HARD LESSONS FOR INSTITUTIONAL INVESTORS FROM THE MBTA RETIREMENT FUND

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Acknowledgements

The author is grateful to Mary Connaughton, Grant Schaumburg and Ken Ardon for their helpful comments and suggestions.

"While we know that 2008 will be a challenging year, we believe that the MBTA Retirement Fund is well positioned to perform in all types of market environments."

– Michael Mulhern, Executive Director of the MBTARF[1]

1. Introduction

When do retirement plans fail? Fraud and poor investment choices are but symptoms of a disease that runs deep and poisons the well from the bottom up. Poor governance is a necessary and sufficient condition to bury an investment firm and, in the case of defined-benefit pension plans, to increase substantially the cost of providing pensions, which puts additional pressure on the already stretched public purse. This study presents the MBTA Retirement Fund (MBTARF) as a cautionary tale for institutional investors not merely with the benefit of hindsight, but as its story unfolds towards what will likely be an unfortunate conclusion.

The most fundamental determinant of an investment company's performance over the long run is its ability to weather fluctuations in the marketplace and among its portfolio managers. That ability is, first and foremost, premised upon the company's governance. While decision making that is based on transparency and accountability does not guarantee anything, the lack of it ensures that the organization will run into trouble sooner rather than later. When organizations do not have in place processes for critical self-examination and robust outside scrutiny from independent observers, they inevitably fall victim to institutional inertia.

An investment fund can transcend the lifetime of a gifted manager or outlive a cyclical bull market that hides the cracks in a fragile organization only with the correct balance of iconoclastic organizational culture and disciplined governance. A thorough examination of MBTARF's annual reports from 2000 to 2012 shows that the fund fails this longevity test on both counts.

2. Governance and Investment Policy

MBTARF is the legal offspring of the labor contract between the Massachusetts Bay Transportation Authority and its labor unions, even though it also provides pensions to nonunion employees. The fund was created in 1948, shortly after the newly incorporated Metropolitan Transit Authority (the MBTA's predecessor) took over most public transit in Greater Boston. The fund's governance and the benefits it provides are embedded in the pension agreement between the T and its unions and can only be changed as part of collective bargaining.

2.1. Structurally Induced Fiduciary Failure

The fund's retirement board consists of three MBTA appointees, at least one of whom has to be a member of its board, two union designees, one member elected by the T's nonunion employees and an "honorary" member elected by the other six, who only casts tie-breaking votes. Alternates are appointed for each of the six regular members in the same manner as the member they may need to substitute for. The board appoints a chair from its membership and a secretary who has to be a nonmember.

At least two members from each of the MBTA and employee quotas are needed both to provide quorum for a board meeting and to pass any resolution. For example, the appointment of the executive director of the fund requires the support of at least two MBTA designees and two employee-selected members. The board members may not be compensated, but may receive per-diems as well as reimbursements for travel expenses when visiting vendor sites and conferences.

This structure is conflicted, provides no independent investment advice or oversight and does not protect the interests of the fund's stakeholders effectively. One obvious group of "shareholders" in MBTARF are plan members, whose retirement – and contributions – are dependent on the fund's investment results. Another less obvious group of notional shareholders consists of Massachusetts taxpayers, who provide most of the T's funding via local tax assessments and subsidies from the state budget. The MBTA is responsible for three quarters of any additional contributions that may be needed if MBTARF's performance falls short of projections; the money necessary to cover the other quarter would be assessed on plan members' pay.

Neither of these groups' interests are particularly well protected under the current governance structure. Only one of the employee representatives on the board is elected – by the nonunion employees of the T. The appointment, rather than direct election, of the two trustees from the union's quota adds an unnecessary layer of fiduciary relationships and makes it much more likely that those trustees will serve the interests of the union leadership instead of those of the rank and file. Agency theory and empirical research show unequivocally that as the number of fiduciary relationships between the principal (employees, taxpayers, shareholders) and the outcome (the cost of providing the benefits and their security) increases, the principal's interests are less likely to be well-protected.

"The appointment, rather than direct election, of the two trustees from the union's quota adds an unnecessary layer of fiduciary relationships and makes it much more likely that those trustees will serve the interests of the union leadership instead of those of the rank and file."

Whereas direct election of trustees by taxpayers may be too costly or ineffective, on this front as well the existing arrangement leaves much room for improvement. Currently, Massachusetts residents elect political leaders, who appoint the MBTA's board, which ultimately selects the trustees from the T's quota. Since pension management has very little to do with operating public transit, the MBTA and its board are a completely redundant link in this fiduciary chain. Instead, the governor could appoint one trustee from the government quota with approval of the House and Senate – these are the institutions which ultimately approve the state budget that keeps the T functioning and delivers the public portion of the pension bill.

Additionally, the MBTA appointees to the board are often conflicted because they may be eligible for a pension from the fund. Their interests are in direct opposition with taxpayers' interest to keep the pension bill as low as possible. Whatever incentive to safeguard that interest survived the long fiduciary chain from Massachusetts voter to pension-fund trustee, it could be thwarted, whether consciously or not, when faced with this direct personal concern about maximizing one's retirement benefit.

There is a straightforward solution to this problem. For taxpayers to have any meaningful representation, trustees from the government quota should not be current or former MBTA employees who are eligible for a pension from the fund. Furthermore, there should be restrictions on their employability by the fund's contractors in accordance with ethics standards.

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The unnecessary convolution of benefit and investment decisions within the same decision-making body is an endemic issue with public pension plans and one that certainly applies in MBTARF's case as well. The flawed fiduciary

structure provides no guarantee that board members or senior management have substantial practical investment experience. Instead, it tilts the field towards political and crony appointments. This is exactly what happened at MBTARF, resulting in turmoil, fiduciary failures and subpar investment returns.

Regardless of the mechanism used to appoint board members, they will still not be omniscient about investment strategy and the selection of portfolio managers. To address any deficit in practical knowhow, MBTARF should create an advisory board of seasoned investment professionals working on a volunteer basis to help improve portfolio management. To reiterate, the advisory board's members should be selected on the basis of practical experience and not academic credentials. Similarly, the retirement board can also create an advisory board of experienced labor-law attorneys to assist with pension fraud, questionable disability claims and other thorny problems. In both cases, the board cedes no decision-making power, but fund management is informed by a more experienced and independent perspective.

> *"To address any deficit in practical knowhow, MBTARF should create an advisory board of seasoned investment professionals working on a volunteer basis to help improve portfolio management."*

2.2. The Importance of Being Earnest about Recruitment and Investment Policy

The inherent unresponsiveness to stakeholders and lack of practical expertise at the board/oversight level have engendered a suspect and erratic investment process, which falls short in both statement and execution. The only reference to an investment policy in the fund's 2012 annual report is a misplaced paragraph in the notes to the financial statements: "to achieve consistent positive real returns and to maximize long term [sic] total return within prudent levels of risk through a combination of income and capital appreciation" and "meet or exceed […] the actuarial target rate of return."[2] In so many words, the statement says the investment policy is to invest with the purpose of making a sufficient return.

Private investment firms go out of their way to explain the investment policy on which their products are based, especially when they target a wide range of potential investors. This is not to say that they do not often keep their specific market moves and the operational details of proprietary investment techniques secret. However, the fundamental investment principles and particularly the risk controls behind those techniques and approaches are made as transparent as possible.

This is an even more common practice in the public sector. For example, the commonwealth's Pension Reserves Investment Management Board (PRIM) publishes a 25-page investment policy statement online,[3] in addition to a trust agreement with participating Massachusetts public retirement systems and an 81-page proxy-voting policy.[4] The Illinois State Board of Investment (ISBI) has an even more detailed 107-page investment policy, including litigation, procurement and proxy voting among other operational issues, that also is publicly available online.[5] Whether MBTARF has a comparable document, if and how it is kept up to date, and what it might contain remains a mystery to the general public.

The same applies to MBTARF's recruitment practices and policies regarding senior management. The retirement board has not been forthcoming in disclosing how many or which candidates for executive director and deputy it has considered, what criteria it has taken into account and what qualifications have made the candidates selected better than those who did not make the cut. (Granted, it is difficult to make any such determination or disclose it without also disclosing the investment policy that the fund executive will have to implement and help improve.)

Nor has the board been eager to disclose any of its deliberations or votes on the subject. Little

seems to have been learnt from past fiduciary failures and quite the opposite of effective reform has transpired. "Privacy" policies have been tightened over the years with the express result of periodically miring the fund in fraud and/or mismanagement scandals, which have led to even more secretiveness, thereby closing the vicious circle and spinning it into a vortex of disrepute and embarrassment.

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MBTARF certainly has had plenty of institutional experience to draw upon (refer to Appendix I for a timeline of key events). Its assets were managed very conservatively (and with poor results) until 1980, when John Gallahue, then president of the Carmen's Local 589 at the T, joined the retirement board. Gallahue pushed to end the existing blind trust with the Bank of Boston and start independent investment management at the fund. In 1983, he became the fund's executive director and within a decade the fund's portfolio had expanded into alternatives and international markets. In 1992, he was already under investigation for improper dealings with investment managers, but no indictments ensued. The fund adopted a feeble ethics policy requiring internal disclosure of meals and gifts, but successfully fended off public-record requests by the media all the way up to the Supreme Judicial Court of Massachusetts.

The persistent lack of transparency and effective internal controls soon yielded their bitter fruit. In late 2000, the retirement board began an investigation into apparent kickbacks received by Gallahue and suspended him in early 2001. He had allegedly lent MBTARF money to the construction company of an associate of crime boss James J. "Whitey" Bulger, who was convicted on multiple counts of murder and racketeering in 2013.

