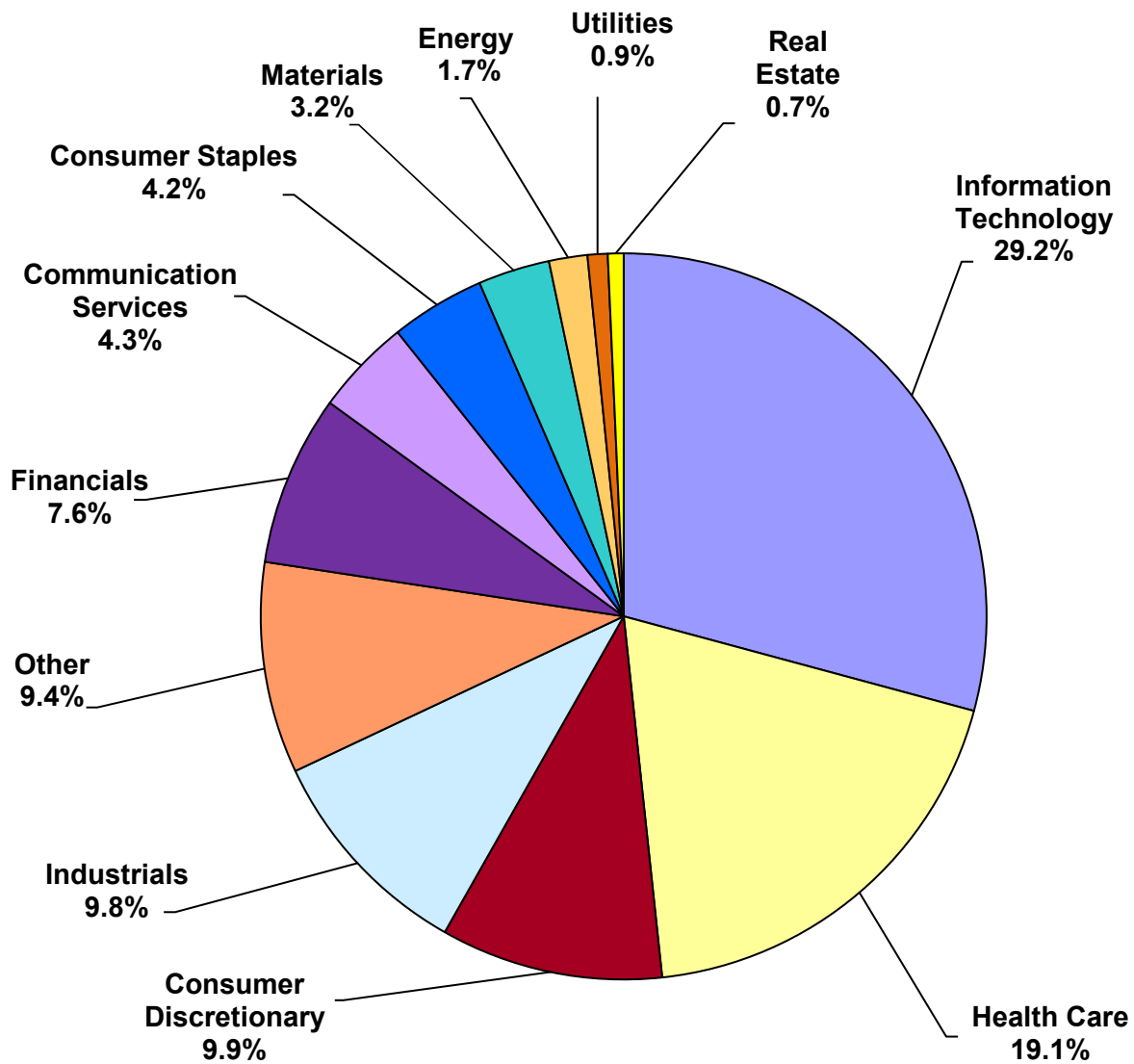
(\$ in Millions)



SMRS Private Equity

9/30/22

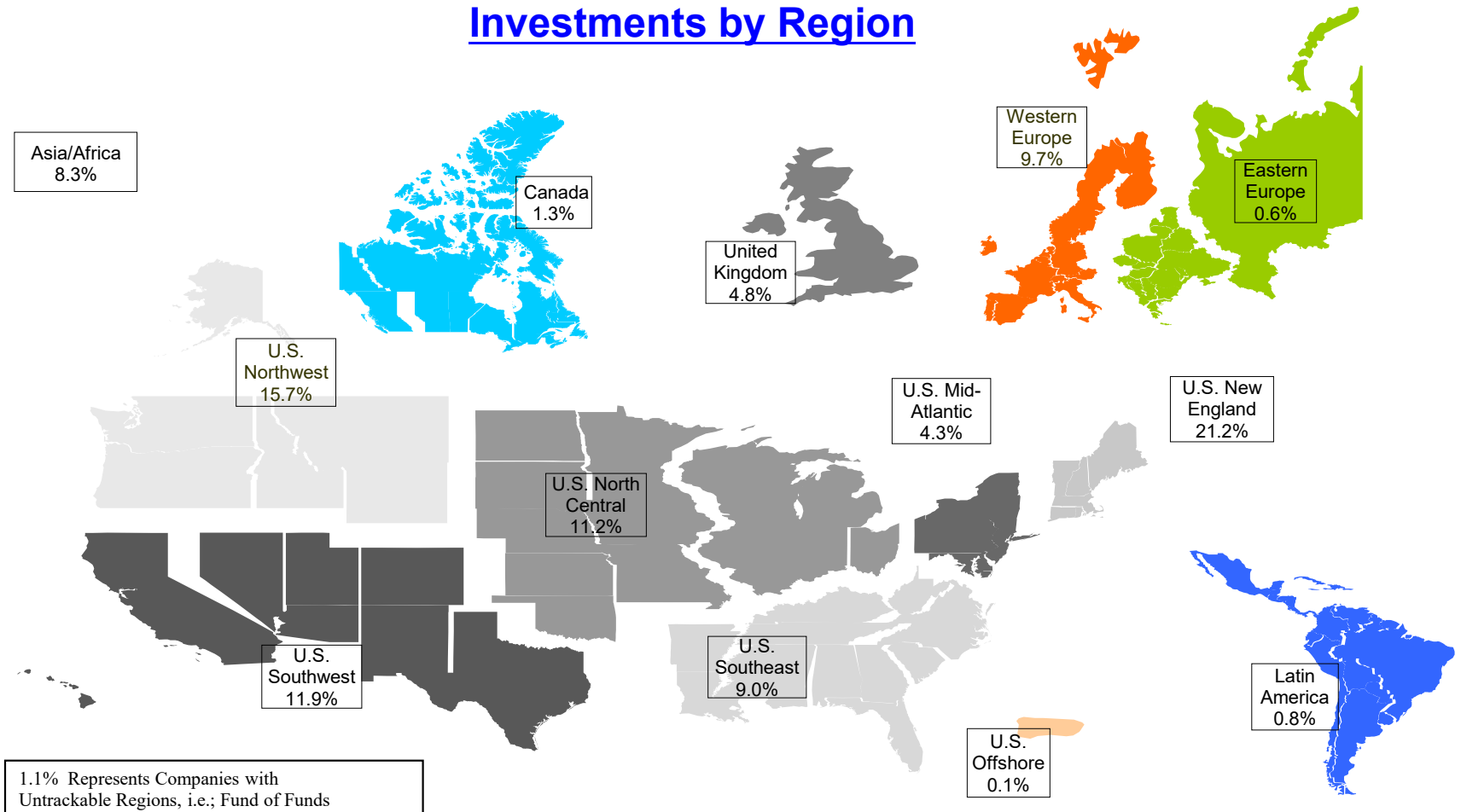
Investments by Industry



These numbers are based on the most recent available General Partner Data; primarily 6/30/22 and are subject to change.

SMRS Private Equity 9/30/22

Investments by Region



Geographic Report: North America 75.9%, Europe 15.1%, Asia 8.3%, Other .7%

SMRS

Private Equity

9/30/22

Portfolio by Vintage Year

(\$ in Millions)

| <u>Asset Vintage</u> | <u>Reported Value</u> | <u>Outstanding Commitment</u> | <u>Total Exposure</u> |
|-----------------------------|-----------------------|-------------------------------|-----------------------|
| 1986-2005 | \$ 247 | \$ 65 | \$ 312 |
| 2006* | 112 | 100 | 212 |
| 2007 | 82 | 83 | 165 |
| 2008 | 216 | 68 | 284 |
| 2009 | 10 | 1 | 11 |
| 2010 | 155 | 3 | 158 |
| 2011 | 429 | 75 | 504 |
| 2012 | 616 | 43 | 659 |
| 2013 | 136 | 44 | 180 |
| 2014 | 1,186 | 103 | 1,289 |
| 2015 | 8,618 | 785 | 9,403 |
| 2016 | 2,336 | 207 | 2,543 |
| 2017 | 1,822 | 239 | 2,061 |
| 2018 | 3,357 | 1,026 | 4,383 |
| 2019 | 1,943 | 511 | 2,454 |
| 2020 | 783 | 487 | 1,270 |
| 2021 | 713 | 2,044 | 2,757 |
| 2022 | 44 | 2,010 | 2,054 |
| Income Accruals | (0) | 0 | (0) |
| Cash | 154 | 0 | 154 |
| Act. Small Cap - Stock Dist | 2 | 0 | 2 |
| Total | \$ 22,961 | \$ 7,894 | \$ 30,855 |

*Liquidation portfolio is 2006 vintage

FX Exposure

(\$ in Millions)

| <u></u> | <u>Reported Value</u> | <u>Outstanding Commitment</u> | <u>Total Exposure</u> | <u>Total (USD)</u> |
|-----------------|-----------------------|-------------------------------|-----------------------|--------------------|
| Euro (\$.98/ €) | € 439 | € 235 | € 674 | \$661 |

SMRS

Private Equity

9/30/22

Top 10 Sponsors

(\$ in Millions)

| <u>Asset Type</u> | <u>Reported Value</u> | <u>Outstanding Commitment</u> | <u>Total</u> |
|---------------------------|-----------------------|-------------------------------|------------------|
| HarbourVest Partners | \$ 7,795 | \$ 960 | \$ 8,755 |
| Advent International | 757 | 426 | 1,183 |
| StepStone Group | 596 | 483 | 1,079 |
| Insight Partners | 880 | 89 | 969 |
| Veritas Capital | 644 | 324 | 968 |
| Thoma Bravo | 612 | 333 | 945 |
| Leonard Green & Partners | 762 | 152 | 914 |
| KKR | 715 | 183 | 898 |
| Flagship Pioneering | 687 | 195 | 882 |
| The Carlyle Group | 526 | 340 | 866 |
| Top 10 Total Value | \$ 13,974 | \$ 3,485 | \$ 17,459 |

Cash Weighted Rates of Return*

| <u>(Net IRR)</u> | <u>Current Qtr.</u> | <u>1-Year</u> | <u>3-Year</u> | <u>5-Year</u> | <u>10-Year</u> |
|--------------------|---------------------|---------------|---------------|---------------|----------------|
| Buyout | -5.5% | 7.3% | 23.7% | 21.3% | 19.2% |
| Fund of Funds | 0.4% | 17.3% | 20.8% | 19.4% | 17.3% |
| Special Situations | -3.0% | 6.3% | 21.0% | 15.1% | 13.9% |
| Venture Capital | -8.4% | -2.0% | 29.8% | 27.7% | 21.3% |

*These numbers are based on most recent available General Partner reported data; primarily 6/30/2022 and are subject to change.

SMRS

Private Equity

9/30/22

Net Market Values by Ownership Entity

| | <u>Adjusted Reported Value</u> | <u>Unfunded Commitment</u> |
|--------------------------------------|------------------------------------|--------------------------------|
| 5AM Opportunities I, LP | \$ 19,853,325 | \$ 0 |
| 5AM Opportunities II, LP | 8,001,292 | 17,000,000 |
| 5AM Ventures VI, LP | 24,036,087 | 2,650,000 |
| 5AM Ventures VII, LP | 2,719,922 | 21,500,000 |
| Accel Europe I, LP | 1,216,014 | 1 |
| Accel Europe II, LP | 24,530,633 | 3,300,000 |
| Accel Growth Fund II, LP | 11,629,014 | 0 |
| Accel Growth Fund III, LP | 15,910,299 | 280,000 |
| Accel Growth Fund IV, LP | 35,276,273 | 0 |
| Accel Growth Fund V, LP | 45,888,858 | 1,028,554 |
| Accel Growth Fund VI, LP | 11,853,089 | 12,875,000 |
| Accel India VII, LP | 1,406,449 | 8,500,000 |
| Accel IX, LP | 1,607,260 | 4,522,725 |
| Accel Leaders 4, LP | 0 | 50,000,000 |
| Accel Leaders Fund 3, LP | 30,178,079 | 8,800,000 |
| Accel Leaders Fund II, LP | 13,465,761 | 0 |
| Accel Leaders Fund, LP | 12,775,208 | 0 |
| Accel London V, LP | 55,611,952 | 1,320,000 |
| Accel London VI, LP | 17,250,520 | 3,000,000 |
| Accel London VII, LP | 4,349,194 | 8,250,000 |
| Accel VI-S | 1,831,169 | 652,611 |
| Accel VI, LP | 640,393 | 0 |
| Accel X, LP | 6,266,340 | 0 |
| Accel XI, LP | 8,670,732 | 1,440,000 |
| Accel XII, LP | 23,466,508 | 980,000 |
| Accel XIII, LP | 24,304,453 | 1,250,000 |
| Accel XIV, LP | 15,588,784 | 1,150,000 |
| Accel XV, LP | 3,885,043 | 6,300,000 |
| Accel-KKR Growth Capital Fund IV, LP | 5,930,529 | 34,069,471 |
| Acorn Bioventures 2, LP | 9,683,808 | 90,000,000 |
| Acorn Bioventures, LP | 60,427,403 | 10,000,000 |
| Advent Global Private Equity V, LP | 3,213,425 | 8,700,000 |
| Advent International GPE IX, LP | 348,383,813 | 32,481,966 |
| Advent International GPE VI-A, LP | 18,259,074 | 0 |
| Advent International GPE VII-B, LP | 43,249,625 | 8,000,000 |
| Advent International GPE VIII-B, LP | 269,160,789 | 0 |

| | Adjusted Reported Value | Unfunded Commitment |
|--|------------------------------------|--------------------------------|
| Advent International GPE X, LP | 12,250,000 | 337,750,000 |
| Advent International LAPEF VII, LP | 24,989,322 | 37,050,000 |
| Advent Latin American Private Equity Fund VI, LP | 37,117,288 | 2,450,000 |
| Affinity Asia Pacific Fund III, LP | 13,561,588 | 8,520,204 |
| Affinity Asia Pacific Fund IV, LP | 64,215,809 | 15,844,396 |
| Affinity Asia Pacific Fund V, LP | 78,809,817 | 108,000,064 |
| Apax Digital II, LP | 0 | 100,000,000 |
| Apax Digital, LP | 48,449,349 | 13,569,616 |
| Apax Europe Fund VI, LP | 8,374,475 | 2,071,762 |
| Apax Europe VII, LP | 3,609,700 | 1,459,072 |
| Apax IX, LP | 178,791,387 | 14,420,230 |
| Apax US VII, LP | 2,546,668 | 417,509 |
| Apax VIII - B, LP | 32,134,567 | 5,661,905 |
| Apax X USD, LP | 93,149,466 | 74,688,688 |
| Apax XI USD, LP | 0 | 150,000,000 |
| Apollo Investment Fund IX, LP | 84,230,875 | 34,064,739 |
| Apollo Investment Fund VIII, LP | 42,262,919 | 12,647,994 |
| Arboretum Ventures II, LP | 1,011,748 | 0 |
| Arboretum Ventures III, LP | 5,911,887 | 0 |
| Arboretum Ventures IV, LP | 26,988,823 | 6,300,000 |
| Arboretum Ventures V, LP | 24,528,906 | 12,950,000 |
| Arboretum Ventures VI, LP | 227,500 | 34,772,500 |
| Ares Corporate Opportunities Fund II, LP | 175,618 | 11,423,773 |
| Ares Corporate Opportunities Fund III, LP | 2,157,928 | 6,656,978 |
| Ares Corporate Opportunities Fund IV, LP | 47,122,287 | 13,701,239 |
| ASF VIII B, LP | 99,547,655 | 78,274,230 |
| AXA ASF Miller Co-Investment, LP | 279,222 | 6,656,684 |
| Axiom Asia 6, LP | 19,253,906 | 33,000,000 |
| Axiom Asia Co-Investment Fund I, LP | 61,376,819 | 8,441,698 |
| Axiom Asia Co-Investment Fund II, LP | 16,401,326 | 33,990,896 |
| Axiom Asia IV, LP | 61,866,913 | 7,950,886 |
| Axiom Asia Private Capital Fund III, .LP | 55,211,936 | 5,250,002 |
| Axiom Asia V, LP | 49,396,023 | 15,000,000 |
| BC European Capital VII, LP | 753,242 | 0 |
| Berkshire Fund IX Coinvestment Fund, LP | 53,822,299 | 6,435,897 |
| Berkshire Fund IX, LP | 199,870,873 | 17,388,820 |
| Berkshire Fund VI, LP | 21,424,866 | 7,600,677 |
| Berkshire Fund VII, LP | 5,856,623 | 2,805,875 |
| Berkshire Fund VIII, LP | 92,696,626 | 8,301,931 |
| Berkshire Fund X, LP | 25,004,229 | 129,999,872 |
| Blackstone Capital Partners IV, LP | 2,537,017 | 4,580,765 |
| Blackstone Capital Partners V, LP | 1,681,492 | 12,930,407 |
| Blackstone Capital Partners V-S, LP | 18 | 712,476 |
| Blackstone Capital Partners VI, LP | 119,779,385 | 32,435,071 |
| Blackstone Capital Partners VII, LP | 295,066,992 | 20,557,815 |

| | Adjusted Reported Value | Unfunded Commitment |
|---|------------------------------------|--------------------------------|
| Blackstone Capital Partners VIII, LP | 103,496,095 | 118,396,993 |
| Blackstone Growth II, LP | 0 | 100,000,000 |
| Carlyle Europe Partners V, S.C.SP. | 89,758,289 | 49,425,704 |
| Carlyle Partners Growth, LP | 2,840,610 | 46,828,291 |
| Carlyle Partners V, LP | 29,186,207 | 53,227,845 |
| Carlyle Partners VI, LP | 91,496,699 | 7,431,037 |
| Carlyle Partners VII, LP | 283,993,554 | 12,449,692 |
| Carlyle Partners VIII, LP | 28,246,502 | 170,151,563 |
| Charlesbank Equity Fund IX, LP | 98,887,453 | 4,046,484 |
| Charlesbank Equity Fund X, LP | 34,263,072 | 65,915,320 |
| Charlesbank Equity Overage Fund X, LP | 31,740,413 | 20,211,575 |
| Charlesbank Fund IX Overage Allocation Program | 47,949,291 | 1,900,045 |
| Clearlake Capital Partners VII, LP | 66,249,562 | 131,034,814 |
| Coller International Partners V, LP | 755,297 | 2,000,000 |
| Coller International Partners VI, LP | 19,183,898 | 29,059,273 |
| Coller International Partners VII, LP | 92,055,563 | 44,654,951 |
| CVC Capital Partners VII, LP | 225,886,394 | 22,808,875 |
| CVC Capital Partners VIII, LP | 37,521,992 | 66,215,608 |
| Dover Street IX, LP | 70,001,253 | 15,000,000 |
| Dover Street X, LP | 113,818,199 | 58,875,000 |
| FirstMark Capital I, LP | 100,367,954 | 196,596 |
| FirstMark Capital IV, LP | 115,084,662 | 2,800,000 |
| FirstMark Capital OF I, LP | 23,250,591 | 0 |
| FirstMark Capital OF II, LP | 107,290,040 | 0 |
| FirstMark Capital OF III, LP | 40,109,222 | 3,150,000 |
| FirstMark Capital OF IV, LP | 0 | 35,000,000 |
| FirstMark Capital V, LP | 28,992,328 | 14,000,000 |
| FirstMark Capital VI, LP | 0 | 35,000,000 |
| Flagship Pioneering Fund VII, LP | 34,907,043 | 169,000,000 |
| Flagship Pioneering Special Opportunities Fund II, LP | 92,325,636 | 21,000,000 |
| Flagship Pioneering VI, LP | 299,526,488 | 4,500,000 |
| Flagship Ventures Fund 2004, LP | 66,305 | 0 |
| Flagship Ventures Fund 2007, LP | 3,408,587 | 0 |
| Flagship Ventures Fund IV, LP | 119,498,761 | 0 |
| Flagship Ventures Fund V, LP | 92,838,902 | 0 |
| Flagship Ventures Opportunities Fund I, LP | 44,645,926 | 0 |
| GCM Grosvenor Fund Investment Program I, LP | 4,963,652 | 1,469,748 |
| GCM Grosvenor Fund Investment Program II, LP | 18,927,445 | 12,818,284 |
| GCM Grosvenor Fund Investment Program III - 2004, LP | 31,332,063 | 4,349,427 |
| GCM Grosvenor Fund Investment Program III - 2006, LP | 39,845,379 | 6,250,107 |
| GCM Grosvenor Fund Investment Program V, LP | 37,961,420 | 8,602,810 |
| GCM Grosvenor Fund Investment Program VI, LP | 23,724,715 | 1,215,466 |
| GCM Grosvenor Fund Investment Program VIII, LP | 113,581,118 | 5,762,891 |
| GCM Grosvenor SeasPriFIP, LP (PIS06-10) | 23,637,608 | 11,340,918 |
| GCM Grosvenor SeasPriFIP, LP (PIS14) | 295,236,263 | 0 |

