January 2019

MPERS
Evolution of Investment Policy

Abstract

The purpose of this document is to review the historical experience and chain of events that ultimately led to the current composition of MPERS' investment portfolio. The historical perspective is presented in two distinct timeframes, specifically the periods prior to the hiring of investment staff in 2003 and the restructuring efforts that occurred subsequent to that initiative.

In reviewing the history of MPERS dating back to its inception in 1955, it can easily be ascertained that the system was created with a limited amount of long-term planning. Many will credit the system's origin to a group of industrious long-term employees who negotiated with the Missouri Department of Transportation (MoDOT) and the Missouri State Highway Patrol (MSHP) and who volunteered to forgo a pay raise to fund the first contributions of the system. Eligible employees were allowed to immediately retire, which culminated in negative cash flows, a zero percent funded status, and an $8.5 million unfunded liability at the outset of the plan. During the decades that followed, a number of legislatively mandated benefit increases put additional stress on the plan and the unfunded liability continued to mount. Together with poor investment performance and a lack of staff working exclusively for the pension system, the structural challenges at the outset proved difficult to overcome.

In 2003 MPERS began to commit considerably more resources to the investment management function. At that point, MPERS' investment performance was poor and the board was eager to improve the perception of the system. There was increasingly more discussion in the legislature about whether MPERS should be consolidated under the supervision of the Missouri State Employees' Retirement System (MOSERS), a sharply contested topic that would resurface multiple times in the coming years and drew mixed reactions from the board.

In the years that followed, the investment portfolio was completely restructured from one that lacked any real management or direction, to one of the more sophisticated investment portfolios of any public plan of similar size in the country. Those efforts have served the plan well, as significant progress has been made towards improving the funded status of the plan. The system now ranks among the best performing funds in the peer universe. The efforts of the investment staff have also received national recognition from industry peers, including the "2016 Industry

Innovation" award for public plans under $15 billion in assets from *Chief Investment Officer Magazine*.

The path was not without obstacles, as the financial crisis of 2008-2009 resulted in MPERS losing roughly one-fourth of the fund's value and brought with it increased scrutiny of the new investment management approach. As with most long-term initiatives, the key to effectively implementing change is to have the conviction to stay the course during challenging times. It was a turbulent path, but a path that explains how the portfolio is positioned in the manner it is today.

Historical Framework (1955 – 2003)

To better understand how MPERS arrived where it is today, the historical chain of events going back to the outset of the plan in 1955 must be understood. The employees of MoDOT and the MSHP agreed to a four percent employee contribution rate, which was matched by the two employers. The total contribution rate of eight percent was consistent with the expected long-term cost of the pension plan, but no additional funds or assets were provided other than the commitment to make future contributions. When the system was officially created on September 1, 1955, eligible employees were allowed to immediately file for retirement with full benefits. One month later (October 1, 1955, the first retirement eligibility date), 109 employees retired having contributed four percent of pay for only one month. The retroactive nature of the legislation created an immediate cash flow challenge, as contributions were used to make benefit payments rather than building the corpus of the fund. That put the system in a funding deficit at the outset of the plan, with a zero percent funded status and an unfunded liability of $8.5 million.

The structural imbalance at the beginning of the plan has proven difficult to overcome over the years due to a number of factors. The extensive list of significant events can be broken down into four primary categories which are detailed below.

<u>A Series of Benefit Increases</u>

From 1955 through 2000, a number of legislatively mandated benefit increases were adopted. Many of these increases came at times when employees were not receiving compensation increases, and the anecdotal evidence and perception was that retirement benefits were a relatively inexpensive way to offset the lack of other compensation increases. This created a challenge for MPERS' funded status, as the cost was often analyzed based on the impact the benefit change had on annual contribution rates versus the overall cost if the benefit was 100% funded up front. The net result was a consistent increase in the system's unfunded liabilities and the gradual increase in contribution rates to finance the growth in the deficit. A sampling of the most meaningful benefit changes connected to MPERS financial condition during this period were:

September 1, 1955	Benefit formula established a .666% multiplier *multiplied by* the average of the last five years of compensation *multiplied by* years of total service.
	Vesting occurred at age 65, no minimum service requirement or age 60 with 20 years of service or for uniformed members at age 55 with 20 years of service.
	Employee and employer contribution rate at 4%.
September 13, 1961	Multiplier increased to 1%.
October 13, 1969	Multiplier increased to 1.125%.
	Death in service benefit added. Joint and 50% survivor benefit provided to spouse of deceased active members until remarriage or death.
August 13, 1972	Multiplier increased to 1.25%.
	Employee and employer contribution rate increased from 4% to 5.1%.
	Special consultant language[1] implemented which makes past and future benefit formula increases retroactive for Closed Plan members.
August 13, 1976	Member contributions eliminated; contributions and interest refunded upon retirement.
	Vesting reduced to 15 years of service or age 35 with 10 years of service.
June 15, 1977	Established cost-of-living adjustment (COLA) fixed at 4% per year with no cap on the amount of COLAs a member could receive over a lifetime.
February 14, 1980	Contributions plus interest refunded to active members; total refund was approximately $41 million.
May 12, 1981	Definition of final average compensation changed from average of "last five years" to average of "highest three consecutive years."

[1] Special consultant language is used to bring specific groups into a plan that were not otherwise considered when the plan was established – a way to pay them a benefit after the fact. This is a retroactive action and rare in the public pension fund universe.

June 1, 1982	Vesting requirement changed to 10 years of service.
October 1, 1984	Multiplier increased to 1.333%.
	Survivors of those retiring after October 1, 1984, to receive unreduced joint and 50% benefit (the free 50% benefit).
August 13, 1986	Long-term disability (LTD) program created.
August 13, 1988	Multiplier increased to 1.5%.
August 28, 1992	Vesting requirement changed to 5 years of service.
August 28, 1994	Rule of 80 made permanent (established in 1990); pop-up and survivor COLAs implemented.
August 28, 1995	Work-related disability benefit set at 70%.
	Multiplier increased to 1.6%.
July 1, 2000	Created Year 2000 Plan.
	Multiplier changed to 1.7% in the Year 2000 Plan and temporary benefit of .8% (until age 62) implemented.
January 1, 2002	BackDROP payment option implemented (designed to be cost neutral but can create cash flow challenges).