The T's then general counsel resigned his seat on MBTARF's board over potential conflicts of interest during the investigation, yet the board took more than a year to remove Gallahue from the fund's payroll. Meanwhile, the board chairman and another union appointee were also replaced, but the opportunity to fix the fund's governance was wasted. Janice Loux, a longtime union activist appointed to the board from the quota of the authority in 1997, was elected chair effective January 2002. By 2014, she had become the longest-serving trustee in the history of MBTARF. Loux and her predecessor as chair, Ed Sheckleton, composed the two-member committee that in late 2001 handpicked Karl E. White to replace the beleaguered Gallahue,[6] who was never prosecuted.

The retirement board led by Loux appears to have been concerned much more with covering up the scandal and preempting future press leaks than fixing the fund's broken governance. The fund delayed the 2002 statements and issued the 2002 and 2003 annual reports together in 2004 to reflect a restatement including a $32 million write-down of "mispriced" currency options off yearend-2002 assets.

More significantly, the report included, as newly required by the 2002 pension agreement, "Members' Rights and Standard for Reporting and Confidentiality," which is a rather lucid indication of the path taken by MBTARF's leadership and the contracting parties – the unions and the MBTA. The last two sections of the policy effectively constitute a gag order on fund employees, contractors and trustees. The language expressly points to investment-related issues and Article III of the labor contract, concerning the application of creditable service to pension benefits:

> To protect the interests of the Fund, trustees and staff are to firmly decline [sic] to answer

> outside inquiries concerning matters that reveal investment plans or strategies of a proprietary nature […] or any comments on a controversial or sensitive subject. […] Except as the full Board shall from time to time direct, no other trustee, employee or consultant [but the Executive Director] shall discuss any information covered by Article III with a member of the general public, including news media.[7]

In case these injunctions prove insufficient, the policy concludes with "Other Information Restrictions":

> [N]o trustee, employee or consultant shall divulge to any person not associated with the Board or the Fund (including, without limitation, the Directors of the [MBTA] or the union from which he was elected or appointed) any information pertaining to the actions of the Board, the management of the Fund [or] investments by the Board...[8]

These provisions, which – quite ironically – are part of the fund's Standards of Fiduciary Responsibility and Members' Bill of Rights, effectively threaten to terminate for cause any whistleblower (be it a contractor, employee or trustee) and/or file a civil suit against them. Indeed, the entire policy, including procedures for internal investigation of such violations, became part of the 2007 and later annual reports. Meanwhile, the fund's publicly available documents manifestly lack an ethics or procurement policy. This is not the type of approach that encourages discussion, critical thinking and ethical behavior; it is focused on damage control rather than prevention – a conclusion reinforced by the pattern of investment contracting evident from MBTARF's annual reports.

Meanwhile, the poor oversight seems to have persisted. White was a director at Progress Investment Management from 2004 to 2007 and also sat on the advisory board of Crescendo Ventures, firms MBTARF did business with during and after his tenure. White also recommended an investment with Fletcher Asset Management, which was a departure from MBTARF's investment practices. Fletcher did not fit the hedge-fund program of MBTARF because it was not a fund of funds; it remains the only such investment MBTARF has ever made.

In mid-2006, White left MBTARF to become Fletcher's chief investment officer. Months later, MBTARF committed $25 million to White's fund within Fletcher. In late 2013, media reports revealed that MBTARF had tried to withdraw some of the money without success; the board was forced to write off most of it, pending bankruptcy proceedings at Fletcher. White would subsequently claim that he had no clue what the company did with client assets despite that he was Fletcher's CIO for over two years.[9] By mid-2014, it was still not clear what had happened at the fund and whether the money was really syphoned off in a Ponzi scheme without ever being actually invested in the markets.

Since 1980, major investment decisions, including the abandonment of the blind trust with Bank of Boston, appear to have been made in reaction to internal crises, in pursuit of market fads and/or without true strategic assessment of how they fit with the fund's mission. In 2002-2004, under Karl White and Janice Loux's leadership, MBTARF replaced both investment consultants retained under Gallahue (Capital Resource Advisors and Callan Associates) and discontinued 22 investment contracts (a rate of about seven a year), which nearly halved the fund's investment expenses (Figs. 1, 2). While the cost reduction was a favorable outcome, it is by no means clear that the churning of the manager contracts followed a solid investment thesis beyond basic cost cutting.

A similar pattern, if less pronounced, occurred during the first year or so of Michael Mulhern's tenure. In 2006, the fund appears to have discontinued eight contracts, which is more than it did in 2010, after the financial crisis. Of the eight terminated managers, three were contracted while White was at the helm and two of the three were hedge funds. Another hedge fund, Suoritus Partners, had been moved off the roster in 2005, just a year after it appeared on it. Manager turnover patterns raise red flags about MBTARF's

Figure 1. Investment Manager Turnover 2000-2012[10]

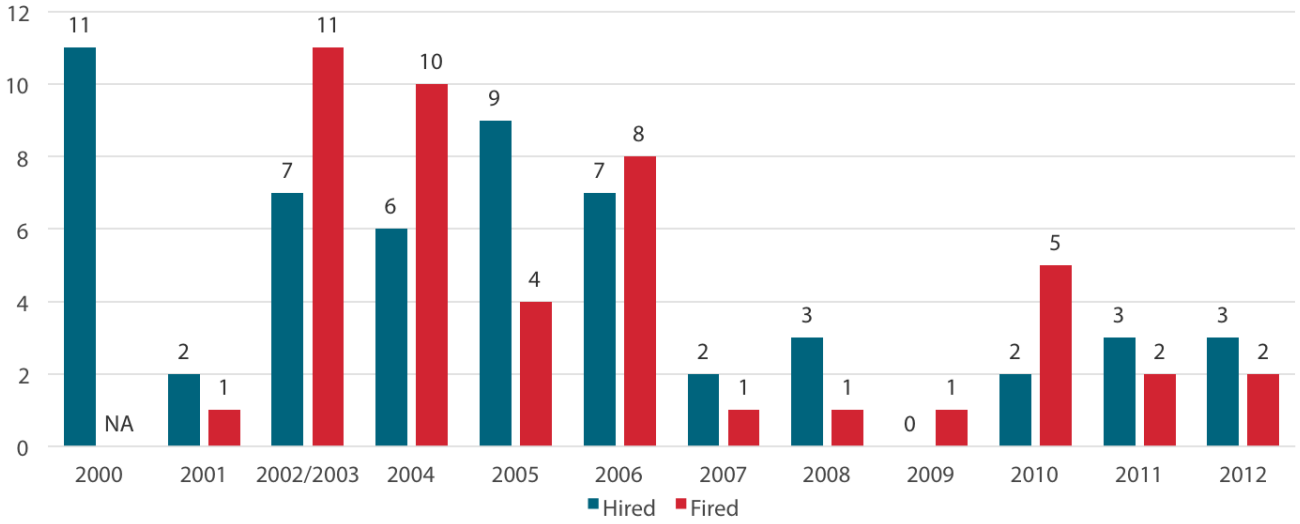
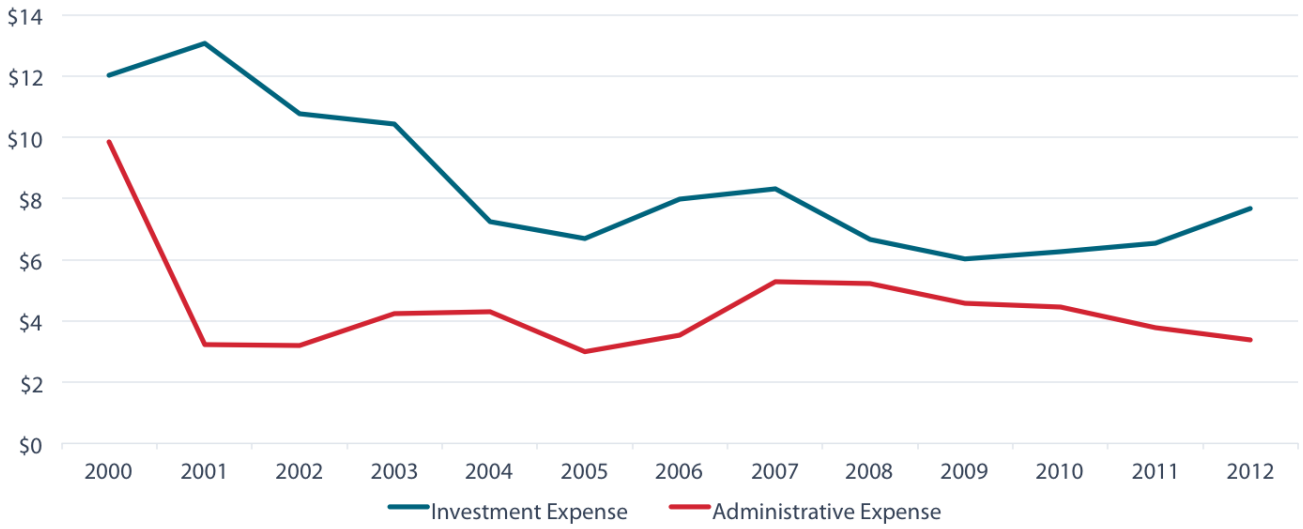


Figure 2. MBTARF Expenses (millions of dollars)



hedge-fund program, aggressively expanded by White, and suggest that investment decisions may have been haphazard and personalized rather than based on robust selection processes. There is little evidence of this issue having been resolved during Mulhern's tenure.