| | Adjusted Reported Value | Unfunded Commitment |
|--|------------------------------------|--------------------------------|
| GCM Grosvenor SeasPriFIP, LP (Seed) | 9,644,918 | 16,470,751 |
| Genstar Capital Partners IX, LP | 90,905,736 | 6,780,322 |
| Genstar Capital Partners VIII, LP | 78,927,313 | 2,206,000 |
| Genstar Capital Partners X, LP | 43,081,332 | 57,594,677 |
| Genstar IX Opportunities Fund I, LP | 54,827,053 | 4,269,139 |
| Genstar VIII Opportunities Fund I, LP | 65,144,363 | 1,703,430 |
| Genstar X Opportunities Fund I, LP | 11,586,072 | 13,734,437 |
| Golden Bell Azalea, LLC | 48,561,646 | 0 |
| Green Equity Investors V, LP | 9,531,449 | 24,920,675 |
| Green Equity Investors VI, LP | 140,763,413 | 7,712,455 |
| Green Equity Investors VII, LP | 302,327,645 | 43,058,799 |
| Green Equity Investors VIII, LP | 231,246,408 | 32,399,582 |
| Greenspring Master G, LP | 550,680,514 | 480,000,000 |
| Greenspring Micro II, LP | 45,515,459 | 3,466,263 |
| GTCR Fund XIII, LP | 22,114,657 | 31,675,000 |
| GTCR Strategic Growth Fund, LP | 1,330,250 | 41,169,750 |
| HarbourVest Dover Street VIII, LP | 9,748,057 | 5,400,000 |
| HarbourVest Int'l III Partnership, LP | 141,821 | 1,200,000 |
| Harbourvest Partners Co-Investment Fund IV, LP | 81,487,171 | 19,107,835 |
| HarbourVest Partners Co-Investment Fund V, LP | 237,968,702 | 45,000,000 |
| Harbourvest Partners Co-Investment Fund VI, LP | 29,169,091 | 170,000,000 |
| HarbourVest V Partnership, LP | 122,472 | 300,000 |
| HarbourVest VI - Direct Fund, LP | 700,543 | 750,000 |
| HarbourVest VI Partnership, LP | 279,938 | 2,000,000 |
| Harvest Partners IX, LP | 7,842,462 | 92,157,538 |
| Harvest Partners VII, LP | 106,416,319 | 3,525,741 |
| Harvest Partners VIII, LP | 121,772,672 | 0 |
| Hellman & Friedman Capital Partners X, LP | 50,541,439 | 45,311,166 |
| Hg Saturn 3 A, LP | 506,849 | 99,493,151 |
| Insight Partners Fund X Follow-On Fund, LP | 31,323,957 | 12,500,000 |
| Insight Partners XI, LP | 157,439,785 | 2,700,000 |
| Insight Partners XII, LP | 75,346,862 | 61,500,000 |
| Insight Venture Partners GBCF, LP | 128,911,468 | 3,620,616 |
| Insight Venture Partners IX, LP | 283,492,080 | 4,987,231 |
| Insight Venture Partners X, LP | 203,631,484 | 3,462,659 |
| Jade Equity Investors, LP | 78,611,898 | 43,654,646 |
| Kelso Investment Associates IX, LP | 50,402,871 | 8,773,321 |
| Kelso Investment Associates VII, LP | 153,100 | 0 |
| Kelso Investment Associates VIII, LP | 7,702,119 | 7,191,927 |
| Kelso Investment Associates X, LP | 134,292,870 | 24,397,083 |
| Khosla Ventures III, LP | 10,268,142 | 675,000 |
| Khosla Ventures IV, LP | 81,315,140 | 950,000 |
| Khosla Ventures Opportunity I, LP | 19,580,860 | 7,100,000 |
| Khosla Ventures Seed D, LP | 21,488,555 | 940,000 |
| Khosla Ventures Seed E, LP | 3,162,823 | 2,500,000 |

| | Adjusted Reported Value | Unfunded Commitment |
|--|------------------------------------|--------------------------------|
| Khosla Ventures V, LP | 100,387,526 | 1,750,000 |
| Khosla Ventures VI, LP | 116,651,531 | 3,750,000 |
| Khosla Ventures VII, LP | 30,978,270 | 21,000,000 |
| KKR 2006 Fund, LP | 17,168,243 | 6,102,869 |
| KKR Americas Fund XII, LP | 269,724,149 | 24,252,317 |
| KKR Asian, LP | 395,771 | 395,007 |
| KKR Asian Fund II, LP | 26,423,081 | 35,398 |
| KKR Asian Fund III, LP | 116,666,980 | 17,841,404 |
| KKR China Growth Fund, LP | 11,626,269 | 3,306,040 |
| KKR European Fund II, LP | 1,060,647 | 0 |
| KKR European Fund III, LP | 3,415,717 | 6,430,608 |
| KKR European Fund IV, LP | 81,763,324 | 291,546 |
| KKR European Fund V (USD) SCSp | 108,147,987 | 21,374,667 |
| KKR Millennium Fund, LP | 232,956 | 0 |
| KKR North America Fund XI, LP | 51,396,476 | 5,165,394 |
| KKR North America Fund XIII SCSp | 26,595,045 | 97,312,766 |
| Lead Edge Capital IV, LP | 30,283,378 | 4,231,624 |
| Lead Edge Capital V, LP | 25,349,833 | 5,792,358 |
| Lead Edge Capital VI, LP | 2,987,945 | 71,250,000 |
| Lightspeed India Fund IV, LLC | 0 | 7,500,000 |
| Lightspeed Opportunity Fund II, LP | 2,723,705 | 22,250,000 |
| Lightspeed Opportunity Fund, LP | 35,591,616 | 500,000 |
| Lightspeed Venture Partners Select IV, LP | 27,805,017 | 4,000,000 |
| Lightspeed Venture Partners Select V, LP | 4,686,490 | 20,000,000 |
| Lightspeed Venture Partners VII, LP | 4,370,411 | 0 |
| Lightspeed Venture Partners XIII, LP | 15,866,827 | 1,400,000 |
| Lightspeed Venture Partners XIV-A, LP | 2,572,822 | 8,550,000 |
| Lightspeed Venture Partners XIV-B, LP | 2,459,545 | 11,137,500 |
| Menlo Special Opportunities Fund II, LP | 42,529,436 | 3,015,852 |
| Menlo Special Opportunities Fund III, LP | 4,091,278 | 20,750,000 |
| Menlo Ventures IX, LP | 1,127,633 | 0 |
| Menlo Ventures X, LP | 2,298,608 | 0 |
| Menlo Ventures XI, LP | 18,337,448 | 0 |
| Menlo Ventures XIV, LP | 16,141,337 | 0 |
| Menlo Ventures XV, LP | 18,282,737 | 8,750,000 |
| Meritech Capital Partners Franchise Fund, LP | 3,814,869 | 10,987,500 |
| Meritech Capital Partners IV, LP | 5,363,246 | 0 |
| Meritech Capital Partners V, LP | 20,081,179 | 600,000 |
| Meritech Capital Partners VI, LP | 45,514,312 | 2,656,250 |
| Meritech Capital Partners VII, LP | 24,529,677 | 20,400,000 |
| Meritech Capital Partners VIII, LP | 0 | 48,000,000 |
| Meritech Capital Sidecar III, LP | 0 | 12,000,000 |
| Michigan Growth Capital Partners II, LP | 114,486,582 | 472,989 |
| Michigan Growth Capital Partners III, LP | 111,315,263 | 22,860,421 |
| Michigan Growth Capital Partners IV, LP | 19,788,996 | 19,368,055 |

| | Adjusted Reported Value | Unfunded Commitment |
|---|------------------------------------|--------------------------------|
| Michigan Growth Capital Partners, LP | 17,583,369 | 6,455,369 |
| Michigan SEMF Barings | 36,825,586 | 115,406,674 |
| Michigan SEMF Grosvenor | 29,590,856 | 122,361,363 |
| New Leaf Biopharma Opportunities II, LP | 109,108,682 | 8,000,000 |
| New Leaf Growth Fund I, LP | 37,164,185 | 0 |
| New Leaf Ventures II, LP | 4,833,186 | 0 |
| New Leaf Ventures III, LP | 33,520,247 | 0 |
| New Leaf Ventures IV, LP | 59,857,838 | 17,000,000 |
| Oak Investment Partners X, LP | 106,341 | 0 |
| Oak Investments Partners IX, LP | 13,913 | 0 |
| Ocqueoc Holdings, LLC | 721,964 | 47,713,507 |
| Odyssey Investment Partners Fund VI, LP | 80,999,108 | 33,110,512 |
| Permira Growth Opportunities I, LP1 | 38,348,886 | 13,244,666 |
| Permira Growth Opportunities II SCSp | 4,000,000 | 46,000,000 |
| Permira VII, LP 1 | 64,576,502 | 14,768,964 |
| Permira VIII, L.P. 2 | 0 | 73,473,752 |
| Public Pension Capital, LLC | 88,787,813 | 30,644,360 |
| Renaissance Venture Capital Fund IV, LP | 5,971,738 | 19,000,000 |
| Riverside Capital Appreciation Fund VI, LP | 19,976,623 | 3,312,932 |
| Riverside Capital Appreciation Fund VII, LP | 105,509,782 | 16,572,602 |
| Riverside Micro Cap Fund I, LP | 13,810,613 | 5,632,976 |
| Riverside Micro-Cap Fund II, LP | 1,428,328 | 2,035,107 |
| Riverside Micro-Cap Fund III, LP | 72,534,245 | 3,913,101 |
| Riverside Micro-Cap Fund IV, LP | 83,612,803 | 3,617,302 |
| Riverside Micro-Cap Fund IV B, LP | 25,493,108 | 713,421 |
| Riverside Micro-Cap Fund V, LP | 105,607,844 | 23,317,049 |
| Riverside Micro-Cap Fund VI, LP | 8,302,437 | 116,697,563 |
| Science Ventures Fund II, LP | 41,265,392 | 1,500,000 |
| Science Ventures Fund III, LP | 10,819,853 | 15,000,000 |
| Silver Lake Partners II, LP | 0 | 3,531,586 |
| Silver Lake Partners III, LP | 6,939,015 | 11,910,583 |
| Silver Lake Partners IV, LP | 77,400,926 | 1,440,657 |
| Silver Lake Partners V, LP | 78,225,716 | 4,879,942 |
| Silver Lake Partners VI, LP | 43,524,730 | 31,440,073 |
| Silver Lake SL SPV-2 | 59,553,274 | 0 |
| SK Capital Partners V, LP | 55,369,197 | 635,106 |
| SKCP Catalyst Fund I-A, LP | 32,544,996 | 10,152,364 |
| SMRS - TOPE, LLC | 5,101,989,112 | 222,835,071 |
| SMRS-CAPP, LLC | 348,810,890 | 0 |
| SMRS-NCRP, LLC | 1,801,186,196 | 419,966,270 |
| Summit Partners Growth Equity Fund X, LP | 92,583,544 | 23,278,399 |
| Summit Partners Growth Equity Fund XI-A, LP | 6,498,932 | 93,501,068 |
| The Veritas Capital Fund VIII, LP | 2,271,565 | 247,728,435 |
| The Veritas Capital Vantage Fund, LP | 16,193,109 | 41,793,565 |
| Thoma Bravo Discover Fund II, LP | 101,189,026 | 21,229,860 |

| | Adjusted Reported Value | Unfunded Commitment |
|---|------------------------------------|--------------------------------|
| Thoma Bravo Discover Fund IV, LP | 0 | 100,000,000 |
| Thoma Bravo Explore II, LP | 0 | 100,000,000 |
| Thoma Bravo Fund XII, LP | 184,086,878 | 25,455,546 |
| Thoma Bravo Fund XIII, LP | 182,472,763 | 9,446,057 |
| Thoma Bravo Fund XV, LP | 30,354,150 | 69,407,859 |
| Thoma Bravo XIV, LP | 113,885,738 | 7,356,134 |
| TI Platform BOV, LP | 18,596,952 | 4,505,945 |
| TI Platform Fund II, LP | 18,204,468 | 2,510,196 |
| TI Platform Fund III, LP | 0 | 25,000,000 |
| TI Platform SMRS SMA, LP | 93,948,997 | 36,501,290 |
| TPG Healthcare Partners II, LP | 0 | 37,500,000 |
| TPG Healthcare Partners, LP | 17,519,794 | 6,979,315 |
| TPG IV (Texas Pacific Group IV), LP | 109,976 | 211,725 |
| TPG Partners IX, LP | 0 | 112,500,000 |
| TPG Partners VI, LP | 15,571,646 | 7,467,821 |
| TPG Partners VIII, LP | 100,436,615 | 44,743,198 |
| TPG Partners, VII, LP | 101,370,955 | 4,633,993 |
| TPG V (Texas Pacific Group V), LP | 867,962 | 5,841,509 |
| TSG6, LP | 35,707,453 | 19,402,996 |
| TSG7 A, LP | 164,574,880 | 24,477,294 |
| TSG8, LP | 103,295,108 | 42,521,070 |
| TSG9, LP | 0 | 175,000,000 |
| Veritas Capital Fund V, LP | 172,310,540 | 6,209,384 |
| Veritas Capital Fund VI, LP | 199,114,864 | 28,589,975 |
| Veritas Capital Fund VII, LP | 132,454,871 | 0 |
| Veritas V Co-Investors, LP | 121,883,943 | 0 |
| Warburg Pincus Global Growth, LP | 172,320,788 | 18,075,000 |
| Warburg Pincus Private Equity IX, LP | 474,828 | 0 |
| Warburg Pincus Private Equity X, LP | 6,275,014 | 0 |
| Warburg Pincus Private Equity XI, LP | 85,964,969 | 0 |
| Warburg Pincus Private Equity XII Secondary, LP | 31,249,854 | 337,500 |
| Warburg Pincus Private Equity XII, LP | 218,556,271 | 2,362,500 |
| Total Private Equity | \$22,805,124,647 | \$ 7,893,564,581 |
| Cash | 124,935,317 | 0 |
| Active Small Cap Cash | 28,715,561 | 0 |
| Active Small Cap | 2,004,486 | 0 |
| Income Accruals | (1) | 0 |
| Grand Total | \$22,960,780,011 | \$ 7,893,564,581 |

Total Private Equity amounts do not include Cash and Active Small Cap

* New Commitments made during quarter reported (no new commitments this quarter)

State of Michigan Retirement System

DOMESTIC EQUITY REVIEW

State of Michigan Investment Board Meeting
December 8, 2022



Jack A. Behar, CFA
Senior Investment Manager
Domestic Equity Division

EXECUTIVE SUMMARY

Performance

| MPSERS Plan (9/30/22) | 1-Year | 3-Years | 5-Years | 7-Years | 10-Years |
|------------------------------|---------------|----------------|----------------|----------------|-----------------|
| Annualized Returns | -21.1% | 5.2% | 7.6% | 9.9% | 10.9% |
| S&P 1500 | -15.6% | 8.0% | 8.9% | 11.2% | 11.6% |
| Peer Median Return | -16.3% | 5.8% | 6.3% | 8.4% | 8.4% |
| Percentile Rank vs. Peers * | 90 | 66 | 40 | 32 | 30 |

*State Street Universe greater than \$1 billion

- For the year ended September 30, 2022, the Domestic Equity Division (DED) underperformed its peer group and the S&P 1500 by 480 basis points (bps) and 550 bps respectively, with incurred tracking error of 1.7%. DED performed near the top quartile of peers over the past ten years, in the top half over five and seven-year periods, and below the S&P 1500 over all periods.
- Energy, defensive and value stocks did well over the past year, while smaller-cap, growth and highly profitable companies, where DED was overweight, all underperformed. Additionally, the Disruptive Innovation space, which experienced disproportionate buying just two years prior, continued to weather disproportionate selling through quarter end. We continue to believe our Disruptive Innovation portfolios are significantly underpriced, with excellent long-term return potential. Our managers have excelled in this space for over 30 years and know how to successfully navigate cycles like these.
- In hindsight, DED erred in 2020 by reducing value exposure and adding expensive momentum exposure to the portfolio in an effort to balance out its long-time value orientation. Since then, value has gone on to significantly outperform, while momentum stocks have suffered meaningful underperformance.
- DED has learned from this experience, and in aggregate is overweight smaller, highly profitable, and substantially undervalued companies that have sold off heavily in the past year. We believe this portfolio will grow quickly and meaningfully outperform the market once the Fed has concluded its rate rising cycle and the economy recovers from its induced slowdown.
- A handful of value managers in the portfolio performed well in the year ended September of 2022:
 - Michigan based managers, Clarkston Capital, Managed Asset Portfolios and Seizert Capital outperformed the market by over 800 bps, 250 bps and 200 bps, respectively.
 - Attucks Asset Management, one of DED's emerging manager of managers, also had a strong year, beating the S&P 1500 by over 500 bps.

Asset Class Goal

To provide the SMRS with long-term domestic equity market returns or better, by investing in a diversified and attractively valued portfolio of companies at an index fund-like cost.

Strategy Update

- The Domestic Equity Division's portfolio remains undervalued when measured against ours and outside analysts' estimates of fair value, trading at nearly a 10% discount to the S&P 1500 on this year's earnings and an even further discount to normalized earnings.
- The correction we have seen in stocks, bonds and housing so far in 2022 is both healthy, and supportive of the Fed's goal of reducing excess inflationary demand in the economy. Significant declines in year over year money supply measures also portend a more balanced inflationary environment over time.
- While it's possible that the Fed's aggressive tightening campaign could send the economy into recession over the next year, we believe stock prices will be materially higher than current levels looking forward over a three-to-five-year period.
- DED is overweight communication services, financials and information technology, highlighting the significant expected return opportunity that has presented itself in these sectors as the market has corrected in 2022. Portfolio underweights include consumer discretionary and real estate.

Market Environment and Outlook

- At ~15.5x forward earnings, equity markets trade at an earnings yield (earnings/price) of nearly 6.5%, or ~270 bps higher than 10-year treasury bonds at ~3.8%, or ~26x earnings.
- Historically stocks have traded at an earnings yield approximately 125 bps higher than bonds, versus today's spread of 270 bps, suggesting that stocks could meaningfully appreciate over the long-term, even with bond yields remaining at these levels.
- Similarly, while in the short-term higher bond yields will likely cause further downside market volatility, the Fed has room to raise rates without significantly depressing stock valuations over the long-term.
- Over time we expect the market to return roughly 9.8%, driven by a dividend yield of 1.8% and dividend per share growth of 8.0%.
 - Dividend per share growth driven by nominal global economic growth of 5% and further 3% growth driven by share buybacks from cash flow rich companies.