<u>Changes to Funding and Actuarial Methodologies</u>

From 1955 through 1972, the statutory contribution rates for both the employees and employers were set at four percent. That rate increased to 5.1% in 1972 and remained there until 1976. Given that contribution rates were set by statute, the amortization period for the unfunded liability was the only variable used to reflect actual experience versus the actuarial assumptions. By 1975, MPERS' funded status was 44% and the amortization period to finance the $81 million unfunded liability was pushed out to 40 years.

In 1976, the system became non-contributory and employees' contributions and interest were refunded upon retirement. In 1980, rather than processing refunds to individual members upon request, the system returned the balance of accumulated member contributions, amounting to over $40 million. This is noteworthy when considering the market value of assets was only $100.6 million on June 30, 1979; representing a deliberate 40% loss of assets.

From 1977 until 1990, the unfunded liability continued to grow. The board changed the actuarial cost method of amortizing the unfunded liability from entry age normal to an aggregate cost method on an open group basis. This extended the unfunded cost of future benefits to the future salary of current *and* future participants. In 1991, the board moved back to the entry age normal cost method, but the unfunded liability had already risen to $280 million with a funded status of 66.7% and an assumed rate of return of 9%.

In 1999, the board changed the actuarial method of amortizing the unfunded liability from level dollar to level percent of pay resulting in fewer contributions being paid to the system. This reduced the contributions to MPERS by $9 million in the first year of the change. At the time, the system had an unfunded liability of $810 million and was 60.5% funded with an assumed rate of return of 8.25%. Also in 1999, a total of 12 benefits that were previously treated on a "pay as you go" basis were rolled into the actuarial valuation reports and included in the unfunded liability. All of these decisions deferred the unfunded liability further into the future and resulted in fewer dollars coming into a system that was already underfunded by almost any definition.

Lack of Staffing for the System

From 1955 through 1988, the retirement system was operated as a division of MoDOT with staff from various divisions assigned on a part-time basis to manage the system's necessary operations. According to sources, investment management was treated as another line item on the balance sheet rather than a trust fund. In 1988, Terry Porterfield became the first executive director of the system; however, the majority of the administrative and support staff remained employed by MoDOT. Since the addition of the first executive director in 1988, the system has grown to 17 full-time employees including 4 investment professionals.

Decades of Conservative Investing and Poor Investment Performance

From 1955 until 1997, MPERS' investment portfolio was conservatively managed by United Missouri Bank (UMB). The board recognized the need to improve investment performance, and began working with investment consultants in 1973, but without an investment staff to implement the consultant's recommendations, most of the proposals were not acted upon. A complete list of investment consultants that have served MPERS' board over the years is provided below.

Investment Consulting Firm (Headquarters)	Time Period
B.C. Christopher & Co. (Kansas City, MO)	December, 1973 – July, 1978
DeMarche Associates (Kansas City, MO)	July, 1978 – April, 2000
Asset Consulting Group (St. Louis, MO)	April, 2000 – March, 2004
Summit Strategies Group (St. Louis, MO)	March 2004 – June, 2011
NEPC, LLC (Boston, MA)	June, 2011 – Present

A review of historical documents indicates that consultants started introducing modern portfolio theories to MPERS' board as early as 1987. In the late 1990s, the system gradually began to diversify the mix of investment managers instead of relying on UMB as the sole investment manager. Unfortunately, the additional managers were primarily equity firms which increased the system's risk profile leading up to the collapse of technology stocks in 2000-2001 and the prolonged bear market that subsequently occurred in the equity markets.

Current Environment (2003 - Present)

The second portion of this paper covers the current environment, which is defined as 2003 to present. During this period, MPERS committed considerably more resources to the investment management operations. At the start of this period, the board was eager to turn around the performance and the perception of MPERS' investment portfolio. Investment performance was poor and there was increasingly more discussion in the legislature about whether MPERS should be consolidated under the supervision of MOSERS. The board was divided on this issue; some members valued the autonomy and control that a separate system offered, while others viewed consolidation as having the potential to merge the funding status of the combined systems which would shift some of the cost burden away from the State Road Fund. The MoDOT Commission testified in support of consolidation legislation in 2005 for that reason. Regardless of the individual views of consolidation, everyone recognized the need to improve the system's investment performance.

The extensive list of changes that occurred subsequent to 2003 can be broken down into the three distinct eras that are detailed below.

First Era: 2003 until the Financial Crisis of 2008-2009 (The "Risk-On" Period)

The common theme of this era was transition, beginning with the transition of custodial banks from UMB to Northern Trust in early 2003. Northern Trust was and continues to be widely recognized as a top tier institutional custodial bank, alongside BNY/Mellon, State Street Advisors, JPMorgan, and U.S. Bank. The move provided additional performance reporting capabilities, along with additional income from securities lending and class action lawsuit collections.

In December of 2003, Larry Krummen was selected as MPERS' first chief investment officer (CIO). He came to MPERS from the Missouri State Treasurer's Office, having served as director of investments beginning in January of 2000. Mr. Krummen had also worked as an investment officer at Central Bank, as a budget analyst for the Missouri Senate, and lobbied for the Missouri Chamber of Commerce. Mr. Krummen received his Bachelor of Science in Business Administration with a dual major in finance and real estate from the University of Missouri, graduating Magna Cum Laude and fifth in his class with a cumulative GPA of 3.89. He also received the Chartered Financial Analyst (CFA) Charterholder designation in 2002. Mr. Krummen's educational accomplishments and his diverse employment history in investments and state government, provided a strong foundation to assist MPERS with the upcoming transition of the investment portfolio. Biographies for each of MPERS' current investment and executive staff are provided in the appendix.