> *"Manager turnover patterns raise red flags about MBTARF's hedge-fund program, aggressively expanded by White, and suggest that investment decisions may have been haphazard and personalized rather than based on robust selection processes."*

After Mulhern became executive director, the fund stopped providing the management discussion and analysis (MD&A) – a part of the financial statements since 2004, according to the Governmental Accounting Standards Board. MBTARF had implemented MD&A requirements in 2004 when they were just recommended supplemental information, but inexplicably eliminated them from 2007 and later reports just as they became required. Nowadays, this section of the financial statements must include not only management's assessment of developments in the fund's financial performance, operations and policies but also potential special

events such as the $25 million Fletcher investment loss.

3. The Revolving Door of Cronyism

White's selection and appointment is emblematic of the opaque and crony culture that had taken root at MBTARF in the Gallahue years and which was allowed to persist under Loux. Instead of fixing fundamental organizational flaws in ethics standards, procurement and investment strategy, the board and the new management stuck to a "bad apples" approach – individuals are at fault, not the oversight or the organizational processes and culture. Thus, conflicts of interest and lack of accountability remained an integral part of the fund's modus operandi. Similarly, Massachusetts state leadership did not swoop in to fix the fund's contorted governance structure and the conflicts inherent in the board's composition. Board members and senior managers are still not required to file public statements of financial interest, so it remains unclear whether any of their decisions, particularly regarding the fund's investments, have been conflicted.

A brief look at the qualifications of MBTARF's senior management and trustees over the past couple of decades provides a very clear picture of how opaqueness and a culture of cronyism undermine organizational effectiveness (Fig. 3). None of the board members as of yearend 2012 had professional experience or educational qualifications in investment management. This effectively allows the fund's management to control the assets with very little supervision and, in the absence of independent investment advice (investment consultants are not independent because they are paid by the fund's leadership), without a robust long-term strategy.

Figure 3. Key Senior Staff and Trustees at MBTARF

John Gallahue was executive director of MBTARF from 1983 to his ouster in 2001. His predecessor had held that position for over 30 years. Gallahue became a trustee in 1979 after being elected president of the Carmen's Union Local 589 and resigned that position to take the much more lucrative post at the fund. He had had no professional investment experience prior to his hiring.

Janice Loux was appointed to the board as a trustee from the government's quota even though she has spent her entire life as a union activist, moving up from an organizer for the Boston Hotel Workers Union Local 26 to being reelected for its president four times beginning in 1997, the same year she joined MBTARF's board. Since 2009, she has been executive vice-president of Unite Here, a national service employees' union, for which she received total compensation of $167,000 in 2013.[11] She had no professional investment experience prior to her appointment.

John Barry was appointed trustee by Local 589 in 2002 and became deputy director (the highest after executive director) in May 2006. While Barry holds an MBA from Suffolk University, it is by no means clear whether he was selected in a competitive search.

Karl White was selected by a search committee composed of only two trustees – Janice Loux and Ed Shackleton, – both of them lifelong union activists with hardly the skillset to make such decisions. White discontinued about a third of investment management contracts while at the fund and moved aggressively to expand its fund-of-funds allocation and the number of managers within that asset class. He is the only executive director in the fund's history to have held an MBA in finance at the time of his hiring. In 2006, White left abruptly to join Fletcher – a hedge fund he had hired in 2004, which went belly-up and, allegedly, was a Ponzi scheme.

Michael Mulhern started his career as a bus driver at the MBTA. He rose up the ranks to become its general manager and was in that position until 2005. In 1999-2002, he was an alternate member of the retirement board from the quota of the T. Like Barry, he completed an MBA at Suffolk – a program he enrolled in as he became MBTARF's executive director in 2006. He had no professional investment experience prior to his hiring, but during his tenure as GM of the T, MBTARF retirees were granted pension raises that increased the plan's liability and the cost to the authority.

4. Asset Allocation and Risk Management

The organizational processes and particularly recruitment and investment policies have yielded similarly poor results in terms of risk management and portfolio allocation. The portfolio exhibits strong procyclical behavior and does not seem to reflect a coherent risk-mitigation strategy that seeks to take advantage of or at least protect against market trends. Worse, the asset allocation seems to move consistently in the direction of overexposure to assets classes which could be expected to have been overbought.

4.1. Cyclical Equity Diversification

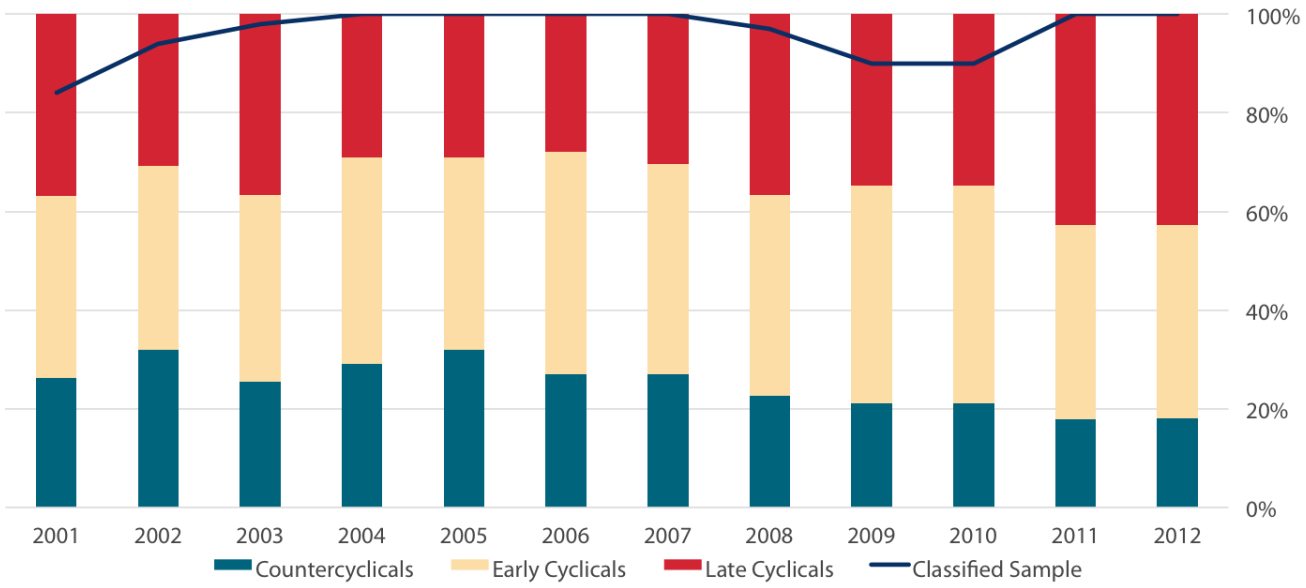
The following figure (4) shows a summary of the available data on yearend asset allocation of the fund's equity portfolio. The ten sectors are classified in three groups according to their typical behavior during the business cycle (sometimes the classified sample of assets is below 100% because the asset classes listed in the annual reports are not clear or consistent). Countercyclicals are "defensive" dividend-yielding stocks (telecoms, healthcare insurers, utilities and consumer staples) which do not lose as much value during downturns, but also provide much less of a growth opportunity when the economy grows. They are characterized by a comparatively lower volatility of returns.

Early cyclicals (financial, materials, industrial and energy companies) tend to benefit in the early stages of an uptick in the business cycle and their growth and returns taper off as the bull market matures and money flows move into speculative investments. Late cyclicals are the most volatile stocks (consumer discretionary, consumer services and technology companies), whose high returns depend on strong – even exuberant – demand from retail customers in the real economy and/or the asset markets.

With the typical business cycle lasting about 5-7 years, active managers often claim that they can anticipate the rotation of returns from one flavor of sectors to another and position a broadly diversified portfolio for the next stage of the business cycle. Limited as it is, the information from MBATRF shows that the fund's management by sector has been, if anything procyclical – i.e., contrary to what a prudent manager would supposedly do.

Countercyclical exposure was cut as the economy tanked in both 2003 and 2008, yet geared up in

Figure 4. Equity Diversification by Sector



the early years of the boom of 2004-2005. Even as the economy expanded, exposure to late-cycle stocks was cut and kept low until 2006, near the very peak of the bull market precipitated by the housing bubble. Then, as the economy soured in 2007 and 2008, the fund loaded up on late-cycle stocks even as their values began to falter (which is suggestive of a conscious policy to increase exposure to these sectors). Both on the defensive and the aggressive end of the equity portfolio, the fund seems to have been too late to the game and to have made the novice mistakes characteristic of retail investors, not of seasoned managers.

In addition, the equity diversification data are strongly suggestive of a strategic shift of the allocation towards more volatile stocks, as the countercyclical exposure has generally been declining. It fell to under 20% for the first time in 2011, compared with 35% in 2002. Meanwhile, late-cycle sectors comprised up to nearly 43% of the equity portfolio. These changes are consistent with an effort to make up for the underfunding by taking riskier – and often less liquid – bets on the markets. Such an endeavor is even more evident in the broader picture across asset classes.