SMRS

Domestic Equity Strategies

9/30/22

| Markets | Amount | Total | % of Total |
|--|---------|----------------|--------------|
| Internal Indexed (\$ in Millions) | | | |
| Indexed Portfolios | \$9,275 | | |
| Total Indexed | | \$9,275 | 57.0% |
| Internal Active | | | |
| Active Portfolios | \$4,347 | | |
| Total Internal Active | | \$4,347 | 26.7% |
| External Active | | | |
| Los Angeles Capital | \$652 | | |
| Seizert Capital Partners | 478 | | |
| Clarkston Capital Partners | 424 | | |
| Martin Currie US LT Unconstrained | 372 | | |
| ARK Investments | 208 | | |
| Patient Capital | 120 | | |
| Attucks Asset Management | 117 | | |
| Bivium Capital | 107 | | |
| Managed Asset Portfolios | 86 | | |
| Ancora | 85 | | |
| Total External Active | | \$2,649 | 16.3% |

Total Domestic Equity

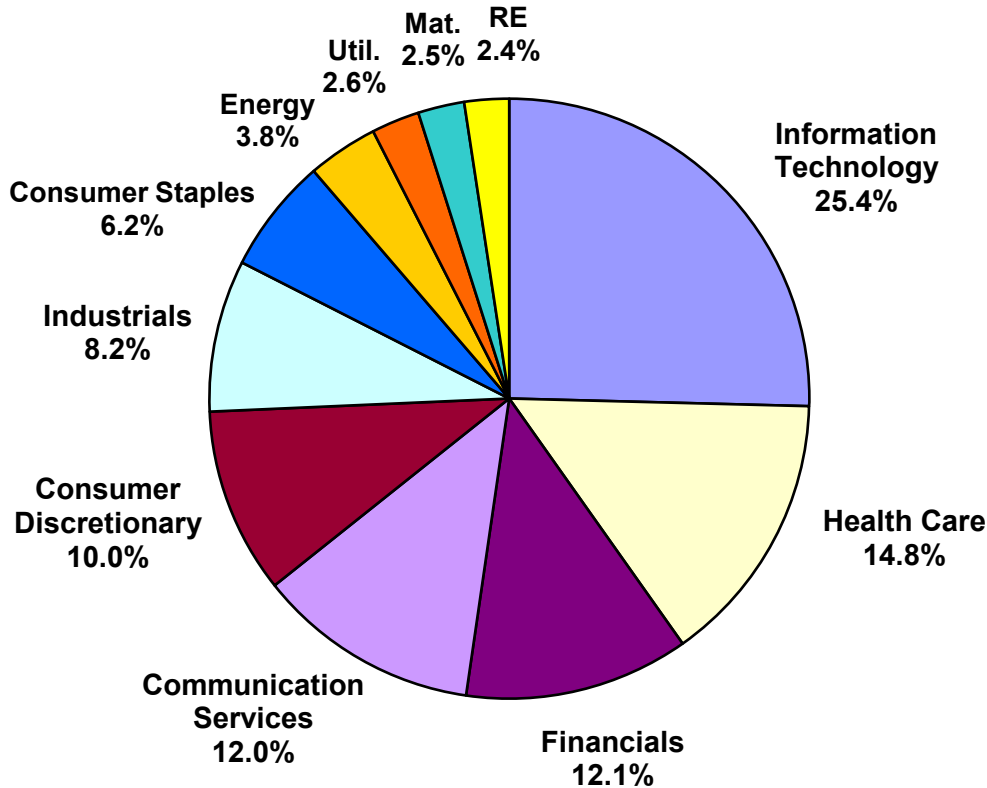
\$16,271

100.0%

SMRS

Domestic Equity By Sector

9/30/22



| Market Value in Millions | | | | |
|---------------------------------|------------------------|----------------------|----------------------|-------------------|
| 9/30/22 | | | | |
| | <u>Assets</u> | <u>Percent</u> | <u>Benchmark</u> | <u>Difference</u> |
| Information Technology | \$4,135 | 25.4% | 25.3% | 0.1% |
| Health Care | 2,414 | 14.8% | 14.8% | 0.0% |
| Financials | 1,975 | 12.1% | 11.5% | 0.6% |
| Communication Services | 1,950 | 12.0% | 7.5% | 4.5% |
| Consumer Discretionary | 1,624 | 10.0% | 11.8% | -1.8% |
| Industrials | 1,334 | 8.2% | 8.7% | -0.5% |
| Consumer Staples | 1,008 | 6.2% | 6.7% | -0.5% |
| Energy | 624 | 3.8% | 4.6% | -0.8% |
| Utilities | 413 | 2.6% | 3.1% | -0.5% |
| Materials | 406 | 2.5% | 2.8% | -0.3% |
| Real Estate | 388 | 2.4% | 3.2% | -0.8% |
| Total | <u>\$16,271</u> | <u>100.0%</u> | <u>100.0%</u> | |

Benchmark: S&P 1500

SMRS

Domestic Equities Composite

9/30/22

| Date: | <u>9/30/22</u> | <u>6/30/22</u> | <u>3/31/22</u> | <u>12/31/21</u> |
|--------------------------|----------------|----------------|----------------|-----------------|
| Assets (\$ in Millions): | \$16,271 | \$17,652 | \$22,354 | \$23,894 |
| Number of Securities: | 1,785 | 1,856 | 3,023 | 3,030 |
| Active Share: | 25% | 28% | 37% | 30% |

Description: The Domestic Equities Composite seeks to deliver excess returns through a blend of index investing and active management with value-added, but diverse strategies. While the goal is for most managers to outperform in the long run, the composite is designed such that they do so during differing parts of the business cycle.

| | SMRS | S&P 1500 |
|------------------------------------|-------------|-------------|
| Characteristics: | | |
| Market Cap. (\$ in Billions) | \$397.5 | \$430.4 |
| FY1 P/E | 14.3 | 15.5 |
| P/E upside to S&P 1500 | 8.3% | 0.0 |
| Return on Equity | 20.4% | 19.9% |
| Risk Metrics | | |
| Beta | 1.08 | 1.00 |
| Tracking Error | 2.6% | 0.0% |
| Projected Returns | | |
| Dividend Yield | 2.0% | 1.8% |
| Buyback Yield | 3.2% | 3.1% |
| Reinvestment Rate | <u>5.1%</u> | <u>4.9%</u> |
| Projected Investment Return | 10.3% | 9.8% |

TOP TEN EXPOSURES – Domestic Equities vs S&P 1500

9/30/22

| <u>Domestic Equity Portfolio</u> | | <u>S&P 1500</u> | |
|----------------------------------|-------------------------|----------------------------------|----------------------|
| <u>Company Name</u> | <u>Portfolio Weight</u> | <u>Company Name</u> | <u>Market Weight</u> |
| Apple, Inc. | 5.5% | Apple, Inc. | 6.4% |
| Microsoft Corporation | 4.8% | Microsoft Corporation | 5.3% |
| Amazon.com, Inc. | 2.6% | Amazon.com, Inc. | 3.1% |
| Alphabet, Inc., Class A | 2.2% | Tesla, Inc. | 2.2% |
| U.S. Dollar | 2.2% | Alphabet Inc., Class A | 1.8% |
| Meta Platforms, Inc., Class A | 2.0% | Alphabet Inc., Class C | 1.6% |
| AT&T, Inc. | 1.8% | Berkshire Hathaway Inc., Class B | 1.5% |
| Verizon Communications, Inc. | 1.7% | UnitedHealth Group, Inc | 1.4% |
| UnitedHealth Group, Inc. | 1.4% | Johnson & Johnson | 1.3% |
| Tesla, Inc. | <u>1.4%</u> | Exxon Mobil Corporation | <u>1.1%</u> |
| TOTAL | <u>25.6%</u> | TOTAL | <u>25.7%</u> |

Manager Performance - Net of Fees

9/30/22

| <u>Fund Name</u> | <u>Market Value</u> | <u>1-Year</u> | <u>3-Years</u> | <u>5-Years</u> | <u>7-Years</u> | <u>Inception</u> | <u>Inception Date</u> |
|--|------------------------|---------------|----------------|----------------|----------------|------------------|-----------------------|
| SMRS S&P 500 Index | \$8,728,366,890 | -15.5% | 8.1% | 9.2% | 11.4% | -- | N/A |
| S&P 500 | | -15.5% | 8.2% | 9.2% | 11.4% | -- | |
| Style & Risk Adjusted Benchmark | | -15.5% | 8.2% | 9.2% | 11.4% | -- | |
| Lipper Large-Cap Core | | -16.2% | 7.4% | 8.5% | 10.4% | -- | |
| <i>Excess Return</i> | | <i>0.0%</i> | <i>-0.1%</i> | <i>0.0%</i> | <i>0.0%</i> | <i>--</i> | |
| <i>Alpha</i> | | <i>-0.1%</i> | <i>0.0%</i> | <i>0.0%</i> | <i>0.1%</i> | <i>--</i> | |
| <i>Pct. Rank vs. Lipper Large-Cap Core</i> | | <i>38</i> | <i>30</i> | <i>34</i> | <i>18</i> | <i>--</i> | |
| SMRS Large-Cap Core | 1,216,000,153 | -25.7% | 5.1% | 7.7% | 8.8% | 7.7% | 8/31/07 |
| S&P 500 | | -15.5% | 8.2% | 9.2% | 11.4% | 8.3% | |
| Style & Risk Adjusted Benchmark | | -12.6% | 7.2% | 8.3% | 11.8% | 6.9% | |
| Lipper Large-Cap Core | | -16.2% | 7.4% | 8.5% | 10.4% | 7.8% | |
| <i>Excess Return</i> | | <i>-10.2%</i> | <i>-3.0%</i> | <i>-1.6%</i> | <i>-2.6%</i> | <i>-0.6%</i> | |
| <i>Alpha</i> | | <i>-13.1%</i> | <i>-2.1%</i> | <i>-0.6%</i> | <i>-3.0%</i> | <i>0.8%</i> | |
| <i>Pct Rank vs Lipper Large-Cap Core</i> | | <i>100</i> | <i>90</i> | <i>78</i> | <i>89</i> | <i>58</i> | |
| SMRS All-Cap Garp | 1,160,548,044 | -23.2% | -0.5% | 2.8% | 5.9% | 9.0% | 4/30/11 |
| S&P 1500 Super Composite | | -15.5% | 8.0% | 8.9% | 11.2% | 11.0% | |
| Style & Risk Adjusted Benchmark | | -19.4% | 8.5% | 9.6% | 11.8% | 11.5% | |
| Lipper Multi-Cap Core | | -17.0% | 6.1% | 7.0% | 9.0% | 9.0% | |
| <i>Excess Return</i> | | <i>-7.6%</i> | <i>-8.5%</i> | <i>-6.1%</i> | <i>-5.2%</i> | <i>-2.0%</i> | |
| <i>Alpha</i> | | <i>-3.7%</i> | <i>-9.0%</i> | <i>-6.8%</i> | <i>-5.9%</i> | <i>-2.5%</i> | |
| <i>Pct. Rank vs. Lipper Multi-Cap Core</i> | | <i>90</i> | <i>100</i> | <i>93</i> | <i>90</i> | <i>54</i> | |
| Value, Quality, Momentum Composite | 697,031,519 | -20.0% | -- | -- | -- | 1.9% | 10/1/20 |
| S&P 1500 | | -15.5% | -- | -- | -- | 5.3% | |
| Style & Risk Adjusted Benchmark | | -14.2% | -- | -- | -- | 5.2% | |
| Lipper Multi-Cap Core | | -17.0% | -- | -- | -- | 4.0% | |
| <i>Excess Return</i> | | <i>-4.4%</i> | <i>--</i> | <i>--</i> | <i>--</i> | <i>-3.4%</i> | |
| <i>Alpha</i> | | <i>-5.8%</i> | <i>--</i> | <i>--</i> | <i>--</i> | <i>-3.3%</i> | |
| <i>Pct. Rank vs. Lipper Multi-Cap Core</i> | | <i>79</i> | <i>--</i> | <i>--</i> | <i>--</i> | <i>79</i> | |
| SMRS Large-Cap Growth | 669,327,986 | -21.1% | 11.0% | 12.3% | 12.6% | 10.2% | 5/31/05 |
| S&P 500 Growth | | -21.1% | 9.9% | 11.4% | 13.1% | 10.2% | |
| Style & Risk Adjusted Benchmark | | -18.3% | 9.0% | 10.9% | 12.6% | 10.1% | |
| Lipper Large-Cap Growth | | -27.4% | 7.3% | 9.6% | 11.2% | 9.4% | |
| <i>Excess Return</i> | | <i>0.0%</i> | <i>1.0%</i> | <i>0.9%</i> | <i>-0.5%</i> | <i>-0.1%</i> | |
| <i>Alpha</i> | | <i>-2.8%</i> | <i>1.9%</i> | <i>1.4%</i> | <i>0.0%</i> | <i>0.1%</i> | |
| <i>Pct Rank vs Lipper Large-Cap Growth</i> | | <i>15</i> | <i>11</i> | <i>10</i> | <i>26</i> | <i>28</i> | |
| LA Capital All-Cap Growth | 651,865,916 | -18.7% | 6.0% | 9.3% | 11.1% | 11.0% | 5/31/05 |
| S&P 1500 Growth | | -21.0% | 9.6% | 10.9% | 12.7% | 10.1% | |
| Style & Risk Adjusted Benchmark | | -19.0% | 8.9% | 10.1% | 11.5% | 8.4% | |
| Lipper Multi-Cap Growth | | -31.7% | 6.2% | 8.4% | 10.0% | 8.9% | |
| <i>Excess Return</i> | | <i>2.3%</i> | <i>-3.6%</i> | <i>-1.7%</i> | <i>-1.6%</i> | <i>0.8%</i> | |
| <i>Alpha</i> | | <i>0.3%</i> | <i>-2.9%</i> | <i>-0.8%</i> | <i>-0.4%</i> | <i>2.5%</i> | |
| <i>Pct. Rank vs. Lipper Multi-Cap Growth</i> | | <i>7</i> | <i>47</i> | <i>38</i> | <i>34</i> | <i>9</i> | |
| SMRS Mid-Cap Index | 547,006,196 | -15.2% | 6.0% | 5.9% | 9.0% | -- | N/A |
| S&P 400 | | -15.2% | 6.0% | 5.8% | 8.7% | -- | |
| Style & Risk Adjusted Benchmark | | -15.2% | 6.0% | 5.8% | 8.7% | -- | |
| Lipper Mid-Cap Core | | -14.5% | 5.1% | 5.3% | 7.8% | -- | |
| <i>Excess Return</i> | | <i>0.0%</i> | <i>0.0%</i> | <i>0.1%</i> | <i>0.3%</i> | <i>--</i> | |
| <i>Alpha</i> | | <i>0.0%</i> | <i>0.0%</i> | <i>0.1%</i> | <i>0.3%</i> | <i>--</i> | |
| <i>Pct. Rank vs. Lipper Mid-Cap Core</i> | | <i>61</i> | <i>36</i> | <i>39</i> | <i>20</i> | <i>--</i> | |
| Seizert Capital Partners | 478,157,803 | -13.2% | 9.2% | 7.7% | 10.5% | 11.9% | 11/30/09 |
| S&P 1500 Value | | -9.9% | 5.2% | 6.1% | 8.9% | 10.5% | |
| Style & Risk Adjusted Benchmark | | -9.1% | 5.2% | 6.0% | 8.9% | 10.5% | |
| Lipper Multi-Cap Value | | -10.8% | 5.3% | 5.4% | 7.9% | 9.5% | |
| <i>Excess Return</i> | | <i>-3.3%</i> | <i>4.0%</i> | <i>1.6%</i> | <i>1.6%</i> | <i>1.4%</i> | |
| <i>Alpha</i> | | <i>-4.1%</i> | <i>4.0%</i> | <i>1.7%</i> | <i>1.6%</i> | <i>1.4%</i> | |
| <i>Pct. Rank vs. Lipper Multi-Cap Value</i> | | <i>77</i> | <i>8</i> | <i>11</i> | <i>6</i> | <i>3</i> | |

| <u>Fund Name</u> | <u>Market Value</u> | <u>1-Year</u> | <u>3-Years</u> | <u>5-Years</u> | <u>7-Years</u> | <u>Inception</u> | <u>Inception Date</u> |
|--|---------------------|---------------|----------------|----------------|----------------|------------------|-----------------------|
| Large-Cap Consistent Growth | 452,777,649 | -33.9% | 1.4% | 8.4% | 9.6% | 8.5% | 3/1/15 |
| S&P 500 | | -15.5% | 8.2% | 9.2% | 11.4% | 9.3% | |
| Style & Risk Adjusted Benchmark | | -23.1% | 10.6% | 11.6% | 13.4% | 11.2% | |
| Lipper Large-Cap Core | | -16.2% | 7.4% | 8.5% | 10.4% | 8.4% | |
| <i>Excess Return</i> | | -18.5% | -6.8% | -0.8% | -1.8% | -0.8% | |
| <i>Alpha</i> | | -10.9% | -9.2% | -3.2% | -3.8% | -2.7% | |
| <i>Pct. Rank vs. Lipper Large-Cap Core</i> | | 100 | 100 | 60 | 78 | 55 | |
| Clarkston Capital Small/Mid-Cap | 423,382,994 | -6.6% | 8.0% | 7.8% | 9.8% | 9.8% | 1/1/14 |
| S&P 400 | | -16.4% | 5.9% | 5.5% | 8.8% | 7.4% | |
| Style & Risk Adjusted Benchmark | | -9.6% | 5.1% | 5.6% | 8.2% | 5.9% | |
| Lipper Mid-Cap Core | | -14.5% | 5.1% | 5.3% | 7.8% | 6.4% | |
| <i>Excess Return</i> | | 9.7% | 2.1% | 2.2% | 1.0% | 2.5% | |
| <i>Alpha</i> | | 2.9% | 2.9% | 2.2% | 1.6% | 3.9% | |
| <i>Pct. Rank vs. Lipper Mid-Cap Core</i> | | 1 | 10 | 8 | 8 | 1 | |
| Martin Currie | 371,756,415 | -37.7% | -- | -- | -- | -11.4% | 11/1/20 |
| S&P 1500 Growth | | -21.0% | -- | -- | -- | 2.7% | |
| Style & Risk Adjusted Benchmark | | -24.4% | -- | -- | -- | 3.1% | |
| Lipper Multi-Cap Growth | | -31.7% | -- | -- | -- | -6.2% | |
| <i>Excess Return</i> | | -16.7% | -- | -- | -- | -14.1% | |
| <i>Alpha</i> | | -13.3% | -- | -- | -- | -14.5% | |
| <i>Pct. Rank vs. Lipper Multi-Cap Growth</i> | | 76 | -- | -- | -- | 78 | |
| Ark Investments | 208,349,436 | -69.1% | -11.7% | -2.4% | -- | 7.4% | 3/1/16 |
| S&P 1500 Growth | | -21.0% | 9.6% | 10.9% | -- | 13.3% | |
| Style & Risk Adjusted Benchmark | | -22.7% | 7.2% | 7.0% | -- | 19.6% | |
| Lipper Multi-Cap Growth | | -31.7% | 6.2% | 8.4% | -- | 11.4% | |
| <i>Excess Return</i> | | -48.1% | -21.3% | -13.3% | -- | -5.9% | |
| <i>Alpha</i> | | -46.4% | -18.9% | -9.4% | -- | -12.2% | |
| <i>Pct. Rank vs. Lipper Multi-Cap Growth</i> | | 100 | 99 | 99 | -- | 92 | |
| Patient Capital | 119,770,597 | -40.1% | -- | -- | -- | -40.1% | 10/1/21 |
| S&P 1500 Value | | -9.9% | -- | -- | -- | -9.9% | |
| Style & Risk Adjusted Benchmark | | -11.5% | -- | -- | -- | -11.5% | |
| Lipper Multi-Cap Value | | -10.8% | -- | -- | -- | -10.8% | |
| <i>Excess Return</i> | | -30.2% | -- | -- | -- | -30.3% | |
| <i>Alpha</i> | | -28.6% | -- | -- | -- | -28.6% | |
| <i>Pct. Rank vs. Lipper Multi-Cap Value</i> | | 100 | -- | -- | -- | 100 | |
| Attucks Asset Management | 117,124,075 | -9.9% | 4.4% | 5.9% | 8.0% | 6.2% | 11/30/07 |
| S&P 1500 | | -15.5% | 8.0% | 8.9% | 11.2% | 8.0% | |
| Style & Risk Adjusted Benchmark | | -10.4% | 5.1% | 5.9% | 8.7% | 7.8% | |
| Lipper Multi-Cap Core | | -17.0% | 6.1% | 7.0% | 9.0% | 6.4% | |
| <i>Excess Return</i> | | 5.7% | -3.5% | -3.0% | -3.2% | -1.8% | |
| <i>Alpha</i> | | 0.6% | -0.7% | 0.0% | -0.7% | -1.6% | |
| <i>Pct. Rank vs. Lipper Multi-Cap Core</i> | | 10 | 78 | 75 | 78 | 58 | |
| Disruptive Innovation Momentum | 114,084,095 | -64.2% | -- | -- | -- | -23.6% | 9/1/20 |
| MSCI Momentum Index | | -24.2% | -- | -- | -- | -6.4% | |
| Style & Risk Adjusted Benchmark | | -23.3% | -- | -- | -- | 8.5% | |
| Lipper Multi-Cap Growth | | -31.7% | -- | -- | -- | -7.7% | |
| <i>Excess Return</i> | | -40.0% | -- | -- | -- | -17.3% | |
| <i>Alpha</i> | | -41.0% | -- | -- | -- | -32.1% | |
| <i>Pct. Rank vs. Lipper Multi-Cap Growth</i> | | 100 | -- | -- | -- | 94 | |

| <u>Fund Name</u> | <u>Market Value</u> | <u>1-Year</u> | <u>3-Years</u> | <u>5-Years</u> | <u>7-Years</u> | <u>Inception</u> | <u>Inception Date</u> |
|---|---------------------|---------------|----------------|----------------|----------------|------------------|-----------------------|
| Bivium Capital Partners | 107,075,469 | -18.1% | 1.4% | 3.3% | 6.1% | 5.2% | 11/30/07 |
| S&P 1500 Value | | -9.9% | 5.2% | 6.1% | 8.9% | 5.9% | |
| Style & Risk Adjusted Benchmark | | -14.8% | 7.7% | 8.9% | 11.3% | 8.1% | |
| Lipper Multi-Cap Value | | -10.8% | 5.3% | 5.4% | 7.9% | 5.5% | |
| <i>Excess Return</i> | | -8.2% | -3.8% | -2.8% | -2.8% | -0.7% | |
| <i>Alpha</i> | | -3.3% | -6.3% | -5.6% | -5.1% | -2.9% | |
| <i>Pct. Rank vs. Lipper Multi-Cap Value</i> | | 94 | 95 | 87 | 90 | 59 | |
| Managed Asset Portfolios | 86,184,867 | -12.9% | 3.9% | 6.2% | -- | 9.2% | 2/29/16 |
| S&P 1500 Value | | -9.9% | 5.2% | 6.1% | -- | 9.3% | |
| Style & Risk Adjusted Benchmark | | -8.9% | 4.5% | 5.0% | -- | 9.1% | |
| Lipper Multi-Cap Value | | -10.8% | 5.3% | 5.4% | -- | 8.6% | |
| <i>Excess Return</i> | | -3.0% | -1.3% | 0.1% | -- | -0.1% | |
| <i>Alpha</i> | | -4.0% | -0.6% | 1.2% | -- | 0.1% | |
| <i>Pct. Rank vs. Lipper Multi-Cap Value</i> | | 75 | 76 | 33 | -- | 32 | |
| Ancora | 84,730,597 | -20.4% | 4.4% | -- | -- | 3.6% | 10/1/17 |
| S&P 1000 | | -16.4% | 5.9% | -- | -- | 5.5% | |
| Style & Risk Adjusted Benchmark | | -10.6% | 5.9% | -- | -- | 5.2% | |
| Lipper Mid-Cap Core | | -14.5% | 5.1% | -- | -- | 5.3% | |
| <i>Excess Return</i> | | -4.1% | -1.5% | -- | -- | -2.0% | |
| <i>Alpha</i> | | -9.8% | -1.6% | -- | -- | -1.6% | |
| <i>Pct. Rank vs. Lipper Mid-Cap Core</i> | | 92 | 70 | -- | -- | 87 | |
| All-Cap Core | 8,372,978 | -- | -- | -- | -- | -16.6% | |
| S&P 1500 | | -- | -- | -- | -- | -12.5% | |
| Style & Risk Adjusted Benchmark | | -- | -- | -- | -- | -12.2% | |
| Lipper Multi-Cap Core | | -- | -- | -- | -- | -12.2% | |
| <i>Excess Return</i> | | -- | -- | -- | -- | -4.1% | |
| <i>Alpha</i> | | -- | -- | -- | -- | -4.4% | |
| <i>Pct. Rank vs. Lipper Multi-Cap Core</i> | | -- | -- | -- | -- | 96 | |