Asset Consulting Group (ACG) was the investment consultant in 2003 and had worked with MPERS' board since April of 2000. ACG was instrumental in diversifying MPERS' investment manager base, and establishing new target allocations to real estate and timber. In 2002, following a few difficult years in the equity markets, ACG proposed a change to the asset allocation that included a number of new alternative investment strategies. To implement the new approach, they proposed an increase in the consulting fee from $105,000/year to approximately $250,000/year. The shock of the increase, along with the poor market performance during ACG's tenure as consultant, were the primary motivating factors behind the search for a new consultant. The existing and proposed allocation targets in 2003 were as follows[2]:

	Current Target	Mix B
EQUITY		
Large Cap Stocks	40%	19%
Small Cap Stocks	10%	11%
International	10%	16%
Equity Long/Short	0%	15%
FIXED INCOME		
Cash	2%	1%
Fixed Income	32%	19%
TIPS	0%	2%
ALTERNATIVES		
Real Estate	3%	5%
Private Equity	0%	7%
Timber	3%	5%
RISK & RETURN		
Expected Return	7.16%	8.25%
Sharpe Ratio	0.35	0.41
Standard Deviation	9.87%	10.86%

It should be noted that the expected return of 7.16% for the existing portfolio was well below the actuarial hurdle of 8.25%. The board had several options: 1) adjust the assumed actuarial rate of return downward to match the projected return on the existing portfolio, which would increase contribution rates in a very tight budgetary environment; 2) increase the allocation to equities and hope that equities would generate double digit returns; or 3) evaluate the inclusion of alternative portfolio management techniques that could both improve investment returns and reduce overall plan volatility. The trade-off with option number 3 was the increased complexity in the portfolio and the need to commit more resources to the investment management function. By adding dedicated staff, using advanced investment techniques, and improving consulting services, the board was looking to the investment portfolio to help bridge the gap between expected returns and the actuarial return assumption.

In early 2004, the board hired Summit Strategies Group (Summit), also from St. Louis, to serve as the general investment consultant. The lead consultant was a former CIO for the Missouri

[2] Asset Consulting Group. Asset Liability Study, March 2003.

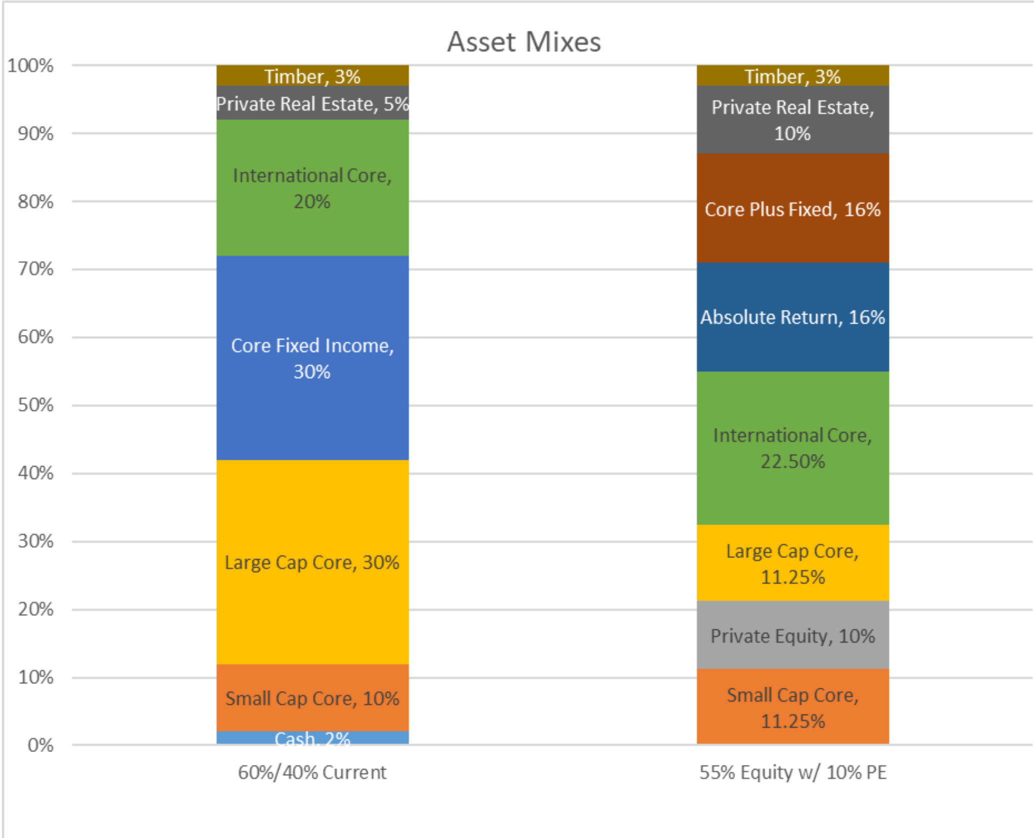
Public School Retirement System (PSRS/PEERS) and Teacher's Retirement System of Illinois. Summit was also the general consultant for MOSERS at the time. Summit also brought with them a progressive asset allocation proposal (outlined below) which the board had started to review during the RFP process and ultimately adopted later that year. Similar to ACG, Summit's modeling suggested MPERS' current portfolio would not deliver the 8.25% actuarial target return. Summit also suggested that it was not the time to increase risk in the investment portfolio. In order to illustrate the value-added benefit of staff and consultants over the years, the following are excerpts from the asset/liability study presented to the board in September 2004[3]:

- Based upon Summit's current capital market assumptions, capital market returns are below their historical level while risk has shifted slightly outward.
- The incremental return pick-up generated by increasing the equity allocation has decreased while the incremental risk has not. (In other words, Summit believes that investors are no longer rewarded for taking (equity) risk to the extent that they once were.)
- Given Summit's current capital market assumptions, the required return of 8.25% cannot easily be achieved without incorporating an active management (alpha) assumption.
- Summit believes that the Plan must take on a moderate level of risk in order to achieve the 8.25% return objective. However, this does not mean that the Plan should take on an inordinate amount of risk. The Plan will not be rewarded for taking additional risk in equities. To whatever extent total equity exposure can be reduced without diminishing returns, the Plan should benefit from a volatility standpoint.

With the benefit of hindsight, these were insightful comments. The board, mindful of the risks, was not interested in putting together a portfolio that did not meet the 8.25% return hurdle. There were increasing pressures to reduce the cost burden of the retirement system on the employers, and the investment portfolio had the potential to offset some of those costs. In response, Summit laid out a well-designed, multi-phased plan that explained how MPERS could structure a portfolio that was projected to earn 8.25% through the use of alternative investment strategies and active management techniques. The portfolio was projected to increase MPERS' expected return by over one percent while also reducing risk (risk defined as volatility of returns). Similar strategies had worked well for MOSERS (while Summit served as its consultant), so there was a reasonable expectation that it could also work for MPERS.

The following asset allocation was presented and approved by the board in September 2004, along with the expected impact to the projected risk and return profile of the fund.

[3] Summit Strategies Group. Asset Liability Study, September 2004.