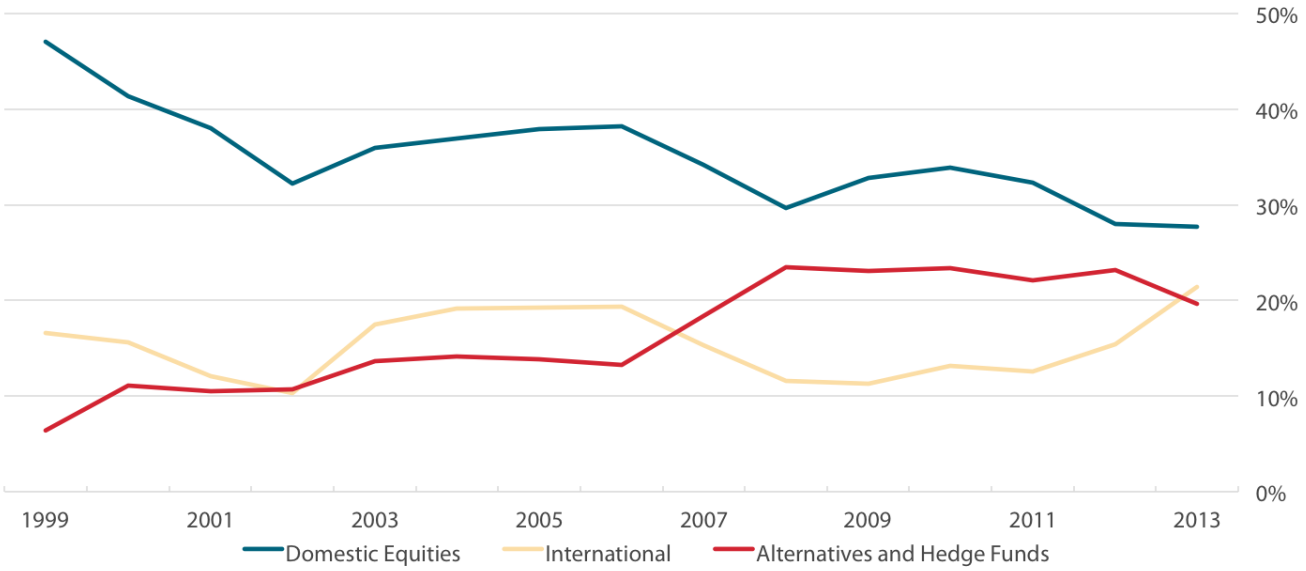
The equity diversification data are also strongly suggestive of a strategic shift of the allocation towards more volatile stocks.

4.2. General Asset Allocation

MBTARF has started reporting more informative asset allocation data in its newsletter. According to the February 2014 issue, alternatives (private equity and diversified beta) and hedge funds totaled 19.6% at yearend 2013, compared with 23.2% a year earlier. Real estate investments shrank from 10.4% to 8.7% of the portfolio over the same period, while international equities expanded from 15.4% to 21.4% of the total portfolio. Overall, some 10% of the total portfolio have been redirected to private equity and hedge funds (Fig. 5) from domestic equities over the past decade or so.

While the reasons for these changes are unclear, the observed trends do indicate a long-term shift towards more volatile and less liquid investments – i.e., away from domestically traded stocks and towards private equity, hedge funds and international equities. Fluctuations

Figure 5. Reported MBTARF Asset Allocation[12]



in cash, fixed income and real estate allocations appear to reflect market trends over the same period and not major investment policy changes. Overweighting fixed income and value (countercyclical) stocks may have made sense in the context of ensuring enough cash flow for current benefit disbursements, but it is by no means clear that liquidity concerns played a significant role in the investment process, as the underlying policy itself is a well-kept secret.

A more detailed breakdown of the yearend portfolio allocation (Fig. 6) raises even more red flags. Of 8% dedicated to hedge funds, some 5.3% are allocated to hedge funds of funds, which are both of dubious value and high cost. Fund-of-funds investments tend to be expensive because they overlay the fees of the hedge fund of funds over the already high fees of the hedge funds in its portfolio. The broad diversification of these strategies makes it all but impossible to generate the significant above-market returns that would justify such a fee structure. At best, such investments can return the market average, yet they are less liquid than a broadly diversified stock portfolio.

Figure 6. Preliminary Allocation by Asset Class as of Yearend 2013

Domestic large cap	17.3%
Domestic small cap	10.4%
International equity	12.7%
International emerging	2.9%
Global equity	5.8%
Core fixed income	5.5%
TIPS	1.3%
Mortgages	2.9%
Global multisector debt	8.0%
Bank loans	2.4%
Real estate debt	1.1%
Cash	1.4%
Private equity	11.6%
Real estate	8.7%
Hedge funds of funds	5.3%
Diversified beta	2.7%

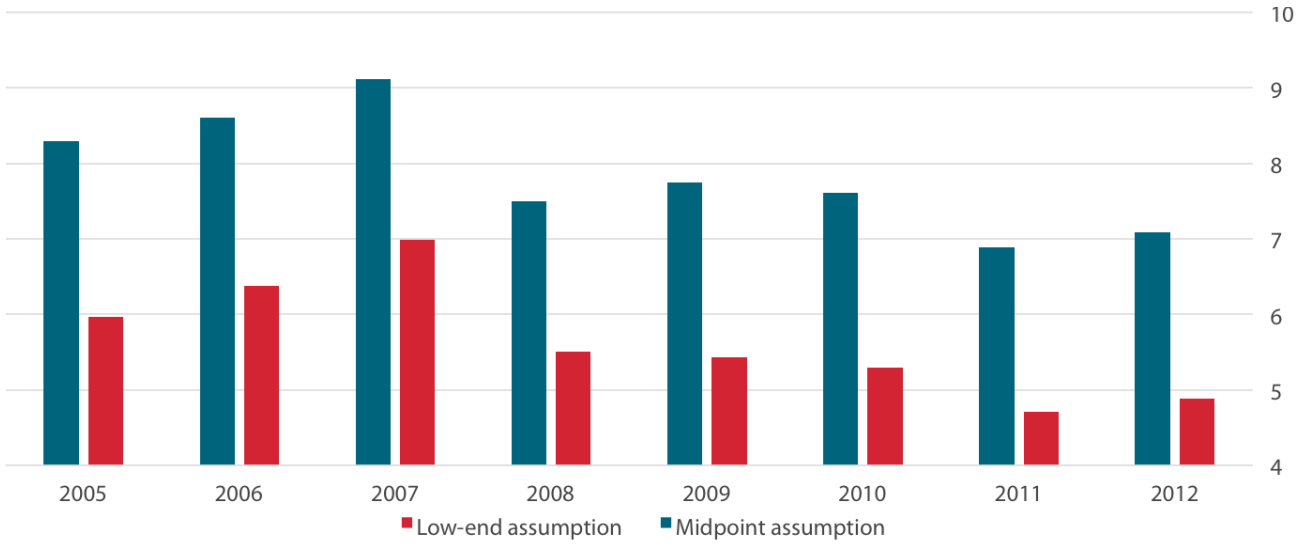
Meanwhile, the diversified beta segment seeks to produce the benefits of the cyclical rotation between industries and investment styles during the business cycle described in the prior subsection. This suggests a clear contradiction. If MBTARF can handle cyclicality internally, it makes no sense to pay extra for someone else to do it; if MBTARF cannot do so credibly, then it should constrain itself to equal-weighted investments in order to avoid style drift.

4.3. Interest-Rate Risk

Similar cyclical behavior is observable in the fixed-income segment of the fund's portfolio. Since the earliest available guidance on the issue dating to 2005, the target duration for fixed income has been 4-5 years with upward deviation to no more than 7.5 years. Since securities are reported by MBTARF in duration brackets, two estimation approaches were taken to quantify the average duration.[13] In one, which is almost certain to underestimate it, securities within the bracket were assumed to have a duration of the lowest number of months within that bracket. For example, all securities within the bracket of one to five years were assumed to have duration of 13 months. Under the midpoint assumption, the average duration for the bracket was assumed to be the midpoint of its range – 36 months for the bracket ranging from one to five years.

The estimated annual durations suggest persistent cyclical misalignment of the allocation with the stated duration benchmark (Fig. 7). In only two of eight years for which data are available does the low-end estimate fall below the five-year higher end of the ideal duration target and even in those years the actual duration is almost certainly longer than 5 years. At the peak of the housing bubble in 2007, the low-end estimate reaches almost seven years whereas the midpoint duration reaches some whopping 9.11 years. The midpoint duration estimate does not fall under the stated extreme threshold of 7.5 years until 2011.

Figure 7. Estimated Average Duration of Fixed-Income Portfolio (years)



5. Portfolio Performance

The results of these policies are a natural consequence of the poor governance and the lack of a well-defined investment policy including a continually updated investment thesis and strategic asset allocation. Individuals ought to be held accountable with regard to the portfolio's alignment with the fund's policy and goals rather than its return. It is myopic and counterproductive to assign blame or give credit for investment performance in any particular year. However, sustained returns below benchmarks can serve as a canary in the coal mine that the governance of an investment company has gone awry. A poor investment process is problematic precisely because it inevitably leads to poor results over time.

Investment funds commonly use "peer" benchmarking, which allows poor performance to be whitewashed with the poor performance of others. Choosing an appropriate "peer" is a matter of considerable subjectivity. The return and volatility mandates underlying the investment policy are much more important signposts in steering a pension plan. Ultimately, the goal of benchmarking ought to be to improve the investment process with regard to (1) objectives and (2) opportunity costs. The most obvious objective for a pension plan is to deliver its assumed rate of return (ARR) without too much deviation below it. Meanwhile, the most immediate opportunity cost is the return on putting the money into another investment vehicle such as a passively managed portfolio.

IIn light of these facts, it is informative to compare MBTARF's performance with that of the Pension Reserves Investment Management (PRIM) Board, which manages the assets of the state and teachers' retirement systems as well as of dozens of local retirement systems in the commonwealth vested in the Pension Reserves Investment Trust (PRIT). The Wilshire 5000 Index total return and the Barclays Aggregate US Bond Index total return provide a handy and cheap measure of the opportunity cost of a passively managed portfolio in equities and fixed income, respectively. From these two indices, the performance of both a traditional 60/40 stock/bond allocation and a recommended 80/20 allocation can be derived in a straightforward manner.