State of Michigan Retirement System

INTERNATIONAL EQUITY REVIEW

State of Michigan Investment Board Meeting

December 8, 2022



Patrick M. Moraniec, CFA
Senior Investment Manager
International Equity Division

EXECUTIVE SUMMARY

Performance

| MPSERS Plan (09/30/22) | 1-Year | 3-Years | 5-Years | 7-Years | 10-Years |
|----------------------------|--------|---------|---------|---------|----------|
| Annualized Returns | -27.5% | -1.1% | -0.5% | 3.8% | 3.9% |
| MSCI ACWI ex USA Returns | -25.2% | -1.5% | -0.8% | 3.3% | 3.1% |
| Peer Median Returns | -25.1% | -0.7% | -0.1% | 3.8% | 4.0% |
| Percentile Rank vs. Peers* | 75 | 71 | 83 | 52 | 66 |

*Source: State Street Universe greater than \$1 billion

- The portfolio underperformed the benchmark by 2.4% over the last twelve months.
- The underperformance was driven by the volatility factor, dividend yield factor, and quality factor, energy sector, and technology sector.

Asset Class Goals

- Construct a non-U.S. equity-focused portfolio to generate, on a consistent basis, ten-year returns that exceed the MSCI ACWI ex USA by 1.0%.
- Perform in the top half of the public plan peer universe percentile rankings.
- Advance people, processes, and systems to continuously improve investment decisions.

Strategy

- The division allocates capital with the intention of persistent exposure to the quality factor, momentum factor, and value factor.
- Persistent factor exposures create consistent, transparent, low-cost, efficient returns.
- Current portfolio drivers of risk and return.
 - The tracking error of the portfolio is approximately 1.5%, which is below the division's risk budget of 3.0%.
 - The division's core strategy of exposure to the quality, value, and momentum factors (QVM), accounts for collectively 13.6% of the total tracking error, indicating that long-term, the portfolio is not materially exposed to any single risk.
- Quarterly changes to International Equity Division allocation.
 - Rebalanced \$0.7 billion of equity swaps to match the division's long-term equity factor strategy.

Market Environment and Outlook

Market Performance

- International stock markets were down -25.2% over the last twelve months. Fundamentals continuing to slow since the May 2022 peak and the forward one-year guidance has begun to decline as well.
- Performance of the quality, value, and momentum factors (QVM) remains strategically important to the IED. Over the last twelve months, the value factor outperformed the MSCI ACWI ex USA by 0.6%. The momentum factor and quality factor continued to lag, underperforming the benchmark -0.7% and -1.0% respectively. IED's core strategy remains balanced and consistent, however, the strategy is currently underperforming the division's benchmark by -0.8% year-to-date.
- Emerging markets underperformed the MSCI ACWI ex USA by -2.9% over the last year. Developed markets outperformed the broader index by 1.3%.
- The U.S. dollar year-to-date was exceptionally strong relative to developed currencies, up 17.3% through September.
- Despite the recent decline in commodities, they remain up 12.4% through September of this year. Oil is up 5.7% year-to-date with copper, and gold declining -23.5% and -8.6%.
- Global government interest rates (index weighted) remain low by historical standards but are significantly higher at 3.6% relative to the March 2020 low.

Outlook

- Global stocks, commodities, and real estate have risen at a pace that indicates significant global inflation across asset classes.
- Major central banks continue to remove liquidity from the financial system. The impact of this withdrawal will have consequences on both the bond and currency markets.
- The global economy is slowing and may contract in 2023. Although international stock markets' earnings per share grew at 8.3% year-over-year, the earnings have been trending down since the peak in May 2022.
- Europe's top-line sales and earnings expanded year-over-year by 2.7% and 16.6%. Forward-looking sales and earnings per share are expected to be up over the next 12 months, 1.3% and 1.8% respectively.
- Japan's sales per share declined by -8.8% year-over-year which earnings per share grew at 3.2% year-over-year. Forward-looking sales and earnings growth are forecasted at -0.5% and 1.9%.
- Over the last two years, central banks' "anything it takes" policies have created tremendous amounts of money in the global financial system. Forward-looking sales and earnings estimates appear to be moderating back towards a more normal level of growth especially as the central banks continue to tighten financial conditions.

- Energy costs have soared even before the war in Ukraine. At the end of December 2021, oil was up nearly 51% year-over-year, indicating the upward inflation pressures predate the war. The same dynamic has occurred across other major input commodities such as soybeans, wheat, and corn. Price increases have begun to moderate in both consumers' and producers' expectations but remain well above central banks' inflation targets.
- Major central banks, apart from the Bank of Japan, have changed monetary policies from accommodative to tightening in 2022 to rein in inflation. Currently, the market continues to believe that central banks will win the fight against inflation. If that belief proves incorrect interest may remain structurally higher for longer than the markets are pricing in.
- Persistently high inflation may force the banks to taper more quickly, leading markets to reassess how much support central banks will provide to indebted governments. Significantly higher interest rates may potentially lead to a further contraction in equity market multiples.
- If the major central banks stop tightening, their respective currencies will come under significant pressure, similar to what has occurred in Japan this year. Temporarily this may drive inflation even higher in 2023.
- Analysts' forward-looking, one-year estimate for the MSCI ACWI ex USA index earnings per share growth is 1.7% down from the 5.7% in March of 2022.
- Go-forward returns for the MSCI ACWI ex USA index on an annualized basis are estimated at 9.0%. This rate is based on the current price and actual fundamentals over multiple periods to remove fundamental variability, and better estimate the earnings power of the index.
- A ten-year blended international government yield of 3.0% implies an international equity risk premium of 6.0%. The equity risk premium contracted by 0.1% in the quarter due to a 0.4% increase in long-term government interest rates offset by a 0.3% rise in the forward-looking returns of the international stocks.

Conclusion

International stock market fundamentals are slowing towards a more normal rate of growth. Global government bond yields have moved higher but remain near all-time lows. As stock markets lap their year-over-year fundamental comparisons, the question becomes what multiples investors are willing to pay if the growth projections moderate or even decline.

International stocks are expected to grow earnings per share by 1.7% in the next twelve months. The market trades at 13.0x price to earnings which is below its twenty-three-year average of 16.0x but questions remain if earnings will be impacted by higher interest rates and inflation. The annualized go-forward return of 9.0% is still a wide spread relative to global risk-free rates. To capture the spread to bonds, international stock investors will need a long investment horizon as the short-term environment may experience increased volatility.

SMRS

International Equity Strategies

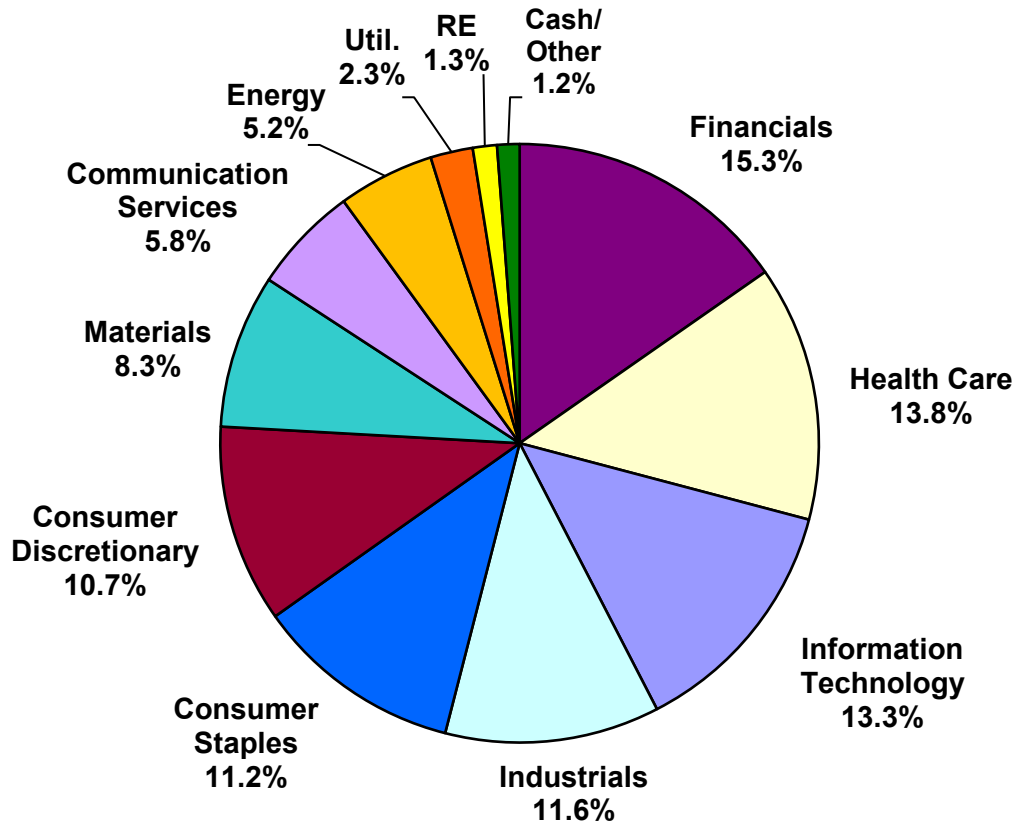
9/30/22

| Markets | Amount | Total | % of Total |
|--------------------------------|---------|------------------------|----------------------|
| Active (\$ in Millions) | | | |
| BlackRock MSCI | \$1,958 | | |
| IED Quality Equity | 809 | | |
| Martin Currie | 363 | | |
| UBS | 145 | | |
| Wellington | 135 | | |
| WCM | 127 | | |
| Brown | 91 | | |
| Vontobel | 83 | | |
| Baillie Gifford | 82 | | |
| Morgan Stanley | 65 | | |
| Baron | 47 | | |
| Total Active | | \$3,905 | 35.2% |
| Stock Plus | | | |
| Internal | \$2,674 | | |
| PIMCO | 1,746 | | |
| Total Stock Plus | | \$4,420 | 39.8% |
| Indexed | | | |
| SSGA | \$1,376 | | |
| BlackRock | 1,268 | | |
| Total Indexed | | \$2,644 | 23.8% |
| Cash | | | |
| Cash | | \$135 | 1.2% |
| TOTAL | | <u>\$11,105</u> | <u>100.0%</u> |

SMRS

International Equity By Sector

9/30/22



| Market Value in Millions | | | | |
|---------------------------------|-----------------|----------------|------------------|-------------------|
| 9/30/22 | | | | |
| | <u>Assets</u> | <u>Percent</u> | <u>Benchmark</u> | <u>Difference</u> |
| Financials | \$1,695 | 15.3% | 20.8% | -5.5% |
| Health Care | 1,537 | 13.8% | 10.0% | 3.8% |
| Information Technology | 1,476 | 13.3% | 10.9% | 2.4% |
| Industrials | 1,287 | 11.6% | 12.4% | -0.8% |
| Consumer Staples | 1,244 | 11.2% | 9.0% | 2.2% |
| Consumer Discretionary | 1,182 | 10.7% | 10.9% | -0.2% |
| Materials | 926 | 8.3% | 8.1% | 0.2% |
| Communication Services | 643 | 5.8% | 5.8% | 0.0% |
| Energy | 574 | 5.2% | 6.6% | -1.4% |
| Utilities | 259 | 2.3% | 3.3% | -1.0% |
| Real Estate | 147 | 1.3% | 2.2% | -0.9% |
| Total Investments | \$10,970 | 98.8% | 100.0% | |
| Cash/Other | 135 | 1.2% | 0.0% | 1.2% |
| Total | \$11,105 | 100.0% | 100.0% | |

Benchmark: MSCI ACWI ex USA

SMRS

International Equities

9/30/22

| Date: | <u>9/30/22</u> | <u>6/30/22</u> | <u>3/31/22</u> | <u>12/31/21</u> |
|--------------------------|----------------|----------------|----------------|-----------------|
| Assets (\$ in Millions): | \$11,105 | \$12,519 | \$14,699 | \$15,889 |
| Number of Securities: | 2,436 | 2,432 | 2,467 | 2,506 |
| Active Share: | 34% | 34% | 34% | 32% |

Benchmark: MSCI ACWI ex USA

Description: The International Equities Composite represents all International Equity Division investments.

| Portfolio Characteristics: | SMRS | | MSCI ACWI ex USA | |
|---|-------------|-------------------|-------------------------|-------------------|
| | <u>LTM</u> | <u>Normalized</u> | <u>LTM</u> | <u>Normalized</u> |
| Return: | | | | |
| Annualized Total Return | 12.2% | 10.2% | 10.3% | 9.0% |
| Sustainable Growth Rate | 7.2% | 6.5% | 6.1% | 6.0% |
| Dividend Yield | 3.4% | 2.8% | 3.1% | 2.8% |
| Buyback Yield | 1.1% | 0.3% | 1.0% | 0.2% |
| Collateral Yield | 0.5% | 0.5% | -- | -- |
| Risk: | | | | |
| Beta | 1.02 | -- | 1.00 | -- |
| Volatility | 18.0% | -- | 17.6% | -- |
| Tracking Error | 1.5% | -- | 0.0% | -- |
| Information Ratio | 1.3 | 0.8 | -- | -- |
| Fundamental: | | | | |
| Average Capitalization (\$ in Billions) | 79.5 | -- | 69.1 | -- |
| Price/Earnings | 11.0 | 14.3 | 12.6 | 15.6 |
| Price/Book | 1.6 | 1.7 | 1.6 | 1. |
| ROE | 14.2% | 11.7% | 12.8% | 11.1% |

TOP TEN HOLDINGS

(\$ in Billions* - \$ in Millions**)

| | <u>Portfolio Weight</u> | <u>Market Capitalization*</u> | <u>FY1 P/E</u> | <u>Market Value**</u> |
|--|-------------------------|-------------------------------|----------------|-------------------------|
| Nestle S.A. | 2.1% | \$299.2 | 22.6 | \$227.7 |
| ASML Holding NV | 1.9% | 172.7 | 31.8 | 208.6 |
| Novo Nordisk A/S Class B | 1.9% | 174.8 | 31.5 | 205.7 |
| Roche Holding Ltd. Dividend Right Cert | 1.8% | 272.9 | 15.3 | 196.3 |
| Taiwan Semiconductor Manufacturing Co., Ltd. | 1.4% | 344.7 | 11.4 | 150.4 |
| Tencent Holdings Ltd. | 1.3% | 325.7 | 20.0 | 140.8 |
| Novartis AG | 1.2% | 184.5 | 12.6 | 133.3 |
| Samsung Electronics Co., Ltd. | 1.1% | 248.5 | 9.0 | 126.9 |
| LVMH Moet Hennessy Louis Vuitton SE | 1.1% | 300.9 | 21.5 | 119.8 |
| BHP Group, Ltd. | 1.0% | 125.5 | 8.0 | 113.8 |
| TOTAL | <u>14.6%</u> | <u>\$2,449.3</u> | | <u>\$1,623.4</u> |

International Equity Performance - Net of Fees

9/30/22

| Fund Name | Market Value | 1-Year | 3-Years | 5-Years | 7-Years | Inception | Inception Date |
|--|-------------------------|---------------|--------------|--------------|-------------|-------------|----------------|
| Total International Equity | \$11,104,963,406 | -27.7% | -1.3% | -0.7% | 3.6% | 4.4% | 1/1/04 |
| MSCI ACWI ex USA | | -25.2% | -1.5% | -0.8% | 3.3% | 4.5% | |
| Lipper International Multi-Cap Core | | -24.6% | -1.6% | -0.9% | 3.0% | 4.1% | |
| Excess Return | | -2.6% | 0.2% | 0.1% | 0.3% | -0.2% | |
| Pct Rank vs. Lipper International Multi-Cap Core | | 88 | 35 | 33 | 17 | 30 | |

| | | | | | | | |
|---|------------------------|---------------|---------------|--------------|-------------|---------------|----------------|
| Total International Active Strategy*** | \$4,040,736,858 | -29.6% | -1.4% | -1.2% | 2.8% | 3.5% | 5/1/05 |
| MSCI ACWI ex USA | | -25.2% | -1.5% | -0.8% | 3.3% | 4.1% | |
| Lipper International Multi-Cap Core | | -24.6% | -1.6% | -0.9% | 3.0% | 3.6% | |
| Excess Return | | -4.4% | 0.2% | -0.3% | -0.5% | -0.6% | |
| Pct Rank vs. Lipper International Multi-Cap Core | | 97 | 43 | 64 | 59 | 51 | |
| BlackRock MSCI Systematic Return | 1,957,718,061 | -25.1% | 0.8% | -- | -- | 2.7% | 12/1/18 |
| MSCI ACWI ex USA | | -25.2% | -1.5% | -- | -- | 0.4% | |
| Lipper International Multi-Cap Core | | -24.6% | -1.6% | -- | -- | 0.4% | |
| Excess Return | | 0.1% | 2.3% | -- | -- | 2.2% | |
| Pct Rank vs. Lipper International Multi-Cap Core | | 45 | 8 | -- | -- | 8 | |
| IED Quality Equity* | 809,039,905 | -29.7% | -- | -- | -- | -1.6% | 2/1/20 |
| MSCI ACWI ex USA | | -25.2% | -- | -- | -- | -3.8% | |
| Lipper International Multi-Cap Core | | -24.6% | -- | -- | -- | -3.8% | |
| Excess Return | | -4.6% | -- | -- | -- | 2.3% | |
| Pct Rank vs. Lipper International Multi-Cap Core | | 97 | -- | -- | -- | 12 | |
| Martin Currie International Long-Term | 363,464,805 | -35.6% | 1.0% | 2.3% | -- | 4.9% | 2/1/17 |
| MSCI ACWI ex USA | | -25.2% | -1.5% | -0.8% | -- | 2.1% | |
| Lipper International Multi-Cap Core | | -24.6% | -1.6% | -0.9% | -- | 2.0% | |
| Excess Return | | -10.4% | 2.5% | 3.1% | -- | 2.8% | |
| Pct Rank vs. Lipper International Multi-Cap Core | | 99 | 7 | 5 | -- | 5 | |
| UBS China A Opportunity Fund | 145,117,888 | -27.4% | -- | -- | -- | -3.6% | 5/1/20 |
| MSCI China On shore | | -20.2% | -- | -- | -- | 13.0% | |
| Lipper Emerging Markets | | -28.8% | -- | -- | -- | 0.9% | |
| Excess Return | | -7.1% | -- | -- | -- | -16.6% | |
| Pct Rank vs. Lipper Emerging Markets | | 43 | -- | -- | -- | 90 | |
| Wellington Select China Equity | 134,663,031 | -33.3% | -32.5% | -- | -- | 3.8% | 9/1/19 |
| MSCI China On shore | | -20.2% | -25.2% | -- | -- | 5.6% | |
| Lipper Emerging Markets | | -28.8% | -24.6% | -- | -- | -2.3% | |
| Excess Return | | -13.0% | -7.3% | -- | -- | -1.7% | |
| Pct Rank vs. Lipper Emerging Markets | | 81 | 99 | -- | -- | 9 | |
| WCM Focused Growth International | 127,155,021 | -32.5% | -- | -- | -- | -32.5% | 10/1/21 |
| MSCI ACWI ex USA | | -25.2% | -- | -- | -- | -25.2% | |
| Lipper International Large-Cap Core | | -24.6% | -- | -- | -- | -24.6% | |
| Excess Return | | -7.3% | -- | -- | -- | -7.3% | |
| Pct Rank vs. Lipper International Large-Cap Core | | 99 | -- | -- | -- | 99 | |
| Brown Capital Intl. Small Company Fund | 91,192,981 | -- | -- | -- | -- | -26.1% | 3/1/22 |
| MSCI ACWI ex USD | | -- | -- | -- | -- | -22.1% | |
| Lipper International Large-Cap Core | | -- | -- | -- | -- | -21.6% | |
| Excess Return | | -- | -- | -- | -- | -3.9% | |
| Pct Rank vs. Lipper International Large-Cap Core | | -- | -- | -- | -- | 0 | |
| Vontobel International Quality Growth Fund | 83,368,452 | -- | -- | -- | -- | -14.7% | 5/1/22 |
| MSCI ACWI ex USD | | -- | -- | -- | -- | -17.1% | |
| Lipper International Large-Cap Core | | -- | -- | -- | -- | -16.6% | |
| Excess Return | | -- | -- | -- | -- | 2.3% | |
| Pct Rank vs. Lipper International Large-Cap Core | | -- | -- | -- | -- | 0 | |