GEOMETRIC EXPECTED RETURN & STANDARD DEVIATION		
	60/40 Current	55% Equity w/ 10% Private Equity
Expected Return	7.2%	8.3%
Standard Deviation	10.9%	9.5%

To implement the new portfolio, staff and Summit developed an investment policy that delegated the day-to-day implementation of the investment portfolio to MPERS' CIO, executive director, and consultant. The increased flexibility allowed staff to move more quickly and expedite the transition to the new asset allocation targets, which the board supported. This was a busy and productive time for MPERS; every board meeting included updates on major initiatives under consideration by the investment staff. From 2004 through 2008, dozens of investment managers were hired to implement the new strategy and MPERS' portfolio performed very well. MPERS' success was also instrumental in quieting the consolidation discussion in the legislature, despite Governor Matt Blunt creating a State Retirement Consolidation Commission (SRCC) in 2005 to review the merits of consolidation. In the coming years, the SRCC would discuss a number of possible consolidation scenarios and several consolidation bills would be debated in the legislature.

Second Era: The Financial Crisis of 2008-2009 (The "Risk-Off" Period)

To quote the boxer Mike Tyson, "everybody has a plan until you get punched in the mouth." The asset allocation and investment decisions were performing as expected heading into 2008.

MPERS' trailing three- and five-year returns ranked among the highest in the peer universe, and the system was fully transitioning the portfolio towards the targeted asset allocation. Norm Robinson retired as executive director, having laid the foundation for a successful road ahead. Susie Dahl was promoted to executive director, having previously served as MPERS' assistant executive director. Discussions of consolidation under MOSERS continued in the state legislature, but there was also an acknowledgment that MPERS was making progress and was on a good path toward improvement.

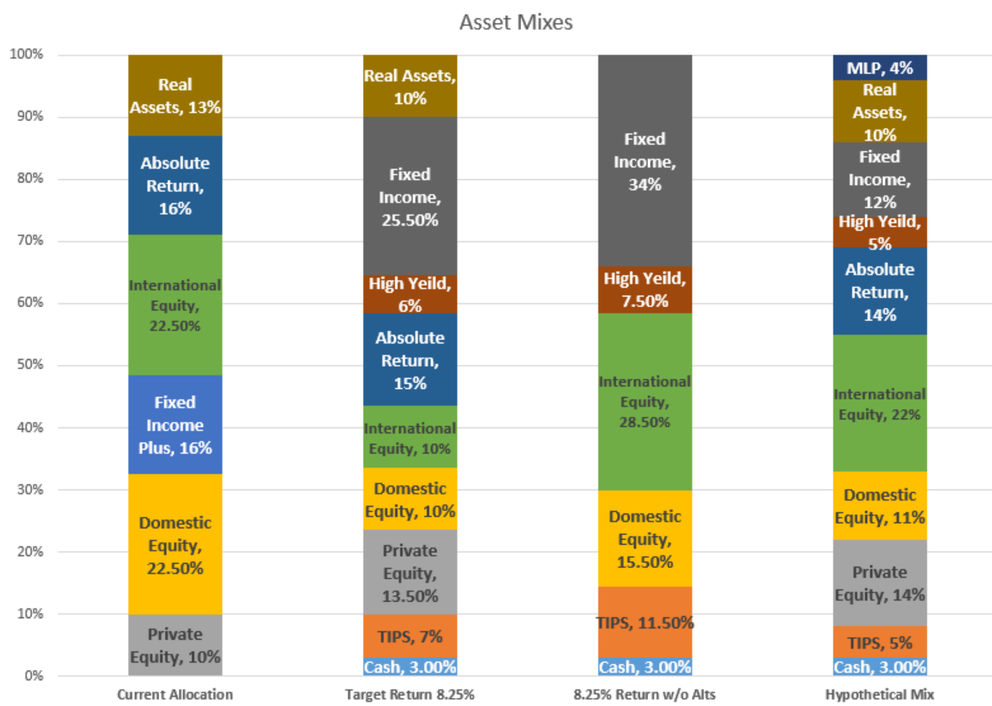
Following this period of success, the financial crisis occurred bringing with it a whole new perspective on the investment portfolio. Signs of a fragile economy began to emerge in Fiscal Year 2008, as MPERS' portfolio lost 2.4% on the year but performed well relative to peers as broader equity markets lost over 9% of their value. The major difficulties came in Fiscal Year 2009 when the investment portfolio lost almost one-fourth of its value. The equity markets bottomed in March of 2009, with the S&P 500 hitting an intra-day low of 666, but not before the U.S. equity markets had dropped over 50% from their peaks. Equity markets around the world experienced even more losses, with developed international equities falling close to 60% and emerging markets falling over 60%. Many of the strategies that worked so well from 2005 until 2008 faltered with the lack of liquidity in the market. America was on the verge of a total economic collapse. Credit markets froze, as banks hoarded cash to absorb losses on bad loans and withdrawals from bank runs. The Federal Reserve made a last minute effort to bail out Bear Stearns, fearing its bankruptcy would lead to catastrophic events, and later made similar bailouts of Fannie Mae, Freddie Mac, and AIG (one of the world's largest insurance companies). The Federal Reserve's fears were proven true when Lehman Brothers filed for bankruptcy, which subsequently triggered a global recession on a scale not seen since the Great Depression.

While Summit's asset allocation modeling correctly identified potential risks in the equity markets, nobody expected such a widespread meltdown of the global capital markets. The ultimate driver of the financial crisis was liquidity, as both individuals and institutions were too levered heading into the downturn. This was clearly an unprecedented event, and one that no investment model could have ever forecasted. The only strategy that offered any diversification was U.S. Treasuries, of which MPERS owned very few. MPERS' funded status would ultimately drop to 42% and contribution rates soared to 58% of pay.

The market volatility also brought renewed discussions in the legislature about pension consolidation, but this time the proposals included MPERS, MOSERS and PSRS/PEERS, with the solution taking the form of a statewide investment board. At the March 25, 2010, meeting, MPERS' board unanimously voted to support legislation to establish the Missouri State Investment Board, which would have effectively combined MPERS' and MOSERS' portfolios and transferred the management of MPERS' investment portfolio to MOSERS. The initiative failed on the last day of the legislative session in May 2010, primarily due to opposition by PSRS/PEERS, who feared they would eventually be included in the new statewide investment board structure. MPERS' board was looking at all possible options. The trustees rightfully challenged everything, feeling as though they were not properly educated on all of the underlying risks in the portfolio. They ordered a fundamental review of every facet of the investment portfolio to ensure the current path was also the preferred path of the future.