The first full year for which PRIM returns were reported is 1985; annual returns for MBTARF were obtained going back to 1981. Extending data back to 1981 did not produce tangible differences in the results, so only the 1985-2013 period is reported here for consistency and simplicity. For ease of use, the performance statistics are summarized in Fig. 8.[14] Complete statistical tables are available in Appendix III.

Figure 8. Summary of Performance Metrics

Traditional metric (normal, linear and/or customary)	Statistically robust metric (nonparametric)
Arithmetic-average return	Geometric-average (annualized) return
Standard deviation	Average semideviation
Sharpe ratio	Return/loss ratios
Linear correlation	Distance correlation

5.1. How Distinct Is MBTARF from a Passive Portfolio?

An asset manager can "add value" relative to the market in two basic ways – by (1) providing superior returns net of fees or (2) reducing the correlation between the return on the managed portfolio and the market return, presumably in order to "smooth out" and make portfolio returns less volatile and more "predictable." It is important to note that two portfolios can be perfectly correlated – i.e., their returns can move up and down in perfect synchrony with one another, – yet one can have systematically higher returns than the other.

Is MBTARF adding value by providing uncorrelated returns relative to other investment options? To establish the distinctiveness of MBTARF, it is informative to look at the distance correlation with the other portfolios. A distance correlation of 1 implies perfect dependence of the results, while a distance correlation of 0 indicates perfect independence (unlike linear correlation, distance correlation is conclusive in this determination[15]). Figure 9 presents the distance correlation of the returns for the period, estimated with the `energy` package for R.

Figure 9. Distance Correlations between Portfolio Returns 1985-2013

	80/20	60/40	PRIM
MBTARF	0.9530179	0.941083	0.9650591
PRIM	0.904601	0.8934792	
60/40	0.9918116		

MBTARF turns out to be substantially more similar to a passive market portfolio than PRIM. As expected, the two passive portfolios exhibit nearly complete dependence – a correlation of over 99% – because they are constructed from the same indices. The dependence between PRIM and MBTARF is second-largest in the set at 96.5%. In other words, the two funds are heavily correlated in terms of their return, but much less so than the passive portfolios, and are more correlated with each other than with either of the passive portfolios. The third important result is that PRIM is substantially less correlated with the index returns than MBTARF. An intuitive but inexact interpretation of this result would be that PRIM is about twice as "distant" from the passive portfolios as MBTARF is. MBTARF turns out to be substantially more similar to a passive market portfolio than PRIM.

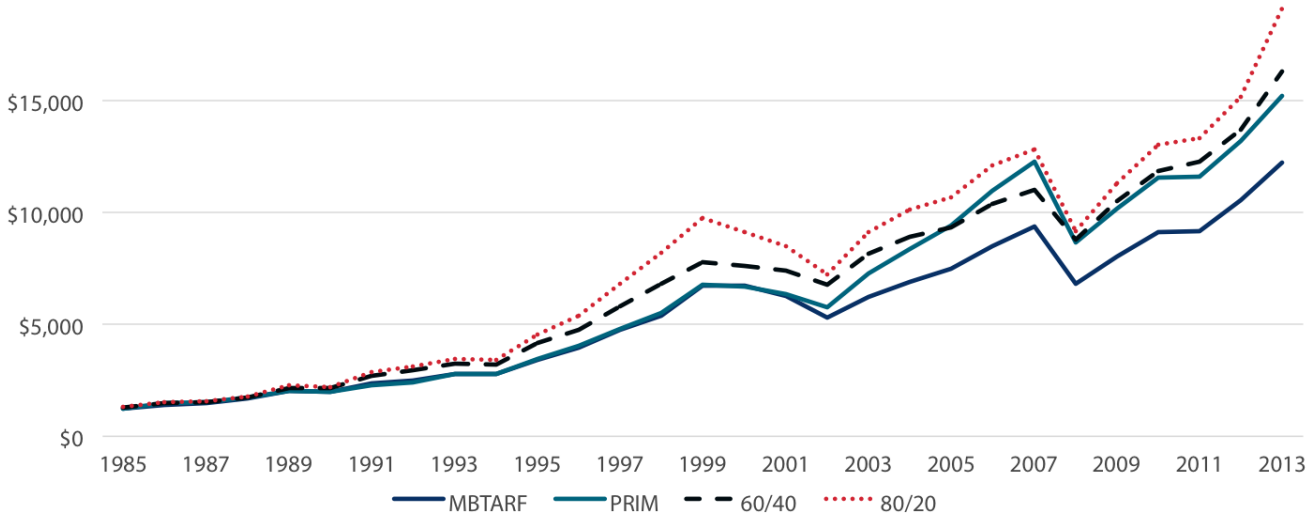
"MBTARF turns out to be substantially more similar to a passive market portfolio than PRIM."

5.2. Raw Returns

How does MBTARF perform relative to PRIM and the passive portfolios based on the simplest possible indicator – gross return? The rolling 3-, 5- and 10-year annualized returns as well as the cumulative and annualized returns for the entire period can help answer this question.

PRIM's annualized gross return from its inception in 1985 through 2013 was 9.84%, while MBTARF's was just over 9.02% during the same period. Even though 82 basis points may not seem like much of a difference, in practice they are very substantial because of the effects of compounding – $1,000 invested in 1985 would have grown to $15,198 in PRIM's portfolio, but only to $12,251 in MBTARF's (Fig. 10). In other words, PRIM would have generated 26% more dollars than MBTARF on the same initial investment made in 1985. Given the size of MBTARF's portfolio, these losses amount to hundreds of millions of dollars.

FIGURE 10. GROWTH OF $1,000



PRIM's annualized return from its inception in 1985 through 2013 was 9.84%, while MBTARF's was just over 9.02% over the same period.

To obtain an overall idea of how much money MBTARF has wasted, it is useful to look at an estimate of the overall portfolio value if the fund had simply been invested in a passive mix of 80% the Wilshire 5000 and 20% the Barclays Aggregate US Bond index. Relevant income and expense data from the annual reports are available back to 1991. From the yearend portfolio value, the income and cost flows, and the reported annual return, the imputed 1990 yearend valuation of the fund's assets is about $786 million.[16]

Using that as a basis, it is possible to impute the portfolio values in subsequent years with the passive investment, assuming that the other flows would be exactly the same. The yearend value is obtained by multiplying the value from the prior yearend by the gross return on the 80/20 allocation for the year, adding contributions and subtracting benefits, administrative expenses and refunds. To make sure the comparison is fair, the annual return on the 80/20 allocation was reduced by 50 basis points to account for investment expenses and potential vagaries in the approximation. This penalty is severe. By comparison, the actual expense on an ETF tracking the Wilshire 5000 in 2014 was less than 5 basis points.

Even with these generous assumptions, the passive portfolio would have resulted in nearly $873 million in additional assets as of yearend 2012 for a total value of $2.35 billion (Fig. 11). Meanwhile, the reported unfunded actuarial liability was $726 million at the end of 2011. In other words, with an 80/20 passive asset allocation and the actual benefit payouts and contributions in 1991-2012, the pension plan would have been overfunded by the end of the period, which would slash millions of dollars from annual employee contributions and tens of millions from the MBTA's contributions.

Based on the 2012 annual report, this would slash the employee contribution down to the contractual minimum of 4%, which would add about $2,500 in annual pay on average for every employee member of MBTARF. It would also save some $40 million in contributions to the MBTA as of 2012.

The recommended portfolio would have made MBTARF fully funded, thus adding $2,500 back to each active member's annual pay and saving the T $40 million in 2012 alone.

MBTARF's underperformance is sustained when returns are analyzed over different subperiods to weed out the impact of luck. On a 10-year basis,

Figure 11. Market Value of MBTARF Assets with Actual and Passive Portfolios (Dollars in Millions)

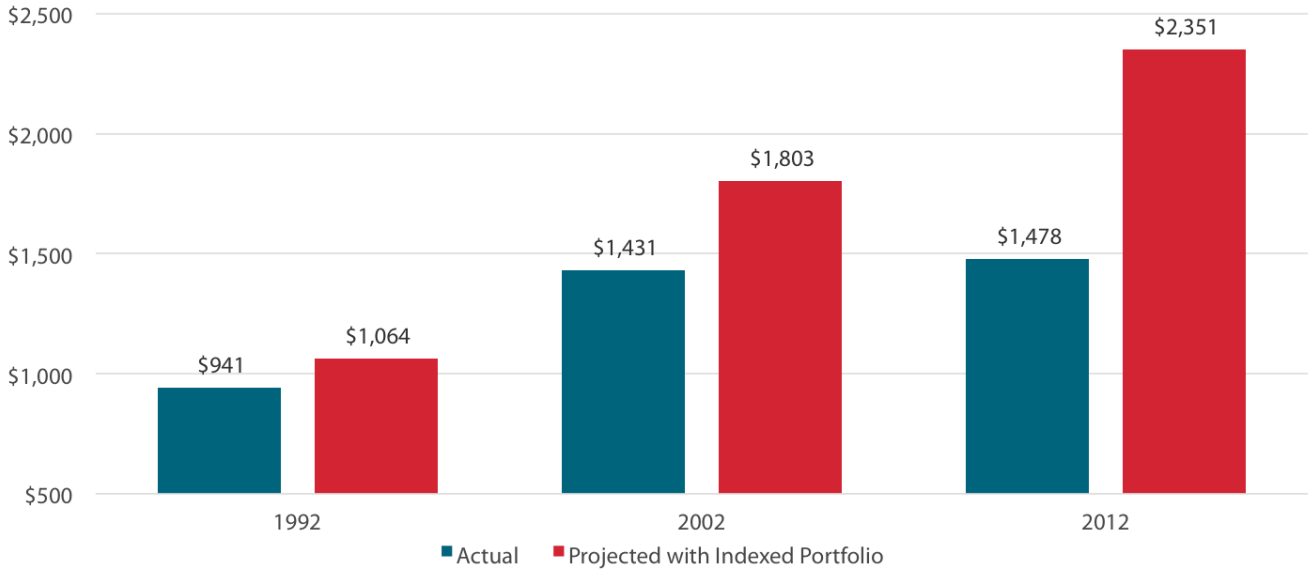


Figure 12. Relative Ten-Year Portfolio Performance

	PRIM>MBTARF	80/20>PRIM	60/40>PRIM	80/20>MBTARF	60/40>MBTARF
Percent years	80%	50%	35%	85%	95%
Count (years)	16	10	7	17	19

the passive portfolios beat PRIM no more than 50% of the time, but beat MBTARF 85% and 95% of the time (Fig. 12). PRIM has registered a better 10-year return than MBTARF in 16 of the past 20 years.[17] On this indicator, MBTARF has not beaten PRIM since 1999.