| <u>Fund Name</u> | <u>Market Value</u> | <u>1-Year</u> | <u>3-Years</u> | <u>5-Years</u> | <u>7-Years</u> | <u>Inception</u> | <u>Inception Date</u> |
|---|---------------------|---------------|----------------|----------------|----------------|------------------|-----------------------|
| Baillie Gifford Int'l Concentrated Growth | 81,782,791 | -- | -- | -- | -- | -49.2% | 12/1/21 |
| MSCI ACWI ex USA | | -- | -- | -- | -- | -23.5% | |
| Lipper International Large-Cap Core | | -- | -- | -- | -- | -23.1% | |
| <i>Excess Return</i> | | -- | -- | -- | -- | -25.7% | |
| <i>Pct Rank vs. Lipper International Large-Cap Core</i> | | -- | -- | -- | -- | 0 | |
| Morgan Stanley Intl Opportunity Fund | 65,381,166 | -- | -- | -- | -- | -41.6% | 2/1/22 |
| MSCI ACWI ex USA | | -- | -- | -- | -- | -23.7% | |
| Lipper International Large-Cap Core | | -- | -- | -- | -- | -23.8% | |
| <i>Excess Return</i> | | -- | -- | -- | -- | -17.9% | |
| <i>Pct Rank vs. Lipper International Large-Cap Core</i> | | -- | -- | -- | -- | 0 | |
| Baron Global Advantage | 47,312,999 | -- | -- | -- | -- | -46.4% | 1/1/22 |
| MSCI ACWI ex USA | | -- | -- | -- | -- | -26.5% | |
| Lipper International Large-Cap Core | | -- | -- | -- | -- | -26.4% | |
| <i>Excess Return</i> | | -- | -- | -- | -- | -19.9% | |
| <i>Pct Rank vs. Lipper International Large-Cap Core</i> | | -- | -- | -- | -- | 0 | |

| | | | | | | | |
|---|------------------------|---------------|--------------|--------------|-------------|-------------|---------------|
| Total International Stock Plus Strategy** | \$4,419,744,377 | -27.4% | -1.3% | -0.2% | 4.3% | 5.2% | 1/1/09 |
| MSCI ACWI ex USA | | -25.2% | -1.5% | -0.8% | 3.3% | 5.2% | |
| Lipper International Multi-Cap Core | | -24.6% | -1.6% | -0.9% | 3.0% | 5.3% | |
| <i>Excess Return</i> | | -2.2% | 0.3% | 0.6% | 1.0% | 0.0% | |
| <i>Pct Rank vs. Lipper International Multi-Cap Core</i> | | 85 | 31 | 14 | 9 | 41 | |
| Internal Stock Plus | 2,673,926,746 | -26.7% | -2.0% | -0.2% | 3.1% | 3.4% | 9/1/11 |
| MSCI ACWI ex USA | | -25.2% | -1.5% | -0.8% | 3.3% | 2.9% | |
| Lipper International Multi-Cap Core | | -24.6% | -1.6% | -0.9% | 3.0% | 3.6% | |
| <i>Excess Return</i> | | -1.5% | -0.5% | 0.6% | -0.2% | 0.5% | |
| <i>Pct Rank vs. Lipper International Multi-Cap Core</i> | | 77 | 62 | 17 | 47 | 57 | |
| PIMCO StocksPLUS | 1,745,691,232 | -28.4% | -0.3% | -- | -- | 0.1% | 4/1/19 |
| MSCI ACWI ex USA | | -25.2% | -1.5% | -- | -- | -1.0% | |
| Lipper International Multi-Cap Core | | -24.6% | -1.6% | -- | -- | -0.9% | |
| <i>Excess Return</i> | | -3.3% | 1.3% | -- | -- | 1.1% | |
| <i>Pct Rank vs. Lipper International Multi-Cap Core</i> | | 91 | 13 | -- | -- | 17 | |

| | | | | | | | |
|---|------------------------|---------------|--------------|--------------|-------------|--------------|----------------|
| Total International Index Strategy | \$2,644,482,171 | -24.9% | -1.2% | -0.1% | 4.0% | 5.4% | 7/1/09 |
| MSCI ACWI ex USA | | -25.2% | -1.5% | -0.8% | 3.3% | 4.4% | |
| Lipper International Multi-Cap Core | | -24.6% | -1.6% | -0.9% | 3.0% | 4.8% | |
| <i>Excess Return</i> | | 0.3% | 0.3% | 0.7% | 0.7% | 1.0% | |
| <i>Pct Rank vs. Lipper International Multi-Cap Core</i> | | 40 | 30 | 15 | 12 | 20 | |
| SSGA MSCI ACWI ex USA Index | 1,376,257,161 | -24.9% | -1.1% | -- | -- | -0.9% | 11/1/17 |
| MSCI ACWI ex USA | | -25.2% | -1.5% | -- | -- | -0.7% | |
| Lipper International Multi-Cap Core | | -24.6% | -1.6% | -- | -- | -1.2% | |
| <i>Excess Return</i> | | 0.3% | 0.4% | -- | -- | -0.2% | |
| <i>Pct Rank vs. Lipper International Multi-Cap Core</i> | | 40 | 27 | -- | -- | 28 | |
| Blackrock ACWI ex USA Index | 1,268,225,010 | -24.9% | -1.3% | -- | -- | -1.8% | 3/1/18 |
| MSCI ACWI ex USA | | -25.2% | -1.5% | -- | -- | -1.6% | |
| Lipper International Multi-Cap Core | | -24.6% | -1.6% | -- | -- | -1.8% | |
| <i>Excess Return</i> | | 0.3% | 0.2% | -- | -- | -0.2% | |
| <i>Pct Rank vs. Lipper International Multi-Cap Core</i> | | 40 | 35 | -- | -- | 35 | |

* The amount includes the total for the International Transition account.

State of Michigan Retirement System

REAL RETURN & OPPORTUNISTIC REVIEW

State of Michigan Investment Board Meeting
December 8, 2022



Travis L. Haney, CFA, CAIA
Senior Investment Manager
Real Return & Opportunistic Division

EXECUTIVE SUMMARY

Performance

| MPSERS Plan (9/30/22) | 1-Year | 3-Years | 5-Years | 7-Years | 10-Years |
|-----------------------|--------|---------|---------|---------|----------|
| Real & Opportunistic | 11.8% | 14.2% | 13.5% | 12.1% | 12.3% |
| Custom Benchmark | 9.2% | 7.9% | 7.6% | 7.6% | 7.4% |

- The portfolio value is \$10.8 billion with a one-year return of 11.8%. As markets continued to decline in the third quarter of 2022, the valuation of our portfolio holdings was slightly down.
- Performance for the year was driven by i) income earned from entertainment royalties, investments in asset managers, credit investments, and natural resource strategies; and ii) capital appreciation of our natural resources and media and entertainment assets.

Strategy Update

- The objective of the Real Return & Opportunistic portfolio is to provide an inflation hedge and/or to gain exposure to attractive opportunities that may not fit in another plan portfolio.
- During the quarter, the Real Return & Opportunistic portfolio continued to benefit from exposure to assets with low equity beta and diversity of strategy, industry, and geography.
- The Real Return & Opportunistic portfolio has approximately \$2.3 billion of unfunded commitments. No new commitments were closed during the quarter.
- In addition to monitoring the impact of COVID-19 and pace of economic recovery, we remain focused on finding differentiated strategies that are additive to the current portfolio mix and continue to favor private credit opportunities and niche strategies with some scalability. Specifically, we like opportunities that have defensible, contractual cash flows and offer structural downside protection. We continue to be selective and favor experienced investment teams with a proven track record.

SMRS

Real Return and Opportunistic

9/30/22

Top Ten Advisors or Entities

(\$ in Millions)

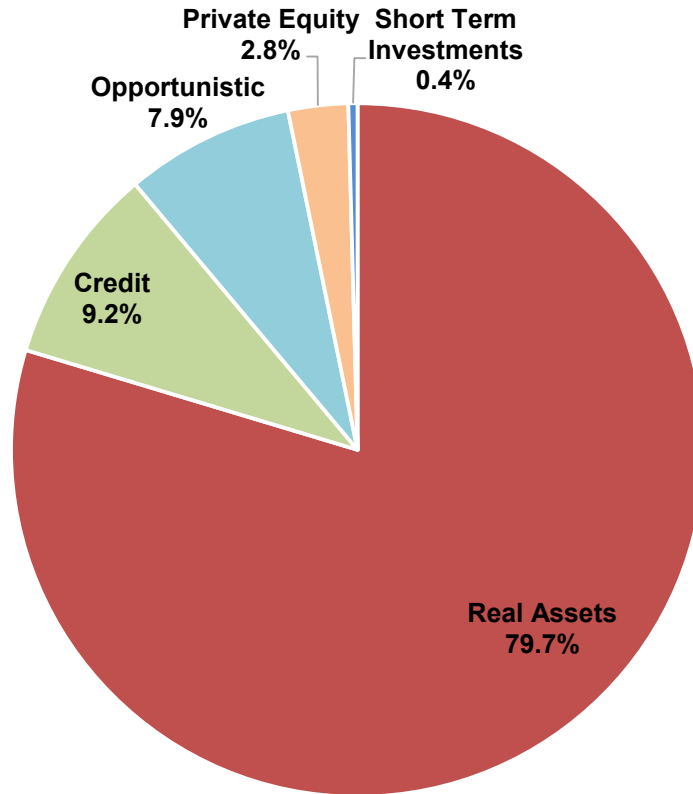
| <u>Advisor or Entity</u> | <u>Market Value</u> |
|---|---------------------|
| Great Mountain Partners | \$ 6,999 |
| Domain Capital Group LLC | 810 |
| Apollo Global Management | 474 |
| Sixth Street Partners | 468 |
| Blackstone Group | 319 |
| Blackstone Alternative Asset Management | 218 |
| BlackRock | 160 |
| Broadriver | 132 |
| Vida Capital, Inc. | 108 |
| Centerbridge Partners, L.P. | 80 |
| Total Market Value | \$ 9,768 |

SMRS

Real Return and Opportunistic

9/30/22

Investments By Strategy

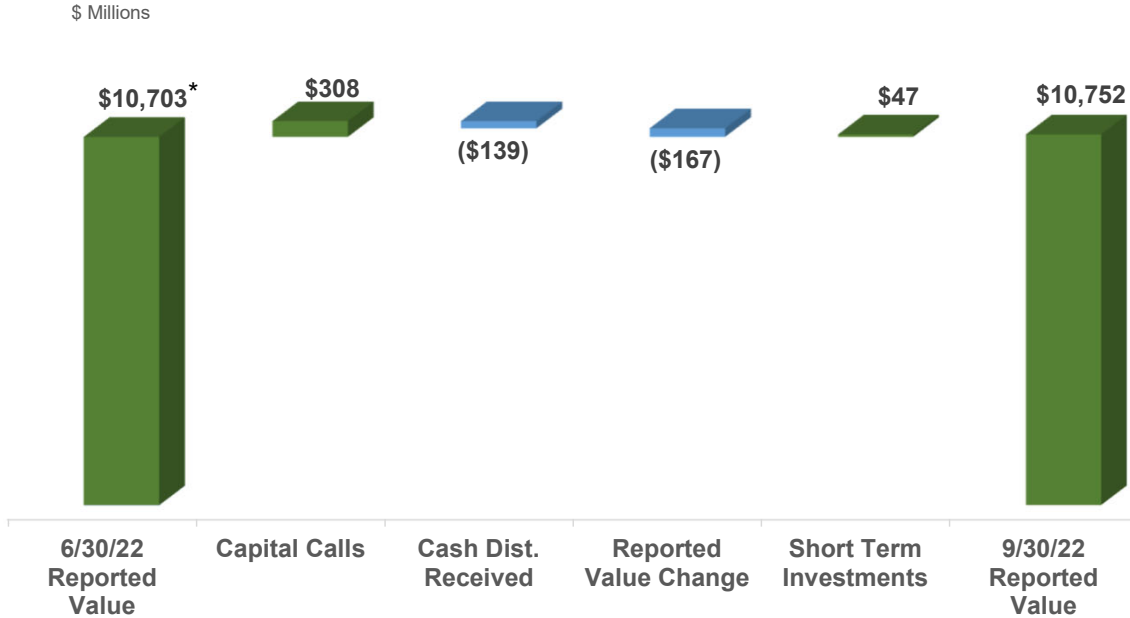


| Market Value in Millions | |
|---------------------------------|------------------------|
| | <u>9/30/22</u> |
| Real Assets | \$8,565 |
| Credit | \$994 |
| Opportunistic | \$846 |
| Private Equity | \$300 |
| Short Term Investments | <u>\$47</u> |
| Total Investments | <u>\$10,752</u> |

SMRS

Real Return and Opportunistic 9/30/22

Invested Commitments



* Excludes investments transferred from RROD to ARD for better strategic alignment.

Outstanding Commitments



* Excludes investments transferred from RROD to ARD for better strategic alignment.

SMRS

Real Return and Opportunistic

9/30/22

Net Market Value by Entity

| | <u>Net Market Value</u> | <u>Unfunded Commitment</u> |
|--|-------------------------|----------------------------|
| * Abernathy Fund I, LLC | \$ 264,914,187 | \$ 17,446,992 |
| * Abernathy Fund II | 11,317,517 | 12,628,058 |
| American Industrial Partners VII, L.P. | 62,984,288 | 21,410,052 |
| Apollo Financial Credit Investments Fund II, LP | 239,406,872 | 265,946,931 |
| * Apollo Financial Credit Investments Fund III, LP | 204,276,214 | 201,986,718 |
| Apollo HK TMS Investments Holdings, LP | - | - |
| Axton Holdings, LLC | 3,496,000,070 | - |
| Blackstone Strategic Capital Holdings (Side Car), LP | 86,891,725 | 7,593,052 |
| Blackstone Strategic Capital Holdings II, LP | 126,595,326 | 134,323,316 |
| Blackstone Strategic Capital Holdings, LP | 129,467,024 | 22,412,472 |
| Blue Peninsula Fund, LP | 142,061,374 | 18,593,224 |
| BroadRiver III, LP | 149,748,745 | 60,245,732 |
| BSCH Parallel (MLG) I, LP | 287,208,716 | - |
| Centerbridge Capital Partners III, LP | 76,778,446 | 7,011,405 |
| CircleUp Credit Fund I, LP | 20,452,741 | 900,364 |
| Clearlake Capital Partners VI, LP | 108,420,018 | 2,094,019 |
| Clearlake Opportunities Partners II, LP | 33,097,857 | 43,721,820 |
| Clearlake Opportunities Partners III, LP | - | 100,000,000 |
| Content Holdings, LLC | 331,649,237 | 28,354,311 |
| Energy Transition Holdings LLC | 1,280,382,043 | - |
| Green Equity Investors IX, LP | - | 275,000,000 |
| Green Range Holdings LLC | 2,433,953,241 | - |
| Hopen Life Sciences Fund II, LP | 3,570,051 | 365,000 |
| Jade Equity Investors II, LP | - | 150,000,000 |
| Lakewater, LLC, Series 4 | - | - |
| Nyanza I, LLC | - | 2,222 |
| Nyanza II, LLC | 84,517,318 | 212,988,600 |
| Orion Coinvest III, LP | - | - |
| * Renaissance Venture Cap Fund II, LP | 30,127,014 | - |
| * Renaissance Venture Cap Fund III, LP | 29,288,646 | 5,000,000 |
| Shamrock Capital Content Fund I, LP | 27,888,204 | 36,519,740 |
| Sixth Street Agriculture Partners I, LP | 49,104,028 | 55,501,702 |
| Sixth Street Growth Partners (A), LP | 252,572,299 | 83,447,520 |
| Sixth Street Growth Partners II (A), LP | 17,297,822 | 182,702,178 |
| Sixth Street TAO Partners (B), LP | 221,490,636 | 122,209,966 |
| * Social Network Holdings, LLC | 260,146,450 | 5,590,289 |
| Sycamore Partners III, LP | 74,957,372 | 36,567,064 |

| | Net Market Value | Unfunded Commitment |
|---|-----------------------------|--------------------------------|
| TPG Rise Climate, LP | 30,940,331 | 215,602,523 |
| Vida Insurance Credit Opportunity Fund II, LP | 74,060,329 | 7,464,742 |
| Warburg Pincus Energy, LP | 63,048,760 | 4,000,000 |
| Total Real Return and Opportunistic | \$ 10,704,614,899 | \$ 2,337,630,011 |
| Short-Term Investments & Other | 47,193,612 | |
| Grand Total | \$ 10,751,808,511 | \$ 2,337,630,011 |

* Fund of Funds

** New Commitment

State of Michigan Retirement System

REAL ESTATE AND INFRASTRUCTURE REVIEW

State of Michigan Investment Board Meeting
December 8, 2022



Todd A. Warstler
Senior Investment Manager
Real Estate and Infrastructure Division

EXECUTIVE SUMMARY

Performance

| MPSERS Plan (9/30/22) | 1-Year | 3-Years | 5-Years | 7-Years | 10-Years |
|------------------------------|---------------|----------------|----------------|----------------|-----------------|
| Annualized Returns | 25.8% | 10.2% | 10.2% | 9.9% | 10.9% |
| NCREIF NPI | 14.6% | 8.5% | 7.2% | 7.1% | 8.1% |
| Peer Median Returns | 23.8% | 10.9% | 10.2% | 10.0% | 10.5% |
| Percentile Rank vs. Peers* | 27 | 62 | 47 | 55 | 46 |

*State Street Universe greater than \$1 billion

- Outperformance relative to the one-year benchmark resulted primarily from the Real Estate and Infrastructure Division's (REID) strategy of being overweight in residential, underweight to office & retail and recovery in the hospitality sector. Over the ten-year timeframe the REID is outperforming the benchmark by 280 basis points.