The board established an investment committee, and launched a comprehensive asset/liability study that incorporated the current economic environment. The liability side of the review was positive, as MPERS' liquidity was deemed adequate because employer contributions were expected to exceed benefit payments over the intermediate period. Staff was also able to remain in compliance with permissible asset class ranges throughout the financial crisis, which was a significant liquidity test for the portfolio. As the investment committee turned its attention to the asset allocation side of the study, the markets were coming off the worst economic downturn since the Great Depression, and looking back, valuations were attractive. Summit's asset allocation models correctly identified the opportunity in the markets, and there were multiple options to construct a portfolio that was projected to earn 8.25%.

In June of 2009, Summit presented its initial findings and concerns, which included the current allocation along with two other options that were projected to earn above 8.25% while each taking distinct paths to accomplish that goal[4]. One option did not utilize any alternatives, while the other continued to use alternatives in roughly the same manner as before.



	Current Allocation	Target Return 8.25%	8.25% Return w/o Alternatives	Hypothetical Mix
Expected Return	9.04%	8.25%	8.25%	9.07%
Expected Risk	12.86%	7.17%	9.66%	11.15%
Risk/Return	0.70	1.15	0.85	0.81

[4] Summit Strategies Group, June 2009 board meeting presentation: Development of Return Expectations.

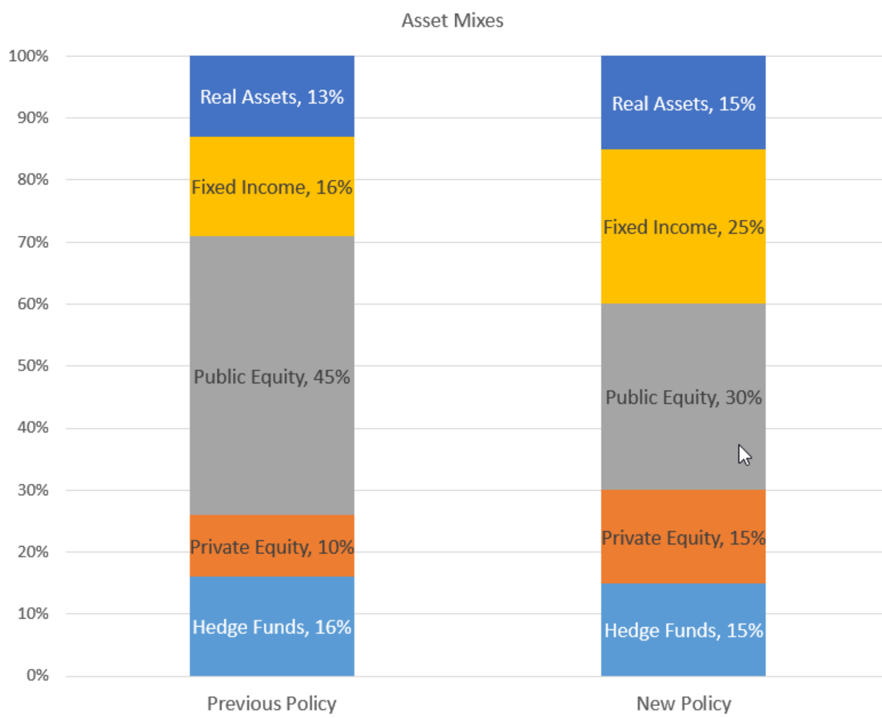
At the core of any asset/liability study is how an organization defines risk. A fundamental challenge for most boards is addressing how individual investors and institutional investors address the concept of risk differently. Individuals will define risk in many different ways, but for institutional investors the definition of risk focuses on volatility of return profiles. From the institutional investor perspective, the biggest contributor of risk to MPERS' portfolio was equities, and equities were coming off one of their worst performing periods in history. The board acknowledged the ultimate goal of the asset/liability study was to protect the corpus of the fund from further financial losses, and equity risk was fresh on the minds of everyone at the time. Reducing MPERS' overall risk profile was the primary goal given the 43% funded status, as everyone feared that MPERS could not survive another reversal of asset value of the magnitude seen in the financial crisis. At the center of the risk debate was MPERS' use of alternatives. The board wanted to reduce risk, but the asset allocation modeling indicated that eliminating the use of alternatives would only increase the volatility of the investment portfolio. The challenge for the trustees was balancing the outputs of sophisticated institutional models against their personal individual (and reasonable) skepticism of financial tools they would not use in their everyday lives.

The board challenged nearly every element of the study and performed a comprehensive evaluation of each asset class. In the 24 months that followed, MPERS' use of active and passive management was closely scrutinized and as a result, the investment committee established a process for annual review of management fees in the portfolio.

The manager selection process was also reviewed, including a review of every investment manager in the portfolio. The board also hired another consultant, Yanni Partners, to review the validity of the inputs and modeling used in Summit's proposals. After a process that spanned several months, Yanni Partners ultimately concluded that Summit's projected returns were reasonable and its methods of forecasting returns were sound.

At the end of this extensive process, the board acknowledged the role that alternatives serve as a diversifier in the portfolio, and adopted the following changes to the asset allocation that went into effect on July 1, 2011[5]. It is important to note that return assumptions were updated throughout the 24-month process, so this chart cannot be compared directly to the charts provided above (June, 2009).

[5] Summit Strategies Group. Asset Liability Study, January 2010.



	Previous Policy	New Policy
Expected Return	8.4%	8.7%
Expected Risk	12.0%	10.2%
Return/Risk	0.70	0.86

In the midst of the extensive asset/liability study, Summit's consulting contract was due to be renewed. After a one-year extension of Summit's contract through March of 2011, the board requested staff to submit a request for proposal (RFP) for a new general investment consultant. The board wanted to get a broader perspective of the consultant universe, and at the same time get additional feedback on the new asset allocation.

MPERS received a total of six responses, to which the investment committee narrowed down the selection to two finalists, Summit Strategies and NEPC (based in Boston and formerly known as New England Pension Consultants). Both finalists were invited to interview with the full board of trustees, and NEPC was ultimately selected to replace Summit Strategies as the board's general consultant effective July 1, 2011. The move to NEPC was not based on any motivations to amend or reconsider MPERS' new asset allocation, as the use of alternatives and lower allocations to public equities were key themes at NEPC. MPERS' list of investment managers also had significant overlap with NEPC's preferred list of managers. In the end, the board determined that over the long term, MPERS would be better served by utilizing the additional research capabilities that NEPC offered in comparison to Summit Strategies.