In other words, PRIM's systematic advantage seems to persist even if MBTARF has produced a better annual gross return in recent years. PRIM also beats MBTARF 60% and 55.6% of the time on five- and three-year basis, respectively.

"PRIM has produced a better 10-year return than MBTARF for 16 of the past 20 years. On this indicator, MBTARF has not beaten PRIM since 1999."

5.3. Returns Relative to Risks

The underperformance of MBTARF is not compensated by lower downside risks associated with its investment decisions. Return over time is a fairly good indirect measure of the long-term cost of benefits, but short-term volatility in returns can add to those costs by creating operational and fiscal stress.

Operational stress at the fund level can be induced by sharp market moves that necessitate a rebalancing of the portfolio to meet allocation targets or a liquidation of assets to cover current benefits. This is not much of a problem in an upmarket, but can result in substantial losses if markets turn bearish. PRIM and MBTARF have experienced negative returns in the same five of the 29 years since 1985 (Fig. 13). The average negative semideviation of returns is slightly larger for MBTARF, but PRIM has a slightly larger

maximum drawdown (in 2008), so there is no substantial difference on this metric alone.

The ratio of annualized return and average losses provides a straightforward measure of "risk-adjusted" return. For every percentage point of losses, MBTARF returned 5.23% annually during the period, but PRIM returned 6.04%. Thus, given that annual drawdowns are similar, it is fair to conclude that PRIM has produced a better return (gross of fees and expenses) than MBTARF relative to its observed downside risk.

Figure 13. Incidence of Negative Annual Returns (1985-2013)

	MBTARF	PRIM
1990	-0.23%	-2.27%
2000	-0.16%	-1.20%
2001	-6.83%	-5.32%
2002	-15.66%	-8.94%
2008	-27.20%	-29.50%
29-year average	-1.73%	-1.63%
Return/loss	5.23	6.04

Fiscal stress for the governmental units dependent on the plan's performance can result from substantial and/or sustained underperformance relative to ARR targets. If the fund does not meet its ARR goal over several years, required contributions may have to increase even if long-term performance is satisfactory. Large one-time losses can be particularly damaging because they combine unpredictability with the need to pay much more than expected in short order.

Since the available data on annual ARR targets are incomplete and variation in other actuarial and operating practices makes them hard to compare anyway, the performance of MBTARF and PRIM was measured relative to a uniform 8% ARR (Fig. 14). On annual basis, both funds missed that target in nine of the 29 years in the sample. However, underperformance was likely to induce substantial fiscal stress only in two instances: the recent financial crisis and a period of sustained underperformance in 2000-2002, which may have been even more damaging. Except for 2002, when MBTARF did much worse than PRIM, the figures are very closely matched, as is the average 29-year semideviation from the 8% target. PRIM again does better on annualized return per average semideviation, but by a narrower margin.

Figure 14. Incidence of Annual Returns below 8% (1985-2013)

	MBTARF	PRIM
1987	-4.30%	-4.75%
1990	-8.23%	-10.27%
1992	-2.26%	-3.23%
1994	-7.88%	-7.59%
2000	-8.16%	-9.20%
2001	-14.83%	-13.32%
2002	-23.66%	-16.94%
2008	-35.20%	-37.50%
2011	-7.25%	-7.82%
29-year average	-3.85%	-3.81%
Return/loss	2.34	2.58

5.4. Performance Summary

In terms of exposure to market downturns, MBTARF seems to have done about as well as PRIM during 1985-2013. However, MBTARF has done substantially worse than PRIM on nearly every other metric examined:

- PRIM's 10-year return has beaten MBTARF's in 16 of the past 20 years and every year since 1999.
- PRIM's five-year return has beaten MBTARF's in 15 of the past 25 years and in seven of the past 10.
- PRIM's three-year return has beaten MBTARF's in 15 of the past 27 years.

- PRIM has not been beaten by MBTARF on any of the above metrics in any 10-year period for which data are available.
- MBTARF was beaten by the passive portfolios 70-95% of the time on all of the above metrics and on its annual returns.
- PRIM both has returned more than MBTARF on an annualized basis and is more distinct from passive market portfolios.

Overall, investment management at PRIM appears to have added much more value than that at MBTARF. Furthermore, there is overwhelming evidence that a passive portfolio of index-tracking securities would have returned much more than the conflict-ridden MBTARF. This implication is compounded by the fact that such a portfolio would face much lower management fees, which would additionally reduce pension costs at the T. Assuming a 0.05% annual cost on a passive portfolio, MBTARF would have saved about $100 million in management fees alone in 2000-2012 without even accounting for the compounded return on this money.

"Overall, investment management at PRIM appears to have added much more value than that at MBTARF. Furthermore, there is overwhelming evidence that a passive portfolio of index-tracking securities would have returned much more than the conflict-ridden MBTARF."

6. The Big Picture on Pensions and Investments

That defined-benefit (DB) pension plans have gone nearly extinct in the private sector and seem resolutely headed that way in the public sector is scarcely a secret. The failure of 401(k) defined-contribution plans to serve as an effective replacement of DB plans is still, by and large, hidden in the woodwork because too few retirees are significantly dependent on the assets accumulated in such accounts. Retirements are still mostly supported by a combination of Social Security, Medicare, IRA savings and home equity, with a portion of legacy defined benefits, including employer-funded retiree healthcare, remaining a significant – if not essential – part of the mix.

But this relatively sanguine picture is about to undergo a sea change. Over the next two decades, even legacy employer-funded pensions and retiree health care will have more or less disappeared. Meanwhile, with the spread of new urbanism – a trend towards more city- and rent-based living – and the concomitant decline in birth rates and household formation, it is not at all clear that home equity can appreciate fast enough to compensate for the depletion of other retirement resources. And very little of the sharp rebound in US securities markets since the last financial crisis has been captured by the vast majority of Americans' retirement accounts.[18]

A big part of the problem with both managed funds and individual retirement accounts is that a lot of the investment process is unstructured (without internal controls, triggers and an "endgame" for the asset allocation) or based on flawed ideas about the behavior of asset markets. Billions of dollars of retirement savings are wasted on management fees for services that do not add enough value and on poor investment decisions without proper justification, even when supposedly sophisticated investors are behind the wheel. MBTARF provides a glaring example of why and how these retirement schemes fail.

In terms of investment policy, a defined-benefit plan must meet at least one of two necessary conditions for its survival:

(1) It must be guided by a rigorous rule-based investment strategy with transparent objectives and independent oversight.

(2) It must employ a passive investment strategy focused on minimizing costs and potentially using a minimal amount of derivatives contracts to constrain downside volatility.[19]

Whether an active or passive investment-management approach is taken, an effective governance structure and processes are indispensable. The cronyism, the often erratic decision making and the lack of professional expertise at MBTARF doubtlessly are a product, by and large, of its flawed system of governance, which does not provide effective representation for all stakeholders and badly needs independent oversight.

In turn, these problems have resulted in multiple failures in strategy and execution:

- Equity allocations have followed procyclical patterns that reduce long-term return and increase downside volatility.
- There is ample evidence that the portfolio has overshot duration targets for fixed income, leading to unwarranted interest-rate risks.
- Asset allocations have followed market fads such as tech stocks in the 1990s and hedge funds in the 2000s.
- Members of senior management have repeatedly been implicated in, investigated for and pushed out as a result of conflicts of interest and other infractions.
- The fund has systematically underperformed cheaper passive benchmarks in terms of both return and volatility.

Unfortunately, outcomes similar to these apply to a vast number of public pension funds in the US, including the largest one – the California Public Employee Retirement System (CalPERS). They can all benefit from reviewing their governance and investment practices following the lessons learnt from this analysis of MBTARF.

7. Conclusion

In spite of the dearth of public information, there is conclusive evidence that the MBTA Retirement Fund's governance has had material and persistent adverse impact on its performance relative to appropriate benchmarks. What is most jarring is that this fact appears to be lost on the fund's board and senior management, who have not recognized publicly these institutional problems despite having had many opportunities to do so. Massachusetts state leaders have mostly remained mute regarding the fund's governance as well, seemingly opting instead to deal with the fallout on a case-by-case basis.

Similarly lackadaisical attitudes pervade much of the public-pension and institutional-investment space. If the retirement tsunami about to roll over American demographics is to be tackled effectively and without major social unrest, policymakers must step up and restrict the ability of institutional investors to waste their clients' money. In the case of public pensions the problem is particularly acute and important because it can cause long-term damage by draining the public coffers which fund investments in education and infrastructure, thereby undermining any subsequent recovery.