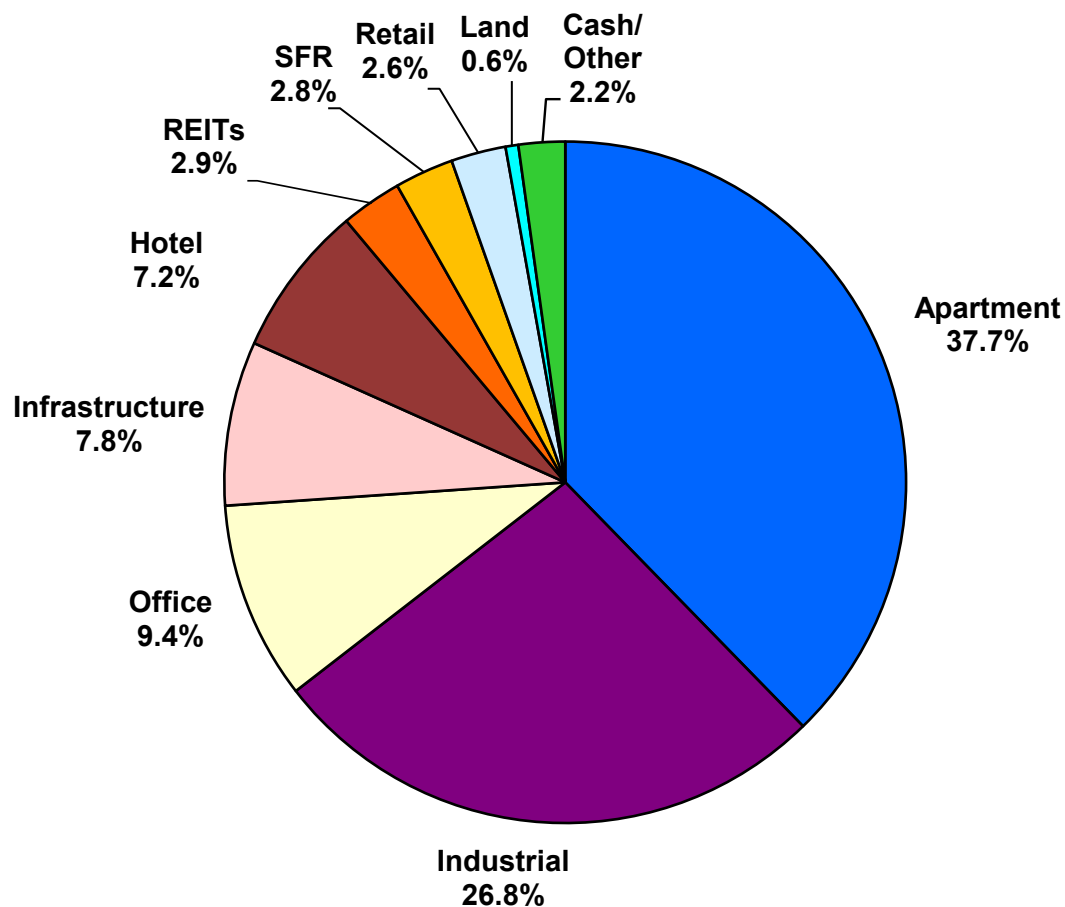
Strategy Update

- The lingering effects of the COVID-19 global pandemic continue to have sporadic impacts on the US and world economies. Impacts to the commercial markets have been uneven across the real estate and infrastructure sectors with some of the impacts transitory and others of a more lasting nature. New threats to the markets have emerged including a war in Europe and elevated levels of inflation. We continue to monitor, assess, and shift strategies, as necessary.
- We are focused on sourcing off-market opportunities through our extensive network and where available reducing risk in the portfolio through early income-generating investments. We have selectively acquired properties where we can add value through management and leasing and have continued to develop properties at attractive risk-adjusted returns. The team continues to assemble portfolios in both traditional and non-traditional real estate sectors that we believe will become institutional property types, providing the potential for above market appreciation and total returns.
- We have been actively managing the portfolio with capital returned of approximately \$674 million, and funding for new or existing investments of approximately \$2.3 billion over the past 12 months.
- The REID has approximately \$3.4 billion in unfunded commitments. Two new commitments were made during the quarter.
 - \$100 million in Blackstone Energy Transition Partners IV, LP, a closed-end global, diversified infrastructure fund concentrating on investments that are beneficiaries of energy transition trends of renewables, electrification, energy efficiency, and decarbonization, managed by Blackstone Management Partners, LLC.
 - \$100 million in Blackstone Green Private Credit Fund III, LP, a closed-end primarily North American, diversified infrastructure fund focused on private credit investments in renewable energy, infrastructure, energy transition, sustainability, and related sectors, managed by Blackstone Alternative Credit Advisors, LP.

SMRS

Real Estate and Infrastructure

9/30/22



| Market Value in Millions | | | | |
|---------------------------------|-----------------------|----------------------|-----------------------|----------------------|
| | <u>9/30/22</u> | | <u>9/30/21</u> | |
| Apartment | \$3,712 | 37.7% | \$2,857 | 42.6% |
| Industrial | 2,637 | 26.8% | 1,401 | 20.9% |
| Office | 926 | 9.4% | 558 | 8.3% |
| Infrastructure | 773 | 7.8% | 717 | 10.7% |
| Hotel | 706 | 7.2% | 552 | 8.2% |
| REITs | 287 | 2.9% | 0 | 0.0% |
| Single Family Residential (SFR) | 280 | 2.8% | 166 | 2.5% |
| Retail | 258 | 2.6% | 305 | 4.5% |
| Land | 55 | 0.6% | 81 | 1.2% |
| | <u>\$9,634</u> | <u>97.8%</u> | <u>\$6,637</u> | <u>98.9%</u> |
| Cash/Other | <u>219</u> | <u>2.2%</u> | <u>73</u> | <u>1.1%</u> |
| Total Investments | <u>\$9,853</u> | <u>100.0%</u> | <u>\$6,710</u> | <u>100.0%</u> |

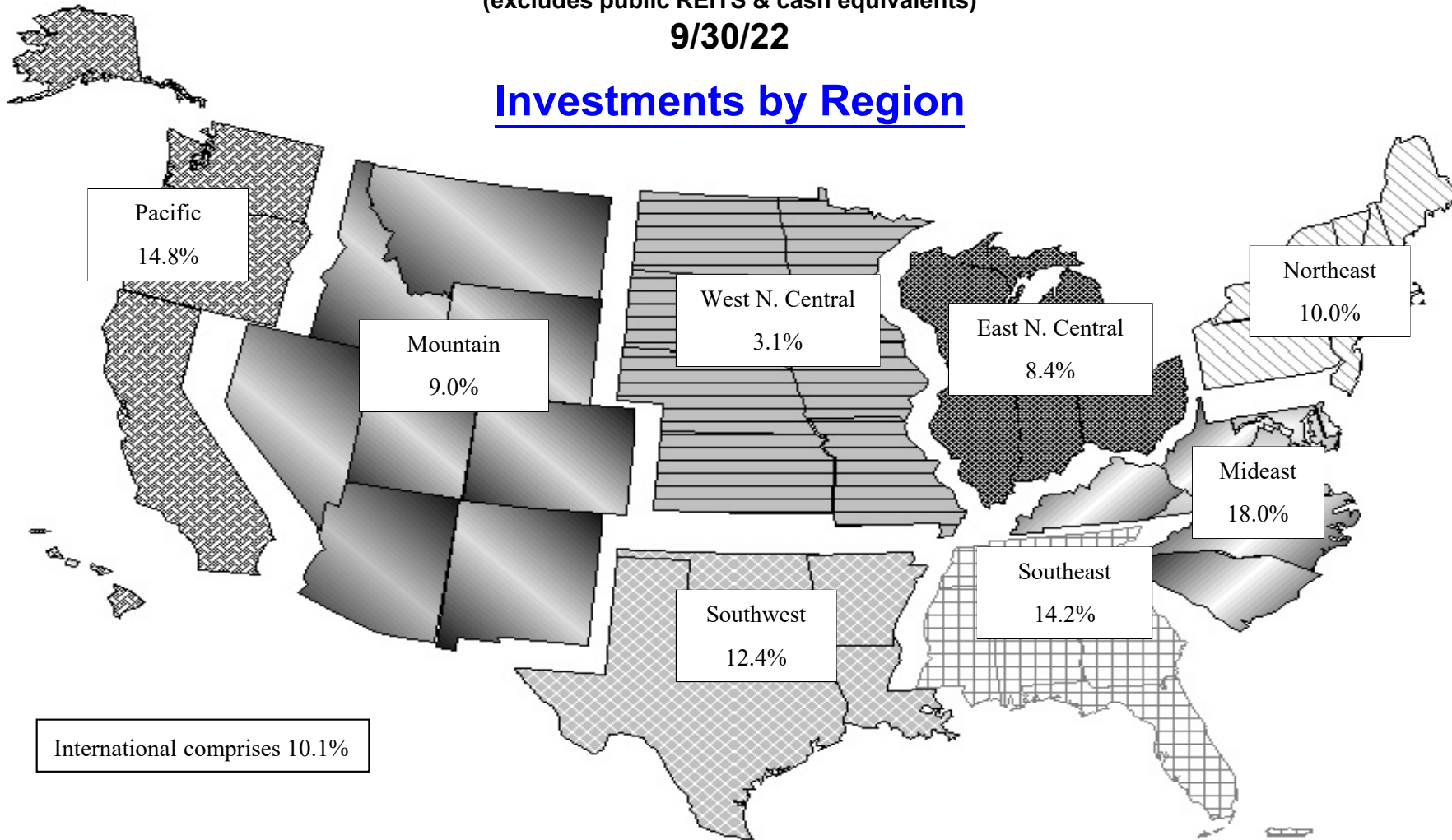
SMRS

Real Estate by Region Based on Market Value

(excludes public REITS & cash equivalents)

9/30/22

Investments by Region



3

Geographic regions defined by NCREIF, whose property index composition is: Pacific 35.2%, Mountain 6.9%, West N. Central 1.0%, Southwest 10.5%, East N. Central 6.2%, Southeast 11.1%, Northeast 18.5%, Midwest 10.6%

SMRS

Real Estate and Infrastructure

9/30/22

Top Ten Advisors or Entity

(\$ in millions)

| <u>Advisor or Entity</u> | <u>Market Value</u> |
|------------------------------------|----------------------------|
| MWT Holdings LLC | \$ 2,973 |
| Principal Real Estate Investors | 1,289 |
| Clarion Partners | 879 |
| BentallGreenOak | 510 |
| Blackstone Group | 394 |
| Domain Capital Advisors Inc | 330 |
| Five Star Realty Partners LLC | 254 |
| Transwestern Investment Management | 244 |
| Lone Star Global | 217 |
| Heitman Capital Management | 194 |
| | <u>\$ 7,284</u> |

Occupancy by Property Type

| | Apartment | Office | Industrial | Retail | Hotel |
|------------------|-----------|--------|------------|--------|-------|
| SMRS Portfolio | 94.3% | 81.3% | 98.3% | 89.2% | 69.2% |
| National Average | 94.4% | 83.1% | 95.4% | 95.6% | 66.9% |

SMRS

Real Estate

9/30/22

Market Values by Ownership Entity

| | <u>Market Value</u> | <u>Unfunded Commitment</u> |
|---|---------------------|--------------------------------|
| 801 Grand Avenue Capital, LLC | \$ 21,880,859 | \$ 0 |
| AEW Senior Housing III | 4,007,469 | 503,557 |
| AEW Senior Housing Investors IV | 27,816,221 | 20,428,156 |
| Apollo Asia Real Estate Fund | 66,181,679 | 22,769,961 |
| Asana Partners Fund I, LP | 33,877,197 | 2,449,559 |
| Asana Partners Fund II, LP | 34,447,387 | 24,030,405 |
| Asana Partners Fund III, LP | 2,700,083 | 94,666,667 |
| Avanath Affordable Housing III | 63,500,522 | 2,575,458 |
| Avanath Affordable Housing IV | 34,281,228 | 1,260,440 |
| BentallGreenOak US Cold Storage, LP | 875,399 | 71,281,150 |
| BGO Europe III Co Invest | 19,671,709 | 7,875,804 |
| BentallGreenOak Europe IV, LP | 0 | 98,020,000 |
| BlackRock MiREIT Fund | 95,251,074 | 0 |
| Blackstone R/E Partners V, LP | 88,191 | 2,087,026 |
| Blackstone R/E Partners VI, LP | 1,920,467 | 3,680,930 |
| Blackstone R/E Partners VIII, LP | 61,549,417 | 10,882,270 |
| Blackstone R/E Partners IX, LP | 218,140,716 | 88,725,790 |
| Blackstone R/E Partners X, LP | 0 | 200,000,000 |
| Capri Urban Investors, LLC | 113,347 | 0 |
| Carlyle Realty Partners IX, LP | 0 | 100,000,000 |
| Creative Media & Community Trust Corp | 3,755,492 | 0 |
| CIM Fund III, LP | 32,939,946 | 0 |
| CIM Fund VIII, LP | 84,433,102 | 0 |
| CIM VI (Urban REIT), LLC | 19,979,786 | 0 |
| Clarion Gables Multifamily Trust, LP | 47,835,844 | 0 |
| Columbus Circle Holdings, LLC | 215,523,743 | 201,323,051 |
| Crown Small Cap Real Estate | 10,982,848 | 3,280,000 |
| DM2501, LLC | 17,572,910 | 26,210,152 |
| Domain GVA-1, LLC | 13,056,705 | 1,940,056 |
| Domain Hotel Properties, LLC | 245,482,332 | 0 |
| Eastport Properties, LLC | 61,452,357 | 0 |
| Gateway Capital Real Estate Fund II, LP | 660,513 | 1,276,875 |
| GreenOak Europe III, LP | 51,818,447 | 26,470,489 |
| Heitman Credit | 48,935,544 | 0 |
| Heitman Global RE Fund II | 48,344,711 | 52,126,829 |
| Heitman MiREIT Fund | 96,429,450 | 0 |
| IDR Core Property Index Fund, LLC | 136,221,514 | 0 |

| | Market Value | Unfunded Commitment |
|--|---------------------|--------------------------------|
| India Property Fund II, LLC | 11,367,504 | 5,897,418 |
| IMRF II CoInvest Spiga, LP | 0 | 0 |
| Invesco Mortgage Recovery Feeder Fund | 1,005,609 | 0 |
| Invesco Mortgage Recovery Fund II, LP | 23,573,635 | 21,394,854 |
| Invesco Strategic Opportunities III, LP | 33,999,661 | 82,461,385 |
| IPF II Co-Invest, LP | 10,668,550 | 2,168,655 |
| ISO III SMRS Sidecar, LP | 18,010,989 | 67,334,000 |
| JBC Funds North LaSalle, LLC | 5,527,194 | 0 |
| KBS/SM Fund III, LP | 239,129 | 0 |
| KBS/SM Fund IV, LP | 101,955,167 | 0 |
| L-A Saturn Acquisition | 62,427,579 | 250,799 |
| L&B Spartan Holdings | 130,140,706 | 74,771,545 |
| Landmark Real Estate Partners V, LP | 4,431,817 | 0 |
| LaSalle Asia Opportunity Fund III, LP | 1,215,989 | 0 |
| Lion Industrial Trust | 582,770,769 | 0 |
| Lion Mexico Fund, LP | 3,608,573 | 0 |
| Lombard GVA0016 | 254,278,617 | 99,033,796 |
| Lone Star Fund X, LP | 87,257,806 | 21,734,113 |
| Lone Star Fund XI, LP | 130,676,391 | 146,481,822 |
| Lubert-Adler Real Estate Fund VII, LP | 44,771,374 | 4,663,662 |
| M1 Westgate CoInvest, LLC | 225,806 | 0 |
| M301W CoInvest, LLC | 380,590 | 0 |
| MERS Acquisitions Ltd. | 21,255,366 | 0 |
| MIP Holdco, LLC | 200,183,190 | 11,004,910 |
| MSREF V - International | 459,188 | 0 |
| MSRESS Fund III Institutional, LP | 3,140,689 | 0 |
| MWT Holdings, LLC | 2,973,515,356 | 0 |
| Northpark Land Associates | 40,473,476 | 5,024,765 |
| Orange Investors, LLC | 239,482 | 0 |
| Paladin Realty Brazil Investors III (USA), LP | 1,312,515 | 0 |
| Paladin Realty Latin America Investors IV-CI, LP | 28,410,238 | 0 |
| Paladin Realty TB COINV V, LP | 9,458,632 | 0 |
| Penmain Office, LLC | 44,125,177 | 0 |
| Principal MiREIT | 95,566,338 | 0 |
| Principal Separate Account | 414,094,190 | 24,214,206 |
| Proprium RE Spec. Situations Fund, LP | 117,502,243 | 0 |
| Rialto Credit Partnership, LP | 8,102,351 | 0 |
| Rialto Real Estate Fund II, LP | 27,771,340 | 0 |
| Rialto Real Estate Fund III-Debt, LP | 43,251,294 | 0 |
| Rialto Real Estate Fund III-Property, LP | 31,632,359 | 0 |
| Rialto Real Estate Fund IV-Debt, LP | 54,287,199 | 42,765,586 |
| SFR CM, LP | 51,017,663 | 51,485,149 |
| SM Brell II, L.P. | 846,457 | 0 |
| SMP Data Center | 758,354,663 | 529,497,917 |
| Stockbridge RE Fund II-C, LP | 883,383 | 0 |
| Strategic II, LLC | 438,178,448 | 47,508,699 |
| TPG RE Finance Trust Inc. | 33,769,694 | 0 |

| | Market Value | Unfunded Commitment |
|--------------------------------------|-------------------------|--------------------------------|
| TPG Real Estate Partners II | 9,101,030 | 6,538,943 |
| TPG Real Estate Partners III | 37,515,048 | 18,344,940 |
| TPG Real Estate Partners IV, LP | 0 | 150,000,000 |
| TSP Fund III | 12,294,105 | 61,958,326 |
| TSP Spartan C-II, LLC | 9,185,868 | 1,500,000 |
| TSP Value & Income Fund II, LP | 22,550,249 | 6,790,952 |
| Trophy Property Development, LP | 124,855 | 0 |
| True North Real Estate Fund III, LLC | 22,406,762 | 5,000,000 |
| Warwick UK Real Estate Fund I | 20,000,000 | 30,000,000 |
| | <hr/> | <hr/> |
| | \$ 8,861,270,742 | \$ 2,581,691,067 |
| Short-Term Investments and Other | 185,282,213 | 0 |
| | <hr/> | <hr/> |
| Total Real Estate Investments | \$ 9,046,552,955 | \$ 2,581,691,067 |

* New or additional commitment made during the quarter reported

SMRS Infrastructure 9/30/22

Market Values by Ownership Entity

| | Market Value | Unfunded Commitment |
|---|-------------------------|-------------------------|
| Arclight Energy Partners VI, LP | \$ 22,105,898 | \$ 7,004,763 |
| Arclight Energy Partners VII, LP | 36,281,526 | 22,383,174 |
| ASF VI Infrastructure B, LP | 10,219,199 | 5,211,032 |
| ASF VII Infrastructure Fund B, LP | 22,569,209 | 11,052,266 |
| ASF VIII Infrastructure Fund B, LP | 12,325,119 | 96,415,776 |
| ASF Como Co-Investment, LP | 1,466,127 | 1,583,035 |
| Basalt Infrastructure Partners, LP | 13,758,111 | 2,219,045 |
| Blackstone Energy Partners, LP | 11,725,820 | 4,728,291 |
| Blackstone Energy Partners II, LP | 82,841,350 | 15,540,808 |
| * Blackstone Energy Transition Partners IV, LP | 0 | 100,000,000 |
| * Blackstone Green Private Credit Fund III, LP | 0 | 100,000,000 |
| Brookfield Infrastructure Fund II-B, LP | 43,429,064 | 2,847,442 |
| Customized Infrastructure Strategies, LP | 10,507,565 | 4,521,318 |
| Dalmore Capital Fund | 52,531,957 | 0 |
| GCM Grosvenor Infrastructure IP, LP | 89,723,454 | 74,863 |
| GCM Grosvenor CIS II, LP | 35,325,108 | 7,473,916 |
| GCM Grosvenor CIS III, LP | 28,748,999 | 71,936,676 |
| Global E&P Infrastructure Fund II, LP | 27,629,693 | 1,804,950 |
| GSO Energy Select Opportunities Fund, LP | 6,513,473 | 23,026,107 |
| GSO Energy Select Opportunities Fund II, LP | 11,867,046 | 38,795,806 |
| JPMorgan AIRRO India SideCar Fund US, LLC | 81,435,161 | 573,799 |
| JPMorgan AIRRO Fund II | 10,750,274 | 6,800,131 |
| Irradiant Renewables Opportunities Partners | 17,988,659 | 86,858,328 |
| KKR Eagle CoInvest, LP | 37,753,671 | 1,853,268 |
| KKR Global Infrastructure Investors, LP | 30,449 | 0 |
| KKR Global Infrastructure Investors IV, LP | 25,875,630 | 82,875,183 |
| Ridgewood Water & Strategic IF, LP | 33,137,470 | 19,289,151 |
| Ridgewood Water & Strategic IF II, LP | 0 | 75,000,000 |
| RPEP SMRS Infra II, LLC | 13,540,591 | 0 |
| StonePeak Infrastructure Fund, LP | 32,661,247 | 8,679,028 |
| | \$ 772,741,870 | \$ 798,548,156 |
| Short-Term Investments and Other | 33,251,113 | 0 |
| Total Infrastructure Investments | \$ 805,992,983 | \$ 798,548,156 |
| TOTAL INVESTMENTS | \$ 9,852,545,938 | \$ 3,380,239,223 |

* New or additional commitment made during the quarter reported

State of Michigan Retirement System

ABSOLUTE RETURN REVIEW

State of Michigan Investment Board Meeting
December 8, 2022



Daniel J. Quigley
Senior Investment Manager
Absolute Return Strategy

EXECUTIVE SUMMARY

Performance

| MPSERS Plan (9/30/22) | 1-Year | 3-Years | 5-Years | 7-Years | 10-Years |
|-----------------------|--------|---------|---------|---------|----------|
| Absolute Return | 3.5% | 7.2% | 6.3% | 5.4% | 5.9% |
| HFRI FOF Conservative | 0.4% | 4.9% | 4.0% | 3.3% | 3.8% |

- The value of the Absolute Return portfolio is \$9.2 billion with a one-year return of 3.5%. The portfolio performance was positive for the year despite negative performance for both equities and fixed income markets. All underlying strategies contributed to performance.
- Credit was a large driver of positive returns for the year, with corporate, mortgage, and housing related exposures driving performance. Performance in structured credit and aviation were also positive.
- The core managers in the Multi-Strategy sleeve of the portfolio served as an effective diversifier. This was due to a combination of non-directional exposures across asset classes. Event managers detracted slightly, driven by reinsurance losses. Special Situations investments also contributed positive performance as managers were able to take advantage of market dislocations and utilize active portfolio hedge positions.
- Macro rate managers did well in the Diversifying sleeve of the hedge fund portfolio as they were able to take advantage of market volatility and profited from higher rates and from a stronger dollar.
- Equities were flat, as L/S equity managers generated negative absolute returns with mixed alpha. Quant equity managers, on the other hand, contributed positively, benefitting from increased and sustained volatility and dispersion.