Third Era: Post-Financial Crisis to Present

Following the fallout from the financial crisis and subsequent stabilization, the period that followed showed relative calm and success for MPERS' investment portfolio. Equity markets ultimately stabilized and began a steady march upwards that continued through calendar year 2017. That is not to say the period did not have its share of market turmoil, but the events that followed the Great Recession pale in comparison to the challenges during the financial crisis.

This era marked yet another transition period for MPERS, both with the investment consultant and with the executive director. Scott Simon replaced Susie Dahl as MPERS' executive director effective September 1, 2012. Mr. Simon came to MPERS from MOSERS, where he served as manager of benefits. This was a pivotal time for MPERS, given that the governance model mandates cooperation between the CIO, executive director, and appropriate consultant when managing the investment portfolio. With two of the three individuals filling those roles being new to MPERS, it was critical that the new group work together to have a successful start in order to continue the progress that was made since the end of the financial crisis.

As the system transitioned to NEPC as the board's general consultant, the investment committee continued to serve as a sounding board for new ideas and modifications to MPERS' policies. NEPC completed its own analysis of MPERS' overall portfolio, rotating individual asset class overviews during each scheduled meeting of the investment committee. NEPC also brought several enhancements to assist with the management of MPERS' private market portfolios, including a more robust commitment pacing model and improved liquidity monitoring capabilities. Together with NEPC's improved method of disseminating market research to clients, there was a steady slate of reports and market research to present to the investment committee and board of trustees.

Over time, staff and NEPC grew more comfortable with the others' roles and the investment committee began to leave the bulk of the management of the portfolio to the consultant and staff. NEPC's comprehensive research team continued to provide insights on the key issues facing the markets and its effects on the portfolio, and the investment committee gradually moved back to a "trust but verify" approach to monitoring activities of the investment portfolio.

Performance during this timeframe was excellent, which also helped to improve the overall sentiment of the board and others involved with the investment function. Most risk-based markets continued to rebound from the lows set during the financial crisis, and MPERS' asset base was gradually rebuilt to an all-time high. The renewed confidence in MPERS' investment management techniques led to the first opposition by the board against another consolidation proposal. In 2013, after the statewide investment board initiative failed, there was another proposal to voluntarily delegate the management of MPERS' portfolio directly to MOSERS. At that time, MOSERS was putting in place a radically different investment approach referred to as balanced beta, which was similar to various risk parity approaches being implemented across the country. After hearing a presentation on MOSERS' new strategy, several board members were uncomfortable with the new approach and the proposal to consolidate investment management was set aside. In hindsight, that was an excellent decision by the board, given that MOSERS' investment performance has consistently underperformed MPERS since the change. MOSERS has since revised its asset allocation, and no longer utilizes the balanced beta approach.

From an asset allocation perspective, there were a number of minor changes to the portfolio during this timeframe, but nothing reaching the magnitude of the changes leading up to the financial crisis or the adjustments made in response to the crisis. The adjustments were driven by bottom-up market opportunities instead of top-down initiatives to either increase or decrease the risk/return profile of the fund. The most recent adjustments to the portfolio are reflected in the chart on the following page, and became effective January 1, 2019[6].

Asset Class	Previous Policy	New Policy Mix	10% Leverage
Global Equity	30%	40%	44%
Private Equity	15%	10%	11%
Equity	**45%**	**50%**	**55%**
Core Bonds	10%	10%	11%
Private Debt	7.5%	7.5%	8.3%
Long Duration	5%	7.5%	8.3%
Inflation Protection	5%	5%	5.5%
Rates/Credit	**27.5%**	**30%**	**33%**
Private Real Assets	7.5%	10%	11%
Core Real Estate	10%	10%	11%
Real Assets	**17.5%**	**20%**	**22%**
Hedge Funds	10%	0%	0%
Multi-Asset	**10%**	**0%**	**0%**
US Leverage Cost	0%	0%	-10%
Cash	**0%**	**0%**	**-10%**

Measure	Previous Policy	New Policy Mix	10% Leverage
Expected Return 5-7 Yr (Geometric)	6.46%	6.39%	6.75%
Expected Return 30 Yr (Geometric)	7.55%	7.51%	7.90%
Standard Deviation (Asset)	11.57%	11.51%	12.67%
Sharpe Ratio (5-7 Years)	0.39	0.38	0.38

The new asset allocation improved the liquidity profile of the fund by focusing more on traditional public equities versus private equity and hedge fund structures. It also allowed MPERS' CIO to use a limited amount of leverage in the portfolio, which further improves the fund's liquidity profile and expected performance by providing an additional source of funds to invest during volatile market environments. The method of risk reporting in this portfolio also changed to what is referred to as beta grouping, which breaks down the underlying portfolio risks into three primary categories: equities, rates and credit, and real assets. The asset allocation revisions lowered the expected return of the fund while simultaneously improving liquidity, but the lower expected return was more than offset with the expected benefits of a 10% leverage facility.

[6] NEPC, Proposed Policy Mix with Leverage, November 2018.

Key Takeaways

Focus on the System's Risk Profile First

Pension systems should always focus first on defining and quantifying an appropriate level of risk, and then build an investment portfolio that maximizes returns around that predefined risk profile. Too often in the past, MPERS has done the opposite; letting the desire for returns drive the risk profile of the fund (as with the pre-financial crisis era) and/or letting individual aversion to risk drive an asset allocation change (e.g., MPERS' reducing equity exposure following the financial crisis).

Establishing a risk framework is challenging, given the problem of defining risk among individuals and institutions. Individuals will define risk in many ways, but the primary risk to institutional investors is the system's volatility of returns. At the center of this debate will be the use of alternative investment strategies, given that over longer timeframes they play a valuable role in reducing the volatility of the investment portfolio. It should be noted that MPERS' board has utilized a number of general investment consultants over the past few decades, and dating back to the early 1990s (when alternative strategies became institutionally accepted), all of them have consistently recommended the use of alternatives. The challenge for most trustees is balancing the outputs of these sophisticated institutional models against their personal experience of financial investment tools.