The crisis precipitated by the $25 million hedge-fund loss and reporting improprieties at MBTARF presents Massachusetts lawmakers a great opportunity to lead not only in the commonwealth, but also in the country. The state can create criminal and civil penalties for omitting required information by the accepted accounting standards for fund fiduciaries and especially board members, as well as their accountants and auditors. Furthermore, the legal framework may require disclosure and periodic evaluation of objective and meaningful risk measures such as asset allocation exposures, interest-rate risks and other metrics.

Appendix I. Timeline of Key Events

1979	John Gallahue, then president of the Carmen's Local 589, joins MBTARF's board
1980	MBTARF begins winding down tthe blind trust with Bank of Boston and commences in-house investment management
1983	Gallahue leaves his union position and becomes the fund's executive director
1989	MBTARF begins international investments
1992	State investigation into Gallahue's relationships with investment managers finds no improprieties
1993	After the First Iraq War recession, poor investment returns prompt the fund to launch alternative-investments program. The board fends off public-record requests by *The Boston Globe*
1997	MBTARF is nearly fully funded
2000	Retirement board begins investigation of John Gallahue over kickbacks from individuals connected with organized crime
2001	Gallahue is forced on paid leave and gradually pushed out. The board's chairman and another union appointee are quietly replaced as well. Janice Loux becomes chairperson
2002	Karl E. White is appointed executive director beginning 1 April. The pension agreement coming into force as of midyear requires the board to publish in the annual report gagging orders for fund employees, prohibiting them from discussing any fund business with outsiders, including the MBTA
2004	The financial statements for 2003 implement GASB 34, including management discussion and analysis. MBTARF makes an investment with Fletcher Asset Management
2006	Michael Mulhern becomes executive director on 1 July, as Karl White returns to Wall Street after "four years of fine service"[20] to join Fletcher. Months later, MBTARF makes a $25 million investment in the hedge fund. MBTARF's annual report no longer lists categories of counterparty risk, return on market value by asset class, results of actuarial valuations
2007	The 2006 annual report includes an even more draconian gag policy on board members and fund employees specifying tinvestigative procedures
2008	MBTARF's 2007 annual report no longer includes management discussion and analysis
2010	The fund reportedly attempts to but fails to recover money from its second investment with Fletcher
2012	Fletcher no longer appears in the annual report but the loss of the investment is not reported or written off in the audited financial statements
2013	MBTARF releases retiree pension data to the *Boston Herald* but denies further records requests by the media. Fletcher does not appear in the 2012 annual report. At yearend, *The Boston Globe* reports that the $25 million hedge-fund investment recommended by Karl White has been unaccounted for and the loss has remained undisclosed for at least two years

Appendix II. Performance Metrics

Sharpe (and, less so, Sortino) ratios are the established way to measure the "risk-adjusted" return on a security or portfolio. The Sharpe ratio divides the annualized return by its annualized volatility expressed in terms of standard deviation. This is problematic because (1) it penalizes positive deviations as well as negative ones and (2) is not statistically meaningful/cannot be interpreted because market returns are not normally distributed and therefore the standard deviation is a biased measure of dispersion around the "mean" return. Even though the Sortino ratio looks at only the negative deviations, it also relies on the standard deviation as a measure of realized risk.

The return/loss ratios included herein rely entirely on statistically unbiased measures. The numerator of the ratio includes the annualized return of the portfolio computed as the geometric average of the gross returns for all available periods. The denominator includes the mean or maximum deviation from a return benchmark over the same period. That benchmark can be zero (if nonnegative returns are the primary policy goal), a varying index return (e.g. the total return of the S&P 500 if that index should be beaten), the fund's actuarial assumed rate of return or any other relevant metric.

As an example of how the ratio is computed relative to a g=8% target, first it is necessary to find the mean absolute semideviation from that target:

$$\frac{1}{N}\sum_{t=1N} \quad |\min\{r_t - g, 0\}|$$

where N is the number of periods and r_t is the return in period t. Dividing the annualized return for these N years by the mean semideviation above produces a measure of total return relative to performance targets.

The return/loss ratio approach uniquely allows a comparison between funds relative to their respective mandates. For example, if two pension funds have target rates of return of 5% and 7% respectively, the second one will have underperformed the first one if they have produced the exact same returns. Such comparison should be made only with due caution, however, because return mandates and targets are not all created equal – oftentimes money managers are saddled with allocation and other restrictions or compensation incentives that make it virtually impossible to pursue the stated goals effectively.

Appendix III. Statistical Summary

Table 1. Annual Returns

Year	MBTARF	PRIM	W5000	Barclays	60/40	80/20
1985	23.70%	22.76%	32.56%	22.10%	28.38%	30.47%
1986	14.80%	19.94%	16.09%	15.26%	15.76%	15.92%
1987	3.70%	3.25%	2.27%	2.76%	2.46%	2.37%
1988	13.90%	13.43%	17.94%	7.89%	13.92%	15.93%
1989	19.74%	17.90%	29.17%	14.53%	23.31%	26.24%
1990	-0.23%	-2.27%	-6.18%	8.96%	-0.12%	-3.15%
1991	18.12%	14.69%	34.20%	16.00%	26.92%	30.56%
1992	5.74%	4.77%	8.97%	7.40%	8.34%	8.66%
1993	11.13%	16.31%	11.28%	9.75%	10.67%	10.97%
1994	0.12%	0.41%	-0.06%	-2.92%	-1.20%	-0.63%
1995	23.24%	24.13%	36.45%	18.47%	29.26%	32.85%
1996	15.36%	16.85%	21.21%	3.63%	14.18%	17.69%
1997	20.62%	18.43%	31.29%	9.65%	22.64%	26.96%
1998	13.15%	14.84%	23.43%	8.69%	17.53%	20.48%
1999	24.95%	23.25%	23.56%	-0.82%	13.81%	18.68%
2000	-0.16%	-1.20%	-10.89%	11.63%	-1.88%	-6.39%
2001	-6.83%	-5.32%	-10.97%	8.44%	-3.20%	-7.09%
2002	-15.66%	-8.94%	-20.86%	10.26%	-8.41%	-14.64%
2003	17.93%	26.33%	31.64%	4.10%	20.63%	26.13%
2004	10.24%	14.45%	12.48%	4.34%	9.22%	10.85%
2005	8.50%	12.70%	6.38%	2.43%	4.80%	5.59%
2006	13.90%	16.72%	15.77%	4.33%	11.20%	13.48%
2007	10.10%	11.90%	5.62%	6.97%	6.16%	5.89%
2008	-27.20%	-29.50%	--37.23%	5.24%	-20.24%	-28.74%
2009	17.70%	17.55%	28.30%	5.93%	19.35%	23.83%
2010	13.42%	13.55%	17.16%	6.54%	12.91%	15.04%
2011	0.75%	0.18%	0.98%	7.84%	3.72%	2.35%
2012	14.93%	13.87%	16.06%	4.22%	11.32%	13.69%
2013	16.20%	15.20%	33.06%	-2.02%	19.03%	26.04%
Annualized	**9.02%**	**9.84%**	**11.17%**	**7.49%**	**10.10%**	**10.71%**

Table 2. Ten-Year Annualized Returns

Year	MBTARF	PRIM	W5000	Barclays	60/40	80/20
1994	10.78%	10.80%	13.85%	9.96%	12.38%	13.13%
1995	10.74%	10.92%	14.18%	9.63%	12.45%	13.33%
1996	10.80%	10.63%	14.67%	8.47%	12.30%	13.50%
1997	12.48%	12.16%	17.57%	9.18%	14.34%	15.97%
1998	12.41%	12.30%	18.11%	9.26%	14.69%	16.42%
1999	12.89%	12.80%	17.59%	7.70%	13.78%	15.71%
2000	12.90%	12.92%	16.98%	7.96%	13.58%	15.31%
2001	10.25%	10.78%	12.28%	7.23%	10.54%	11.46%
2002	7.79%	9.23%	8.74%	7.51%	8.70%	8.80%
2003	8.43%	10.14%	10.59%	6.95%	9.64%	10.20%
2004	9.48%	11.59%	11.90%	7.72%	10.74%	11.41%
2005	8.09%	10.52%	9.15%	6.16%	8.44%	8.88%
2006	7.95%	10.51%	8.65%	6.24%	8.16%	8.49%
2007	6.97%	9.88%	6.31%	5.97%	6.61%	6.54%
2008	2.36%	4.65%	-0.64%	5.63%	2.55%	1.09%
2009	1.75%	4.15%	-0.26%	6.33%	3.04%	1.52%
2010	3.05%	5.61%	2.50%	5.84%	4.50%	3.63%
2011	3.86%	6.21%	3.80%	5.78%	5.23%	4.64%
2012	7.13%	8.61%	7.85%	5.18%	7.30%	7.68%
2013	6.97%	7.62%	7.97%	4.55%	7.16%	7.67%