Strategy Update

- The objective of the Absolute Return portfolio is to diversify the total plans' holdings, targeting returns above investment-grade fixed income with lower volatility than the equity portfolio. The portfolio utilizes a diverse mix of managers that invest both long and short to target specific exposures and seek to hedge out unwanted risk.
- No new commitments for the quarter.
- In terms of allocation priorities, we will continue to increase exposure to high quality multi-strategy exposures, which act as a ballast to the portfolio. We will also build out sector-focused fundamental equity exposures and niche credit ideas.

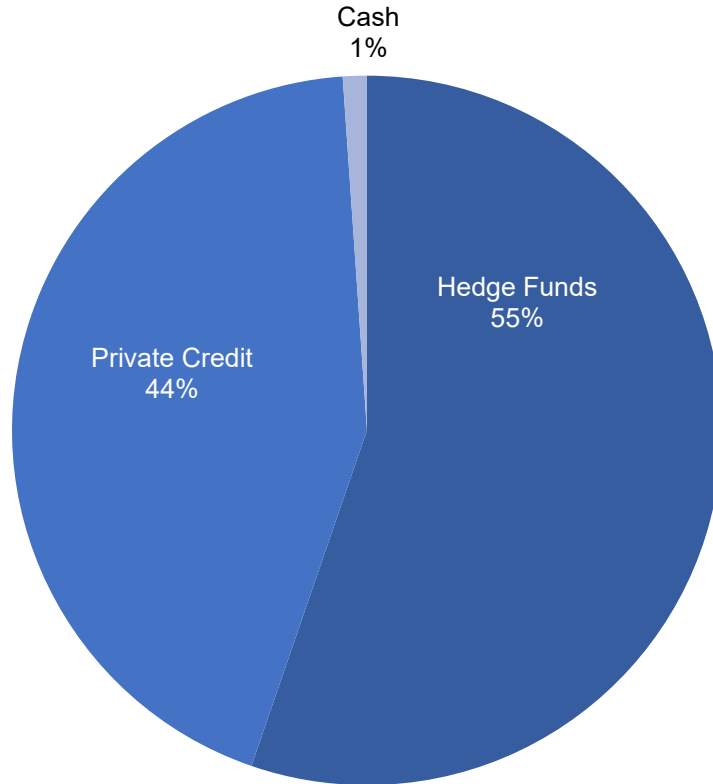
Overall, we will continue to focus on opportunities that seek to provide diversification, protect the downside and deliver absolute return.

SMRS

Absolute Return

9/30/22

Total Investments by Asset Type



| Market Value in Millions | |
|---------------------------------|------------------|
| | 9/30/2022 |
| Hedge Funds | \$ 5,088 |
| Private Credit | 4,017 |
| Cash | 100 |
| Total Investments | \$ 9,205 |

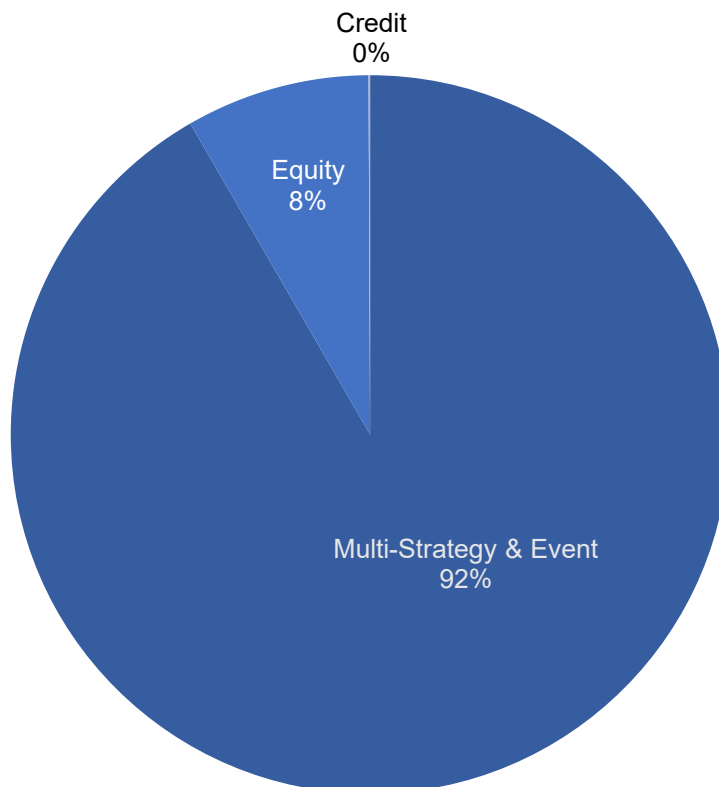
Note: Totals may not be exact due to rounding.

SMRS

Absolute Return

9/30/22

Hedge Funds by Asset Type



| Market Value in Millions | |
|---------------------------------|------------------------|
| | <u>9/30/2022</u> |
| Multi-Strategy & Event | \$ 4,664 |
| Equity | 421 |
| Credit | 3 |
| Total Investments | \$ <u>5,088</u> |

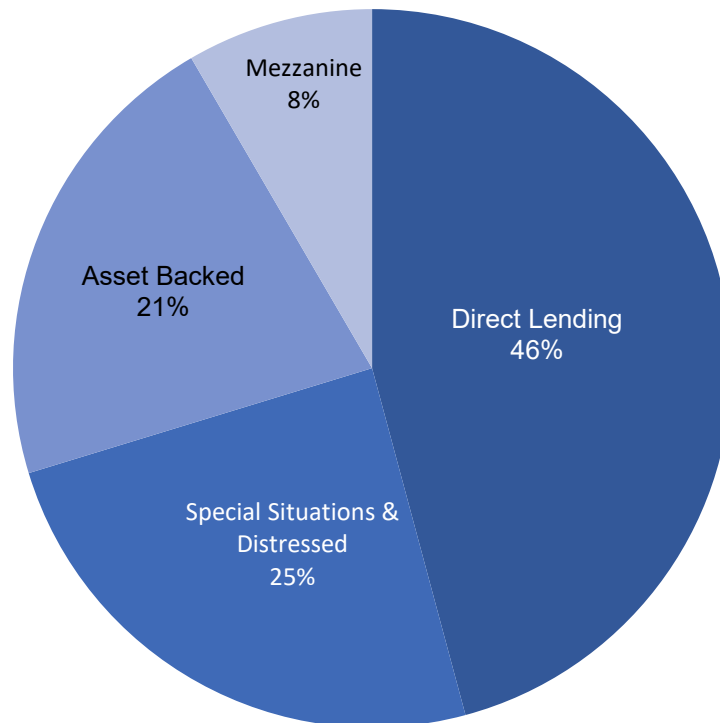
Note: Totals may not be exact due to rounding.

SMRS

Absolute Return

9/30/22

Private Credit by Asset Type



| Market Value in Millions | |
|---------------------------------|------------------|
| | 9/30/2022 |
| Direct Lending | \$ 1,840 |
| Special Situations & Distressed | 983 |
| Asset Backed | 856 |
| Mezzanine | 337 |
| Total Investments | \$ 4,017 |

Note: Totals may not be exact due to rounding.

SMRS

Absolute Return

9/30/22

Net Market Value by Entity

| | <u>Net Market Value</u> | <u>Unfunded Commitment</u> |
|---|-------------------------|--------------------------------|
| * Tahquamenon Fund, LP | \$ 4,655,001,467 | \$ 0 |
| Acacia Coinvest, LP | 321,652,775 | 2,000,000 |
| Apollo MidCap FinCo Holdings, LTD | 320,233,201 | 0 |
| HPS Red Cedar Fund, LP | 287,058,309 | 143,468,611 |
| Cerberus Manitou Residential Loan Fund, LP | 214,002,028 | 8,580,645 |
| SJC Onshore Direct Lending Fund IV-SMRS LP | 176,974,509 | 212,083,059 |
| Castle Credit SMRS Holdings, LLC | 153,183,347 | 81,739,828 |
| SJC Direct Lending Fund III, LP | 127,388,935 | 17,990,215 |
| Apollo Accord+ | 125,898,093 | 169,589,002 |
| Fortress FCO MA MI, LP | 124,701,196 | 29,105,947 |
| Irradiant Solutions Fund, LP (fka Kayne) | 109,036,271 | 119,780,867 |
| Angelo Gordon Credit Solutions Fund, LP | 108,709,634 | 10,325,340 |
| AG Essential Housing, LP | 100,588,213 | 58,000,000 |
| SMRS-HVDL, LLC | 100,491,055 | 100,200,000 |
| Jana Strategic Investment Fund IV, LP | 99,428,170 | 0 |
| Apollo SCRF IV, LP | 98,619,745 | 147,742,521 |
| Pimco Private Income Fund Onshore Feeder, LLC | 96,791,776 | 0 |
| Redding Ridge Holdings, LP | 94,621,565 | 15,155,765 |
| Harbourvest Direct Lending Fund | 94,457,609 | 30,000,000 |
| SJC Direct Lending Revolver Fund III, LP | 91,333,137 | 9,316,075 |
| Sixth Street Opportunities Partners IV (A), LP | 87,044,594 | 23,650,997 |
| Kayne Anderson BDC, LLC (KABDC) | 75,955,214 | 35,768,666 |
| Centerbridge SCP III-Flex, LP | 75,501,508 | 14,579,537 |
| Crescent Mezzanine Partners VII, LP | 72,825,328 | 67,894,872 |
| Irradiant CLO Partners Fund II, LP (fka Kayne CLO Partners FD II) | 68,816,818 | 19,218,287 |
| Oaktree Opportunities Fund Xb, LP | 66,003,203 | 24,500,000 |
| Monument Park, LLC | 64,836,852 | 0 |
| Sixth Street Lending Partners | 64,689,807 | 435,310,193 |
| OCM Opportunities Fund IX, LP | 57,989,849 | 0 |
| TICP CLO Partners III, LP | 57,077,524 | 31,287,241 |
| Castle Credit SMRS Holdings, LLC Series C | 54,069,086 | 50,000,000 |
| Fortress MSR Opportunities Fund I A, LP | 46,017,753 | 15,662,214 |
| Turning Rock Fund I, LP | 45,401,228 | 16,319,293 |
| HarbourVest Credit Opportunities Fund II, LP | 44,849,744 | 32,250,000 |
| HPS Mezzanine Partners 2019 LP | 43,634,794 | 10,484,294 |
| Angelo Gordon Credit Solutions Fund II, LP | 41,152,950 | 57,500,000 |
| Farallon Special Situations Fund II, LP | 39,091,098 | 62,366,474 |
| SJC Direct Lending Fund III Co-Invest G-III | 39,008,288 | 0 |
| GSO Capital Opportunities Fund III, LP | 38,684,617 | 29,742,279 |
| HPS Mezzanine Partners III, LP | 38,170,718 | 4,345,231 |
| Riverside Credit Solutions Fund I | 36,336,173 | 9,039,123 |
| Sixth Street Specialty Lending Europe II (USD Feeder), LP | 35,245,279 | 84,838,204 |
| Turning Rock Fund II LP | 33,338,550 | 41,764,611 |
| HarbourVest Partners Mezzanine Income Fund | 33,225,844 | 16,310,000 |
| Peninsula Fund VI, LP | 31,526,902 | 1,510,528 |
| TICP CLO Partners II, LP | 29,730,574 | 1,480,904 |
| Blackstone Capital Opportunities Fund IV | 28,918,583 | 122,643,286 |
| Sixth Street Opportunities Partners V (A) LP | 25,888,710 | 97,855,166 |
| Owl Rock Technology Finance Corp II (ORTF II) | 24,852,808 | 175,147,192 |
| GSO Credit Alpha Fund, LP | 22,200,596 | 37,910,064 |
| Oaktree Opportunities Fund X, LP | 20,425,697 | 5,100,000 |
| Irradiant Solutions Fund II, LP | 20,127,600 | 229,872,400 |
| OCM Opportunities Fund VIIIb, LP | 14,191,205 | 0 |
| GSO COF III Co-Investment Fund, LP | 13,650,876 | 14,309,235 |

| | | |
|---|-------------------------|-------------------------|
| Cerberus SMRS Partners, LP | 12,802,127 | 23,304,657 |
| Marathon CLO Equity Fund, LP | 12,638,617 | 0 |
| Centerbridge SCP III, LP | 12,007,607 | 3,025,715 |
| Blackstone Capital Opportunities Fund IV Co-Invest | 11,725,616 | 26,071,568 |
| Pimco Aviation Co-Invest Vehicle Onshore Feeder LP | 10,267,232 | 90,000,000 |
| Crescent Mezzanine Partners VI, LP | 9,834,242 | 5,560,568 |
| KKR Lending Partners II, LP | 9,673,558 | 11,737,239 |
| EnTrust White Pine Partners, LP | 8,882,189 | 0 |
| Apollo Credit Opportunity Fund III, LP | 6,024,634 | 19,306,590 |
| Apollo European Principal Finance Fund II, LP | 5,441,691 | 7,645,750 |
| KKR Lending Partners I, LP | 4,114,888 | 8,917,164 |
| PGIM Fixed Income Global Liquidity Relative Value Fund I, LP | 3,045,828 | 0 |
| MP Securitized Credit Fund, LP | 2,657,537 | 0 |
| GSO Capital Opportunities Fund II, LP | 2,519,251 | 9,732,327 |
| TCW/Crescent Mezzanine Partners V, LP | 622,655 | 12,395,466 |
| OCM Opportunities Fund VII, LP | 465,993 | 0 |
| Owl Rock Technology Holdings II (ORTH II) | 351,667 | 24,648,333 |
| Oaktree Opportunities Fund VIII, LP | 323,140 | 0 |
| TCW/Crescent Mezzanine Partners VC Secondary | 300,629 | 0 |
| Highbridge Principal Strategies - Specialty Loan Fund III, LP | 179,433 | 5,638,845 |
| OCM Opportunities Fund VIIb, LP | 23,380 | 2,500,000 |
| * Visium Balanced Fund, LP | 178 | 0 |
| OCM Principal Opportunities Fund IV, LP | 1 | 10,004,754 |
| SJC Direct Lending Fund II, LP | 1 | 38,261,315 |
| Total Absolute Return Strategies | \$ 9,104,553,498 | \$ 3,222,488,456 |
| Short-Term Investments & Other | 100,072,703 | 0 |
| Grand Total | \$ 9,204,626,200 | \$ 3,222,488,456 |

* Fund of Funds

** New Commitment

State of Michigan Retirement System

DEFINED CONTRIBUTION REVIEW

State of Michigan Investment Board Meeting
December 8, 2022



Lan Hue Chen, CFA, CAIA
Senior Investment Manager
Defined Contribution, Trusts & Agencies Division

EXECUTIVE SUMMARY

Market Environment and Outlook

Financial markets across the globe saw intense selloffs in the third quarter. Deteriorating investor sentiment drove broad pullbacks as inflation surged, central banks responded with aggressive interest rate increases, and the global economy began to falter. Stocks generally took the hardest hit as investors reassessed earnings expectations, but bonds also sustained heavy losses. Even commodities lost ground, though they remained one of the few asset classes to still show a positive year-to-date return. Only two asset classes, small-cap growth stocks and short-term U.S. Treasury bills, saw gains on the quarter.

Though all market capitalization segments declined, small-cap stocks generally fared better than large-cap or mid-cap stocks. Growth styles fared better than value styles across the capitalization spectrum. Quarterly S&P 500 index industry sector results were mixed. Consumer discretionary and energy had positive returns, whereas the rest were negative. Rising interest rates pushed down prices and thus, total returns of U.S. bonds, which still fared better than non-U.S. bonds.

In its November meeting, the Federal Reserve raised the target range for the federal funds rate by 75bps to 3.75%-4%. This marked the fourth consecutive three-quarter point increase and the sixth rate hike since March, pushing borrowing costs to the highest levels since 2008. With consumer inflation still running near a four-decade high (8.2% in September), further tightening is anticipated. After an October rally in developed market stocks based on the possibility that rate hikes would slow, uncertainty quickly returned and, with it, the expectation of further volatility in both equity and fixed-income markets.

Regulatory Update

The IRS released retirement plan contribution limits for 2023.

- The contribution limit for employees who participate in 401(k), 403(b), and most 457 plans is increased to \$22,500, up from \$20,500. The catch-up contribution limit for participants aged 50 and over is increased to \$7,500, up from \$6,500.
- In addition, the income limits used to determine eligibility to make deductible contributions to traditional IRAs, to contribute to Roth IRAs, and to claim the Saver's Credit all increased for 2023.

SECURE Act required minimum distributions (RMD) changes won't apply until at least 2023.

- The SECURE Act of 2019 increased the beginning age for RMDs from 70-1/2 to 72.
- Originally slated to begin in 2022, the IRS announced via Notice 2022-53 that updated final regulations for RMDs would not apply until at least 2023.

Update on SECURE Act 2.0

In March, the House of Representatives passed the Securing a Strong Retirement Act of 2022. The retirement savings legislation, also known as SECURE Act 2.0, expands on the original SECURE Act, passed in 2019.

The House's version of Secure Act 2.0 focuses on incentivizing people to save more, improving retirement plans, and lowering costs for employers.

Allow People to Save More

- **Expands automatic enrollment in retirement plans.** Automatically enroll all new, eligible employees at a 3% contribution rate that would tick up by 1% annually until it reaches 10%. Companies that are less than three years old or employ 10 or fewer people would be exempt, as would church plans and government plans.
- **Promotes the saver's credit.** Extra tax deductions when lower earners save for retirement. The bill increases the number of employees who qualify and sets the credit at 50%, rather than having it decline as you earn more. These changes would be implemented starting in 2027.
- **Raises catch-up contribution limits.** Employees ages 62 to 64 could contribute an additional \$10,000 to their 401(k) or 403(b) plans. Beginning in 2023, catch-up contributions would be taxed as Roth contributions, meaning they would be subject to income tax before being invested for retirement. The bill would also index the IRA catch-up contribution limit of \$1,000 to inflation.
- **Offers extra assistance to student loan borrowers.** Employees making payments on their student loans but not saving for retirement would be able to get employer matching contributions.

Improve Retirement Plans

- **Delay required minimum distributions (RMDs).** The original Secure Act increased the age when withdrawals were required to age 72. Secure Act 2.0 would increase it once again: to 73 by 2023, to 74 by 2030, and finally to 75 by 2033.
- **Make it easier to buy annuities.** Ease certain RMD requirements for annuity options and make Qualified Longevity Annuity Contracts (QLACs) more appealing by removing the current contribution cap of 25% of tax-deferred savings.
- **Allows collective investment trusts (CITs) in 403(b) plans.** Under current law, 403(b) plan investments are generally limited to annuity contracts and mutual funds. This limitation cuts off 403(b) plan participants, generally employees of charities and public educational organizations, from access to CITs, which are often used by 401(k) plans due to their lower fees. The bill permits 403(b) custodial accounts to invest in collective investment trusts.
- **Opens the door for ETFs in variable annuities.** SECURE 2.0 directs the Treasury Department to update regulations to facilitate the creation of a new type of ETF that is "insurance-dedicated."

Lower Costs for Employers

- **Grant tax credits for small businesses.** The bill would change the three-year small employer startup tax credit by raising the credit to 100% from 50% for companies with up to 100 employees (up from 50), with a per-employee cap of \$1,000.
- **Help small 403(b) plans.** The Secure Act lowered costs and regulations so small businesses could join up and take part in so-called multiple employer plans (MEP). Secure Act 2.0 would extend that treatment to 403(b) plans, which are typically offered by nonprofits and government entities.
- **Ease up on plan paperwork.** The bill would also lessen penalties for some reporting mistakes.

Four months after the House passed their version of Secure Act 2.0, the Senate Finance Committee unanimously voted in favor of the EARN Act - Enhancing American Retirement Now and the Senate Health, Education, Labor, and Pensions (HELP) Committee advanced the RISE and SHINE Act. Eventually, the two bills will be consolidated into one package and voted upon by the entire Senate. Should it pass, the bill would then need to be reconciled with the House's version of Secure Act 2.0. While many of the individual provisions of both Senate bills were included in the House's Secure Act 2.0, there were a few distinct policies that could offer even more aid to retirement savers:

- **Emergency savings accounts.** The Rise & Shine Act would give companies the option to offer emergency savings accounts linked to an employee's retirement saving plan. Employees could opt to save up to 3% of their annual pay, or a maximum of \$2,500, as an after-tax contribution.
- **Encourage employees to invest for retirement.** If a workplace plan automatically enrolls its workers, yet a worker decides not to participate, the Rise & Shine Act would require employers to prompt these non-participating employees to reconsider their decision at least every three years.
- **Offer retirement plans for domestic employees.** The EARN Act would allow employers of domestic workers, such as nannies, to offer a retirement plan through a Simplified Employee Pension IRA (SEP IRA).