Establish the Proper Balance Between Contributions and Investment Return

One of the fundamental relationships for any pension system is the following equation:

Contributions + Investment Income = Benefits + Expenses

The right side of the equation is relatively stable, given that the benefit structure is set in statute and operating expenses are fairly predictable. That leaves the left side of the equation (contributions and investment income) highly dependent upon each other, in fact, they have a direct negative correlation. For contributions to go down, investment income must go up. The opposite is also true in that if investment income goes down, then contributions must go up. The key point here is to recognize the trade-off.

At present, the board no longer looks to the investment portfolio to rescue the system from a funding perspective. The actuarial return assumptions were recently lowered from 8.25% to 7% to reflect more realistic assumptions. The board has also closed the amortization period of the unfunded liability, has approved contribution rates that exceed the actuarially required rates, and created a contribution stabilization fund to offset years when experience falls short of expectations. These decisions can be viewed as difficult for the board to make, given the current budget challenges of the employers. But because of these efforts, MPERS is on pace to see meaningful progress with its funded status and considerable reductions to employer contribution rates over the coming decade.

Trust but verify the input and recommendations coming from external consultants

In 2003, the system recognized a need to improve MPERS' investment performance and began committing significant resources to accomplish that goal. That initiative included the hiring of dedicated investment staff, along with upgrading the board's investment consultants.

Consultants bring advanced asset allocation tools and a wide range of resources to assist in managing the investment portfolio. It is important to allow the consultant's comprehensive research to lead the portfolio allocation discussion rather than the views of any one individual. Individuals can easily be influenced by emotions, fear, and personal experiences, and are often guilty of relying too much on historical results versus looking forward into the future. This is where the tools that institutional investors utilize are most valuable, given that they are driven by market fundamentals and forward-looking models instead of emotions and personal biases. This is not to imply that trustees should not question the advice of consultants and staff or seek input from other sources; however, MPERS has spent a significant amount of money on independent outside consultants and professional investment staff, who serve as fiduciaries for the system and whose interests are aligned with the system's interests. The system has also spent a significant amount of time establishing governance policies to properly manage the investment portfolio. The resulting policy is far less susceptible to being influenced by fears or emotions, and provides a balanced and professional management structure.

Continuity of investment staff matters

In 2003, MPERS' investment portfolio ranked at the bottom of the peer universe. Today, MPERS' one-, five-, and ten-year returns all rank in the top quartile of the public fund peer universe, with a risk profile in the lowest 19% of the universe over the ten-year period (see chart below). That combination has produced a Sharpe ratio (a measure of risk versus reward) that is in the top six percent of the peer universe.

MPERS Relative Ranking Within ICC Public Fund Universe (in Percentiles)		
Timeframe	12/31/2003	09/30/2018
1-year	66th	15th
3-year	85th	74th
5-year	82nd	3rd
10-year	95th	22nd

The continuity of MPERS' investment staff is a significant factor in MPERS' success story. In the fifteen years since MPERS hired a chief investment officer, the system has worked with three general consultants, three executive directors, and fifty-four individual trustees. Each and every one of those individuals has impacted the portfolio in some capacity and played a part in how the portfolio is constructed today. The turnover of trustees highlights the discrepancy between the average term lengths of board members relative to the investment horizon of the investment portfolio. Most trustees do not serve long enough to see the impact of their decisions, leaving the next generation of trustees to evaluate the results of their predecessors' actions and start the process again.

Over the same timeframe referenced above, MPERS has built a staff of four investment professionals and has been fortunate not to have had any turnover during this same time. This is a significant accomplishment given the market volatility, the various attempts to consolidate the system with MOSERS, and the amount of turnover with board members, executive directors, and consultants. Compensation always plays an important role in staff retention, and the incentive compensation plan put in place for MPERS' investment staff has kept the total compensation package in line with other local systems. The stability of MPERS' investment staff is a key factor in the system's ability to having worked through the difficult events over the past 15 years, transitioned the portfolio into one of the top performing funds in the country, and generated hundreds of millions of dollars in additional income compared to MPERS' historical 60/40 mix of stocks and bonds.

Executive Summary

The chain of events outlined in this document demonstrates a system that has taken significant steps to address the structural challenges that date back to the outset of the plan. The system ultimately addressed the lack of staffing and resources, and has since made considerable progress to improve its overall health and performance. The list of accomplishments includes the following:

- The series of legislatively mandated benefit increases were replaced by statutes that prohibit further benefit increases until the fund reaches a funded status of 80%.
- The wide range of historical funding and actuarial methodologies was replaced with conservative return assumptions and a closed amortization period for the unfunded liability – which now stands at 17 years. This implies MPERS will be 100% funded in 17 years if actual experience is equal to or better than current actuarial assumptions.
- From the investment perspective, the combination of a stable investment staff and strong consulting advice has the fund performing well by almost any metric. Investment performance has consistently outperformed policy benchmarks, generating hundreds of millions of dollars of incremental income for the system.

Managing the investment portfolio of a multi-billion dollar pension system is a complex task. Part of the difficulty is accurately forecasting future events, as assumptions are made about the future liabilities of the plan (i.e., growth of wages and inflation, mortality tables, etc.), and how the investment portfolio will respond to a wide range of possible economic environments. The process requires the use of complicated actuarial and investment tools to effectively manage those underlying risks and achieve the targeted results. Fortunately, the additional resources provided to MPERS over the years has led to meaningful improvements in the management of the system, and the plan is on track to make additional progress over the coming years.

Appendix

Larry Krummen
Chief Investment Officer, MPERS

Larry Krummen is the Chief Investment Officer for the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS), where he is responsible for the management and oversight of the system's $2.3 billion investment portfolio. Since joining MPERS in 2003, he has restructured the portfolio into a diversified and sophisticated investment program with investments across global equities, fixed income, hedge funds, private equity, and real assets. During his tenure, he has transformed MPERS' investment portfolio from a historically underperforming fund to one that consistently ranks among the top performing funds in the peer universe. Through the efficient use of alternative investment strategies, Larry has also reduced MPERS' overall risk profile. The combination of improved returns and reduced risk has helped MPERS' portfolio generate a risk-adjusted return (Sharpe Ratio) that ranks among the top 6% of the peer universe over the ten year period ending in 2018. In 2016, Larry's efforts to improve the system's performance were recognized by *CIO Magazine*, awarding MPERS the "CIO Industry Innovation Award" for public funds under $15 billion in assets.