Table 3. Five-Year Annualized Returns

Year	MBTARF	PRIM	W5000	Barclays	60/40	80/20
1989	14.97%	15.25%	19.11%	12.31%	16.42%	17.77%
1990	10.13%	10.11%	11.16%	9.78%	10.72%	10.96%
1991	10.76%	9.13%	14.43%	9.92%	12.78%	13.63%
1992	11.19%	9.45%	15.89%	10.90%	14.05%	14.99%
1993	10.64%	10.00%	14.55%	11.28%	13.39%	13.99%
1994	6.75%	6.52%	8.82%	7.66%	8.47%	8.66%
1995	11.36%	11.74%	17.28%	9.48%	14.21%	15.76%
1996	10.84%	12.16%	14.92%	7.04%	11.82%	13.38%
1997	13.79%	14.94%	19.28%	7.48%	14.63%	16.96%
1998	14.20%	14.65%	21.78%	7.27%	16.01%	18.90%
1999	19.38%	19.45%	27.06%	7.73%	19.34%	23.20%
2000	14.45%	14.12%	16.68%	6.46%	12.94%	14.87%
2001	9.67%	9.41%	9.70%	7.43%	9.27%	9.57%
2002	2.09%	3.81%	-0.86%	7.55%	3.07%	1.20%
2003	2.94%	5.81%	0.42%	6.62%	3.61%	2.14%
2004	0.40%	4.25%	-1.45%	7.71%	2.76%	0.75%
2005	2.08%	7.04%	2.11%	5.87%	4.13%	3.21%
2006	6.26%	11.61%	7.61%	5.06%	7.05%	7.42%
2007	12.08%	16.31%	14.01%	4.42%	10.26%	12.15%
2008	1.78%	3.50%	-1.69%	4.65%	1.51%	0.05%
2009	3.12%	4.05%	0.93%	4.97%	3.32%	2.29%
2010	4.04%	4.21%	2.90%	5.80%	4.88%	4.05%
2011	1.51%	1.07%	0.13%	6.50%	3.43%	1.93%
2012	2.39%	1.43%	2.03%	5.95%	4.42%	3.39%
2013	12.43%	11.89%	18.58%	4.44%	13.12%	15.88%

TABLE 4. THREE-YEAR ANNUALIZED RETURNS

Year	MBTARF	PRIM	W5000	Barclays	60/40	80/20
1987	13.77%	14.98%	16.32%	13.09%	15.05%	15.69%
1988	10.68%	11.99%	11.88%	8.51%	10.55%	11.22%
1989	12.25%	11.36%	15.93%	8.28%	12.91%	14.42%
1990	10.81%	9.33%	12.64%	10.42%	11.95%	12.33%
1991	12.16%	9.74%	17.60%	13.12%	16.06%	16.87%
1992	7.61%	5.50%	11.12%	10.73%	11.16%	11.17%
1993	11.55%	11.80%	17.62%	10.99%	15.02%	16.33%
1994	5.57%	6.96%	6.62%	4.60%	5.81%	6.21%
1995	11.10%	13.18%	14.91%	8.07%	12.22%	13.57%
1996	12.49%	13.35%	18.24%	6.03%	13.40%	15.82%
1997	19.69%	19.76%	29.49%	10.42%	21.87%	25.68%
1998	16.33%	16.70%	25.24%	7.29%	18.06%	21.65%
1999	19.47%	18.79%	26.04%	5.73%	17.94%	21.99%
2000	12.18%	11.83%	10.77%	6.36%	9.49%	10.21%
2001	5.14%	4.86%	-0.66%	6.28%	2.63%	1.07%
2002	-7.77%	-5.21%	-14.37%	10.10%	-4.54%	-9.45%
2003	-2.51%	2.89%	-2.48%	7.57%	2.26%	0.01%
2004	3.12%	9.60%	5.43%	6.20%	6.46%	6.08%
2005	12.15%	17.67%	16.35%	3.62%	11.35%	13.87%
2006	10.86%	14.61%	11.47%	3.70%	8.37%	9.93%
2007	10.81%	13.75%	9.16%	4.56%	7.35%	8.26%
2008	-2.99%	-2.71%	-8.44%	5.51%	-1.99%	-5.04%
2009	-1.92%	-2.48%	-5.25%	6.04%	0.35%	-2.24%
2010	-0.95%	-2.01%	-1.92%	5.90%	2.44%	0.50%
2011	10.38%	10.17%	14.92%	6.77%	11.81%	13.39%
2012	9.51%	9.01%	11.15%	6.19%	9.25%	10.21%
2013	10.40%	9.53%	15.96%	3.27%	11.18%	13.62%

The following table summarizes the relative return of the four portfolios under consideration over different periods. The first column provides the length of the trailing period and the last column lists the number of observations available for that length from the data. The remaining columns show the percentage and number of years within each sample for which the portfolio on the left in the column header had a higher return than the portfolio on the right. For example, the 80/20 passive portfolio had a better three-year trailing return than MBTARF in 20 of the 27 years (or 74.1% of the time) for which data are available.

Table 5. Relative Portfolio Performance

Rolling Period (years)	Number of observations	80/20> PRIM	60/40> PRIM	80/20> MBTARF	60/40> MBTARF	PRIM> MBTARF
10	20	50% 10	35% 7	85% 17	95% 19	80% 16
5	25	64% 16	48% 12	80% 20	80% 20	60% 15
3	27	59.3% 16	59.3% 16	74.1% 20	70.4% 19	55.6% 15
1	29	48.3% 14	51.7% 15	58.6% 17	58.6% 17	48.3% 14

Appendix IV. Estimation of Relative MBTARF Portfolio Performance with Passive Strategies

The starting value on both portfolios was estimated by going backwards from the earliest available asset value of $1,978,324,284 as of yearend 2000. This was done according to the formula

$$V_{t-1} = \frac{V_t + \text{Expense} + \text{Refunds} + \text{Benefits} - \text{Contributions}}{1 + r_t}$$

where V_t is the market value at the end of year t and r_t is the return for that year. In other words, the year's expenses, benefits and refunds were added back to the yearend value, then the contributions were subtracted and the result was discounted back by the gross return for the year in order to obtain the prior yearend's market value. The data necessary for this extrapolation were available only for the years 1991-2012.

The passive portfolio's return was estimated by taking the 1990 yearend value obtained using the above formula and applying the reverse formula

$$V_{t+1} = V_t(1 + r_t) - \text{Expense} - \text{Refunds} - \text{Benefits} + \text{Contributions}$$

where r_t are the returns on a portfolio composed 80% of the Wilshire 5000 Index and 20% of the Barclays Aggregate US Bond Index in year *t*.

Appendix V. Disclosure of Discrepancies in Financial Statements

MBTARF's annual reports contain some discrepancies, which cannot be reconciled solely on the basis of the information provided in the reports. This study makes no warrant as to accuracy of the information provided in the fund's reports. If anything, the reader would be well-advised to proceed with caution in relying on these data since the fund has been known to have hidden losses and expenses in the past. Here are listed some potential inaccuracies and/or items that are missing or unnecessarily convoluted:

1. Equities and other asset classes are reclassified too often (as frequently as every 2-3 years), which makes it difficult to track the allocation consistently.

2. The number of current employees and retirees is inconsistently reported in the publication in 2000-2003, 2006-2008 and 2012. Management commentary and/or reported totals do not match the sum of members as they are shown by service or age group.

3. The total of contributions for fiscal 2008 does not equal the sum of its reported parts.

4. US treasuries are not classified properly by their credit rating in the credit risk section of the annual reports.

5. The fund does not report consistently basics about its external investment managers such as assets under management, investment style and strategy, performance benchmarks, date of commitments/investments.

6. Beginning with the 2007 annual report, the fund's financial statements do not include management discussion and analysis as required by accounting standards for 2008 and later.

About the Author

Iliya Atanasov is Pioneer's Senior Fellow on Finance, leading the research tracks on pension portfolio management, infrastructure and municipal performance. Iliya is a PhD candidate in Political Science and Government and a former Presidential Fellow at Rice University. He also holds BAs in Business Administration, Economics and Political Science/International Relations from the American University in Bulgaria.

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Endnotes

1. "Letter from the Executive Director" in MBTA Retirement Fund, 2007 Annual Report, 2008.
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5. Illinois State Board of Investment, "Investment Policy," March 21, 2014, http://www2.illinois.gov/isbi/Documents/Investment-Policy.pdf.
6. Jack Meyers, "MBTA Retirement Fund Board Picks Gallahue Replacement," The Boston Herald, December 22, 2001.
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8. Ibid.
9. Beth Healy, "Ex-T Pension Chief Recommended $25m Investment That Went Bust," *The Boston Globe*, December 21, 2013, http://www.bostonglobe.com/business/2013/12/20/former-mbta-pension-fund-chief-recommended-million-hedge-fund-investment-that-went-bust/baNMRcCLcdIoitY8xqx66M/story.html.
10. These data are inferred from the list of managers published with MBTARF's annual reports. They have not been audited by an independent party and are likely incomplete. The initiation and termination of contracts often has to be assumed just from their appearance and disappearance on the roster.
11. Unite Here, "Form LM-2 Labor Organization Annual Report," March 28, 2014.
12. Preliminary allocation for 2013 obtained from unaudited newsletter.
13. The annual reports do not make clear whether Macaulay or modified duration is provided. The term is used here in whichever sense it is used in the reports.
14. For a discussion of some of these metrics please refer to Appendix II.
15. See Gabor J. Szekely, Maria L. Rizzo, and Nail K. Bakirov, "Measuring and Testing Dependence by Correlation of Distances," Annals of Statistics 35, no. 6 (2007): 2769–94.
16. See Appendix IV for more detailed estimation methods and data disclosures.
17. Ten-year returns cannot be generated for earlier years.
18. Alicia H. Munnell, Anthony Webb, and Rebecca Cannon Fraenkel, *Will the Rebound in Equities and Housing Save Retirements?* (Center for Retirement Research at Boston College, December 2013), http://crr.bc.edu/wp-content/uploads/2013/12/IB_13-17.pdf.
19. This condition will be explored further in a forthcoming paper.
20. MBTA Retirement Fund, *2005 Annual Report*, 2006.

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