Retirement Savings Modernization Act

The Retirement Savings Modernization Act is legislation intended to make fiduciaries more comfortable offering non-traditional investments in defined contribution plans.

The bill is a proposed amendment to the Employee Retirement Income Security Act (ERISA). While ERISA doesn't currently ban such investments, the bill's sponsors intend for the amendment to clarify ERISA law for sponsors who may not be aware that such investments are allowed or who are concerned about facing litigation simply for offering such investments. Investment types covered in the bill include hedge funds, private equity, direct real estate, digital assets, and venture capital.

Bill sponsors could attempt to attach this to SECURE 2.0.

SMRS

Defined Contribution Strategies

9/30/22

| Markets | Amount | | % of Total | Fee per \$1,000 |
|---|------------------------|------------------------|----------------------|--------------------|
| QDIA (\$ in Millions) | | | | |
| | <u>9/30/22</u> | <u>9/30/21</u> | | |
| Total Target Date Fund | \$3,077 | \$3,401 | 29.2% | \$0.55 |
| Tier I Index Funds | | | | |
| State Street S&P 500 Index Fund | \$1,491 | \$1,781 | | \$0.13 |
| State Street Bond Market Index Fund | 983 | 1,128 | | 0.20 |
| State Street Global All Cap Equity ex-U.S. Index Fund | 664 | 855 | | 0.45 |
| State Street S&P Mid Cap Index Fund | 633 | 751 | | 0.20 |
| BlackRock Government Short-Term Investment CL F | 241 | 224 | | 0.56 |
| BlackRock S&P Small Cap 600 Equity Index CL F | 150 | 181 | | 0.30 |
| BlackRock Emerging Markets Index CL F | 93 | 134 | | 0.69 |
| Total Tier I Index | \$4,255 | \$5,054 | 40.4% | \$0.25 |
| Tier II Active Funds | | | | |
| Stable Value Fund | \$1,270 | \$1,234 | | \$2.14 |
| Dodge & Cox Stock Fund | 568 | 674 | | 4.13 |
| Jennison Large Cap Growth Fund | 370 | 610 | | 2.95 |
| American Funds EuroPacific Growth R6 | 214 | 348 | | 4.60 |
| T. Rowe Price Mid-Cap Value Fund | 128 | 139 | | 6.20 |
| Artisan Mid Cap Fund | 112 | 193 | | 7.05 |
| Voya Small Cap Growth Equity Fund | 113 | 164 | | 3.33 |
| PIMCO Total Return I Fund | 97 | 120 | | 4.60 |
| Virtus Ceredex Small-Cap Value Eq I | 61 | 75 | | 6.50 |
| Prudential High Yield Fund | 40 | 47 | | 3.76 |
| Total Tier II Active | \$2,974 | \$3,605 | 28.2% | \$3.40 |
| Tier III | | | | |
| Total Self Directed Brokerage Account | \$232 | \$304 | 2.2% | NA |
| Total Defined Contribution Assets | <u>\$10,537</u> | <u>\$12,364</u> | <u>100.0%</u> | \$1.22 |

*Loan Fund \$192M as of 9/30/22

NOTE: Totals may not be exact due to rounding.

Defined Contribution Performance by Fund 9/30/22

| <u>Fund Name</u> | <u>Market Value</u> | <u>1-Year</u> | <u>3-Years</u> | <u>5-Years</u> | <u>10-Years</u> |
|--|----------------------|---------------|----------------|----------------|-----------------|
| State Street Target Retirement Income Fund | \$108,621,381 | (12.4) | 1.5 | 2.6 | 3.3 |
| State Street Income Custom Index | | (12.5) | 1.5 | 2.6 | 3.4 |
| Morningstar Target-Date Retirement | | (14.5) | (0.5) | 1.4 | 2.9 |
| <i>Variance State Street Income Custom Index</i> | | 0.1 | 0.0 | 0.0 | (0.1) |
| <i>Variance Morningstar Target-Date Retirement</i> | | 2.1 | 2.0 | 1.2 | 0.4 |
| State Street Target Retirement 2020 Fund | \$123,040,594 | (13.6) | 2.2 | 3.4 | 5.2 |
| State Street 2020 Custom Index | | (13.6) | 2.2 | 3.3 | 5.2 |
| Morningstar Target-Date 2020 | | (16.4) | 0.5 | 2.2 | 4.2 |
| <i>Variance State Street 2020 Custom Index</i> | | 0.0 | 0.0 | 0.1 | 0.0 |
| <i>Variance Morningstar Target-Date 2020</i> | | 2.8 | 1.7 | 1.2 | 1.0 |
| State Street Target Retirement 2025 Fund | \$238,331,466 | (16.5) | 2.6 | 3.8 | 6.0 |
| State Street 2025 Custom Index | | (16.6) | 2.6 | 3.8 | 6.0 |
| Morningstar Target-Date 2025 | | (17.1) | 1.0 | 2.6 | 5.0 |
| <i>Variance State Street 2025 Custom Index</i> | | 0.1 | 0.0 | 0.0 | 0.0 |
| <i>Variance Morningstar Target-Date 2025</i> | | 0.6 | 1.6 | 1.2 | 1.0 |
| State Street Target Retirement 2030 Fund | \$300,798,287 | (19.2) | 2.5 | 3.8 | 6.3 |
| State Street 2030 Custom Index | | (19.2) | 2.5 | 3.8 | 6.3 |
| Morningstar Target-Date 2030 | | (18.0) | 1.6 | 3.0 | 5.5 |
| <i>Variance State Street 2030 Custom Index</i> | | 0.0 | 0.0 | 0.0 | 0.0 |
| <i>Variance Morningstar Target-Date 2030</i> | | (1.2) | 0.9 | 0.8 | 0.8 |
| State Street Target Retirement 2035 Fund | \$343,727,944 | (20.2) | 2.6 | 3.9 | 6.6 |
| State Street 2035 Custom Index | | (20.3) | 2.6 | 3.9 | 6.7 |
| Morningstar Target-Date 2035 | | (19.0) | 2.2 | 3.5 | 6.3 |
| <i>Variance State Street 2035 Custom Index</i> | | 0.1 | 0.0 | 0.0 | (0.1) |
| <i>Variance Morningstar Target-Date 2035</i> | | (1.2) | 0.4 | 0.4 | 0.3 |
| State Street Target Retirement 2040 Fund | \$348,122,584 | (20.9) | 2.9 | 4.1 | 6.9 |
| State Street 2040 Custom Index | | (21.0) | 2.9 | 4.1 | 7.0 |
| Morningstar Target-Date 2040 | | (19.8) | 2.6 | 3.7 | 6.4 |
| <i>Variance State Street 2040 Custom Index</i> | | 0.1 | 0.0 | 0.0 | (0.1) |
| <i>Variance Morningstar Target-Date 2040</i> | | (1.1) | 0.3 | 0.4 | 0.5 |
| State Street Target Retirement 2045 Fund | \$373,977,401 | (21.5) | 3.1 | 4.2 | 7.1 |
| State Street 2045 Custom Index | | (21.5) | 3.1 | 4.2 | 7.1 |
| Morningstar Target-Date 2045 | | (20.2) | 3.0 | 4.0 | 6.9 |
| <i>Variance State Street 2045 Custom Index</i> | | 0.0 | 0.0 | 0.0 | 0.0 |
| <i>Variance Morningstar Target-Date 2045</i> | | (1.3) | 0.1 | 0.2 | 0.2 |
| State Street Target Retirement 2050 Fund | \$481,120,628 | (21.9) | 3.2 | 4.2 | 7.1 |
| State Street 2050 Custom Index | | (22.0) | 3.2 | 4.2 | 7.1 |
| Morningstar Target-Date 2050 | | (20.5) | 3.0 | 4.0 | 6.8 |
| <i>Variance State Street 2050 Custom Index</i> | | 0.1 | 0.0 | 0.0 | 0.0 |
| <i>Variance Morningstar Target-Date 2050</i> | | (1.4) | 0.2 | 0.2 | 0.3 |
| State Street Target Retirement 2055 Fund | \$509,931,996 | (22.0) | 3.1 | 4.2 | 7.1 |
| State Street 2055 Custom Index | | (22.0) | 3.2 | 4.2 | 7.1 |
| Morningstar Target-Date 2055 | | (20.6) | 3.1 | 4.1 | 7.1 |
| <i>Variance State Street 2055 Custom Index</i> | | 0.0 | (0.1) | 0.0 | 0.0 |
| <i>Variance Morningstar Target-Date 2055</i> | | (1.4) | 0.0 | 0.1 | 0.0 |

| <u>Fund Name</u> | <u>Market Value</u> | <u>1-Year</u> | <u>3-Years</u> | <u>5-Years</u> | <u>10-Years</u> |
|---|------------------------|---------------|----------------|----------------|-----------------|
| State Street Target Retirement 2060 Fund | \$231,221,980 | (21.9) | 3.1 | 4.2 | N/A |
| <i>State Street 2060 Custom Index</i> | | (22.0) | 3.2 | 4.2 | N/A |
| <i>Morningstar Target-Date 2060</i> | | (20.6) | 3.1 | 4.1 | N/A |
| <i>Variance State Street 2060 Custom Index</i> | | 0.1 | (0.1) | 0.0 | N/A |
| <i>Variance Morningstar Target-Date 2060</i> | | (1.3) | 0.0 | 0.1 | N/A |
| State Street Target Retirement 2065 Fund | \$18,219,978 | (22.0) | N/A | N/A | N/A |
| <i>State Street 2065 Custom Index</i> | | (22.0) | N/A | N/A | N/A |
| <i>Morningstar Target-Date 2065+</i> | | (21.0) | N/A | N/A | N/A |
| <i>Variance State Street 2065 Custom Index</i> | | 0.0 | N/A | N/A | N/A |
| <i>Variance Morningstar Target-Date 2065+</i> | | (1.0) | N/A | N/A | N/A |
| TIER 1 | | | | | |
| State Street S&P 500 Index Fund | \$1,490,575,466 | (15.5) | 8.1 | 9.2 | 11.7 |
| <i>S&P 500 Index</i> | | (15.5) | 8.2 | 9.2 | 11.7 |
| <i>Morningstar Large Blend</i> | | (16.1) | 6.2 | 7.3 | 9.8 |
| <i>Variance S&P 500 Index</i> | | 0.0 | (0.1) | 0.0 | 0.0 |
| <i>Variance Morningstar Large Blend</i> | | 0.6 | 1.9 | 1.9 | 1.9 |
| State Street US Bond Index Fund | \$983,334,108 | (14.6) | (3.2) | (0.3) | 0.9 |
| <i>Bloomberg U.S. Aggregate Bond Index</i> | | (14.6) | (3.3) | (0.3) | 0.9 |
| <i>Morningstar Intermediate Core Bond</i> | | (14.9) | (3.3) | (0.5) | 0.8 |
| <i>Variance Bloomberg U.S. Aggregate Bond Index</i> | | 0.0 | 0.1 | 0.0 | 0.0 |
| <i>Variance Morningstar Intermediate Core Bond</i> | | 0.3 | 0.1 | 0.2 | 0.1 |
| State Street Global All Cap Equity ex-U.S. Index Fund | \$663,763,239 | (25.5) | (1.2) | (0.7) | 3.3 |
| <i>MSCI ACWI ex USA IMI (Net)</i> | | (25.7) | (1.3) | (0.8) | 3.2 |
| <i>Morningstar Foreign Large Blend</i> | | (25.5) | (2.0) | (1.3) | 3.0 |
| <i>Variance MSCI ACWI ex USA IMI (Net)</i> | | 0.2 | 0.1 | 0.1 | 0.1 |
| <i>Variance Morningstar Foreign Large Blend</i> | | 0.0 | 0.8 | 0.6 | 0.3 |
| State Street S&P Mid Cap Index Fund | \$632,805,211 | (15.3) | 6.0 | 5.8 | 10.0 |
| <i>S&P 400 Index</i> | | (15.3) | 6.0 | 5.8 | 10.0 |
| <i>Morningstar Mid-Cap Blend</i> | | (15.9) | 5.1 | 5.0 | 8.6 |
| <i>Variance S&P 400 Index</i> | | 0.0 | 0.0 | 0.0 | 0.0 |
| <i>Variance Morningstar Mid-Cap Blend</i> | | 0.6 | 0.9 | 0.8 | 1.4 |
| BlackRock Government Short-Term Investment Fund | \$241,077,747 | 0.7 | 0.6 | 1.1 | 0.7 |
| <i>FTSE Treasury Bill 1 Mon USD</i> | | 0.6 | 0.5 | 1.1 | 0.6 |
| <i>Variance FTSE Treasury Bill 1 Mon USD</i> | | 0.1 | 0.1 | 0.0 | 0.1 |
| BlackRock S&P Small Cap 600 Equity Index Fund | \$149,832,554 | (18.7) | 5.5 | 4.9 | N/A |
| <i>S&P SmallCap 600 Index</i> | | (18.8) | 5.5 | 4.8 | N/A |
| <i>Morningstar Small Blend</i> | | (19.1) | 4.4 | 3.3 | N/A |
| <i>Variance S&P SmallCap 600 Index</i> | | 0.1 | 0.0 | 0.1 | N/A |
| <i>Variance Morningstar Small Blend</i> | | 0.4 | 1.1 | 1.6 | N/A |
| BlackRock Emerging Markets Index Fund | \$93,348,381 | (28.6) | (2.4) | (2.0) | N/A |
| <i>MSCI Emerging Market (Net)</i> | | (28.1) | (2.1) | (1.8) | N/A |
| <i>Morningstar Diversified Emerging Mkts</i> | | (28.8) | (2.3) | (2.2) | N/A |
| <i>Variance MSCI Emerging Market (Net)</i> | | (0.5) | (0.3) | (0.2) | N/A |
| <i>Variance Morningstar Diversified Emerging Mkts</i> | | 0.2 | (0.1) | 0.2 | N/A |
| TIER 2 | | | | | |
| Stable Value Fund | \$1,269,805,449 | 1.8 | 2.1 | 2.3 | 2.2 |
| <i>BofA Merrill Lynch US 3-Month Treasury Bill Index</i> | | 0.6 | 0.6 | 1.2 | 0.7 |
| <i>Hueler Universe</i> | | 1.7 | 2.0 | 2.1 | 2.0 |
| <i>Variance BofA Merrill Lynch US 3-Month Treasury Bill Index</i> | | 1.2 | 1.5 | 1.1 | 1.5 |
| <i>Variance Hueler Universe</i> | | 0.1 | 0.1 | 0.2 | 0.2 |

| <u>Fund Name</u> | <u>Market Value</u> | <u>1-Year</u> | <u>3-Years</u> | <u>5-Years</u> | <u>10-Years</u> |
|---|-------------------------|---------------|----------------|----------------|-----------------|
| Dodge & Cox Stock Fund | \$567,740,700 | (12.7) | 8.3 | 7.2 | 11.4 |
| <i>Russell 1000 Value Index</i> | | (11.4) | 4.4 | 5.3 | 9.2 |
| <i>Morningstar Large Value</i> | | (9.7) | 5.0 | 5.5 | 8.7 |
| <i>Variance Russell 1000 Value Index</i> | | (1.3) | 3.9 | 1.9 | 2.2 |
| <i>Variance Morningstar Large Value</i> | | (3.0) | 3.3 | 1.7 | 2.7 |
| Jennison Large Cap Growth Equity Fund | \$369,850,671 | (34.9) | 8.0 | 9.8 | N/A |
| <i>Russell 1000 Growth Index</i> | | (22.6) | 10.7 | 12.2 | N/A |
| <i>Morningstar Large Growth</i> | | (27.6) | 6.4 | 8.6 | N/A |
| <i>Variance Russell 1000 Growth Index</i> | | (12.3) | (2.7) | (2.4) | N/A |
| <i>Variance Morningstar Large Growth</i> | | (7.3) | 1.6 | 1.2 | N/A |
| American Funds EuroPacific Growth R6 Fund | \$214,094,496 | (32.9) | (1.2) | (0.2) | 4.5 |
| <i>MSCI ACWI Ex USA NR USD</i> | | (25.2) | (1.5) | (0.8) | 3.0 |
| <i>Morningstar Foreign Large Growth</i> | | (33.4) | (1.7) | (0.1) | 3.9 |
| <i>Variance MSCI ACWI Ex USA NR USD</i> | | (7.7) | 0.3 | 0.6 | 1.5 |
| <i>Variance Morningstar Foreign Large Growth</i> | | 0.5 | 0.5 | (0.1) | 0.6 |
| T. Rowe Price Mid-Cap Value Fund | \$128,418,356 | (9.8) | 7.5 | 5.4 | 9.5 |
| <i>Russell Midcap Value Index</i> | | (13.6) | 4.5 | 4.8 | 9.4 |
| <i>Morningstar Mid-Cap Value</i> | | (11.4) | 5.4 | 4.6 | 8.6 |
| <i>Variance Russell Midcap Value Index</i> | | 3.8 | 3.0 | 0.6 | 0.1 |
| <i>Variance Morningstar Mid-Cap Value</i> | | 1.6 | 2.1 | 0.8 | 0.9 |
| Voya Small Cap Growth Equity Fund | \$112,716,692 | (26.3) | 1.7 | 1.0 | 7.3 |
| <i>Russell 2000 Growth Index</i> | | (29.3) | 2.9 | 3.6 | 8.8 |
| <i>Morningstar Small Growth</i> | | (29.9) | 4.7 | 5.7 | 9.1 |
| <i>Variance Russell 2000 Growth Index</i> | | 3.0 | (1.2) | (2.6) | (1.5) |
| <i>Variance Morningstar Small Growth</i> | | 3.6 | (3.0) | (4.7) | (1.8) |
| Artisan Mid Cap Fund | \$112,265,955 | (35.9) | 6.4 | 9.3 | 10.7 |
| <i>Russell Midcap Growth Index</i> | | (29.5) | 4.3 | 7.6 | 10.9 |
| <i>Morningstar Mid-Cap Growth</i> | | (29.9) | 4.7 | 6.8 | 9.6 |
| <i>Variance Russell Midcap Growth Index</i> | | (6.4) | 2.1 | 1.7 | (0.2) |
| <i>Variance Morningstar Mid-Cap Growth</i> | | (6.0) | 1.7 | 2.5 | 1.1 |
| PIMCO Total Return I Fund | \$97,404,397 | (15.7) | (3.1) | (0.3) | 1.1 |
| <i>Bloomberg U.S. Aggregate Bond Index</i> | | (14.6) | (3.3) | (0.3) | 0.9 |
| <i>Morningstar Intermediate Core-Plus Bond</i> | | (14.9) | (2.8) | (0.1) | 1.2 |
| <i>Variance Bloomberg U.S. Aggregate Bond Index</i> | | (1.1) | 0.2 | 0.0 | 0.2 |
| <i>Variance Morningstar Intermediate Core-Plus Bond</i> | | (0.8) | (0.3) | (0.2) | (0.1) |
| Virtus Ceredex Small-Cap Value Eq I Fund | \$60,991,389 | (15.0) | 1.7 | 2.8 | 7.9 |
| <i>Russell 2000 Value Index</i> | | (17.7) | 4.7 | 2.9 | 7.9 |
| <i>Morningstar Small Blend</i> | | (19.1) | 4.4 | 3.3 | 7.9 |
| <i>Variance Russell 2000 Value Index</i> | | 2.7 | (3.0) | (0.1) | 0.0 |
| <i>Variance Morningstar Small Blend</i> | | 4.1 | (2.7) | (0.5) | 0.0 |
| Prudential High Yield Fund | \$40,366,194 | (14.6) | (0.2) | 2.2 | N/A |
| <i>Bloomberg U.S. Corp. HY 1% Issuer Cap Index</i> | | (14.1) | (0.6) | 1.5 | N/A |
| <i>Morningstar High Yield Bond</i> | | (13.3) | (1.1) | 0.8 | N/A |
| <i>Variance Bloomberg U.S. Corp. HY 1% Issuer Cap Index</i> | | (0.5) | 0.4 | 0.7 | N/A |
| <i>Variance Morningstar High Yield Bond</i> | | (1.3) | 0.9 | 1.4 | N/A |
| TIER 3 | | | | | |
| Self Directed | \$231,650,848 | | | | |
| TOTAL | \$10,537,156,094 | | | | |

Loan Fund:

\$191,639,208

Disclaimer



This presentation was given solely for the purpose of explaining the structure, investment process, and returns for the State of Michigan Retirement System. It should not be interpreted in any way as financial advice.