In addition to his accomplishments at MPERS, Larry has a unique set of educational accomplishments and prior work experience. Prior to joining MPERS, he was the Director of Investments for the Missouri State Treasurer's Office, managing a $3.0 billion fixed income portfolio. His passion to improve performance was evident with the Treasurer's Office as well, where he was instrumental in passing legislation to enhance the portfolio's securities lending program. Prior to his work for the State of Missouri, he worked as an Investment Officer at Central Bank, a budget analyst at the Missouri Senate, and lobbied for the Missouri Chamber of Commerce.

Larry earned his Bachelor of Science in business administration with a dual major in finance and real estate from the University of Missouri, graduating magna cum laude with a cumulative GPA of 3.87. He also holds the Chartered Financial Analyst (CFA) charter holder designation.

Jennifer Johnson
Manager – Hedge Funds and Private Equity, MPERS

Jennifer Johnson is the Manager of Hedge Funds and Private Equity for the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS). Jennifer reports directly to the Chief Investment Officer. She is responsible for the sourcing of new relationships and opportunities across her respective areas of coverage and has successfully developed each program, simultaneously enhancing diversification across managers and strategies. She regularly evaluates new investment opportunities across numerous industries and investment types, in addition to monitoring and managing current relationships. Since joining MPERS in 2007, Jennifer has worked diligently to provide top-tier investment returns for the system's investment portfolio.

Before coming to MPERS, Jennifer traded fixed income securities for Central Bank where she was responsible for maintaining an inventory of fixed income products for retail brokers. She educated and trained brokers on fixed income products. She increased retail fixed income revenue and trading profits year over year.

Jennifer acquired several years of customer service, marketing, and project management experience while working at General American Life Insurance Company. She was responsible for marketing a newly developed variable life insurance product for high net worth individuals to general agents and managing the product's administration department. She also managed implementation and led training for new client products.

She is the Ex-Officio President of MAPERS (Missouri Association of Public Employee Retirement Systems). MAPERS is dedicated to the education of Missouri pension plan staff and trustees. She has been a board member since 2009 and has served two-year terms as Secretary/Treasurer, Vice President and President.

Jennifer obtained her Master of Finance degree from St. Louis University and her Bachelor of Arts degree in economics and political science with a minor in business from Valparaiso University. She holds the Chartered Alternative Investment Analyst (CAIA) designation. The CAIA designation certifies an education standard of expertise in the area of alternatives. In addition, Jennifer has earned the National Association of Securities Dealers Series 6, Series 7 and Series 63 licenses, currently inactive; the Fellow, Life Management Institute (FLMI); and Associate, Insurance Regulatory Compliance (AIRC) designations.

Bobby Hagedorn
Manager of Real Assets & Credit, MPERS

Bobby Hagedorn is the Manager of Real Assets and Credit for the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS). Bobby reports to the Chief Investment Officer and serves as one of the four professionals on the MPERS investment team. He is responsible for overseeing the real assets and credit portion of the investment portfolio. Bobby leads the sourcing of new relationships and opportunities across his respective asset classes and has successfully developed each program, simultaneously enhancing diversification across managers and strategies. Bobby regularly evaluates new investment opportunities across numerous industries and investment types in addition to monitoring and managing over 25 existing investment manager relationships.

Prior to joining MPERS in 2013, Bobby spent three years as an Equity Research Analyst for Edward Jones in St. Louis. At Edward Jones, Bobby worked on a team responsible for making investment recommendations on over 60 North American consumer companies.

Bobby, received a Bachelor of Science in business administration with an emphasis in finance and a minor in economics from the University of Missouri. Bobby holds both the Chartered Financial Analyst (CFA) and Chartered Alternative Investment Analyst (CAIA) designation.

Tinisha Eickhoff
Investment Officer, MPERS

Tinisha Eickhoff is an Investment Officer for the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS). She reports directly to the MPERS Chief Investment Officer. Tinisha manages all investment operations and investment accounting for the plan's investment portfolio. She is responsible for coordinating and monitoring activities with the external custodial and consulting firms, as well as auditors, as it pertains to the investment portfolio. Risk management continues to be an area of focus for the system and since joining MPERS in 2012, Tinisha has worked diligently to enhance both the operations and risk management of the ever-growing investment program. She spends significant time implementing appropriate measures to identify, define, measure and communicate risks in the portfolio. In addition to the operations function, Tinisha is responsible for ongoing due diligence for MPERS' traditional equity managers and supports other investment staff for all asset classes.

Tinisha began her career at the Public School Retirement System (PSRS) as an assistant to investment staff. During her time at PSRS, Tinisha was promoted to Investment Operation Officer where she gained much of the knowledge she uses today when managing MPERS' investment operations. Tinisha has almost a decade and a half of experience in investment operations.

Tinisha earned both a Master of Science in business administration and a Bachelor of Science in business administration (magna cum laude) from Columbia College while working full-time. She holds the Chartered Alternative Investment Analyst (CAIA) designation.

Scott Simon
Executive Director, MPERS

Scott Simon is the Executive Director for the Missouri Department of Transportation and Highway Patrol Employees' Retirement System (MPERS), where he provides sound and effective leadership, coordinates all MPERS operational and administrative functions, and administers the programs for which MPERS is responsible. He reports directly to the MPERS Board of Trustees. His key responsibilities include guiding the governing board regarding policy and strategic objectives; ensuring effective implementation of board governance, including the investment policy; representing the organization on behalf of all stakeholders; managing and overseeing MPERS' staff and their various responsibilities; and reviewing and reporting administrative performance to the governing board. Since joining MPERS in 2012, Scott has worked diligently to continue the transformation of MPERS into a sophisticated pension plan, pursuing practical excellence through customer service and risk management, what he views as the system's two most fundamental responsibilities.

Twenty-two years ago, Scott began his pension plan career as a Benefit Specialist for MOSERS, the state's largest public pension plan, delivering quality service and helpful benefit information to plan members. He progressed through the ranks first as a Benefit Supervisor and then as the Manager of Benefit Services. During that time, he took advantage of educational opportunities to broaden his knowledgebase of pension plan administration and management. That education covered a broad range of topics including leadership and strategy development, benefit administration, human resource development and workforce management, reporting and benchmarking, and defined contribution plan management. Prior to his pension plan work, Scott completed an executive development program for a major U.S. retailer where he became one of the youngest store managers in the history of the company. He has over 28 years of experience in customer service and risk management.

Scott graduated from the University of Missouri, Columbia, and received a Bachelor of Science in business logistics with a minor area of specialization in business management.