

EXAMINING THE EXPERIENCES OF PUBLIC PENSION PLANS SINCE THE GREAT RECESSION



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By Tyler Bond, Dan Doonan, Todd
Tauzer, and Ronald Temple

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ABOUT THE AUTHORS

Tyler Bond is the research manager for the National Institute on Retirement Security. He works with the executive director to plan all NIRS research products. Since joining NIRS, Bond has authored and co-authored numerous research reports, issue briefs, and fact sheets on a wide range of topics relating to retirement security. He regularly speaks at conferences about NIRS research and testifies before policymakers. Previously, Bond spent four years at the National Public Pension Coalition, where he directed the research program and authored six original research reports. He also has held positions on Capitol Hill and at the Center on Budget and Policy Priorities. Bond holds a B.A. in political science and philosophy from Indiana University and an M.A. in public policy from The George Washington University. He is a member of the National Academy of Social Insurance.

Dan Doonan is the executive director of the National Institute on Retirement Security. With the Board of Directors, Doonan leads the organization's strategic planning, retirement research and education initiatives. Doonan has more than 20 years of experience working on retirement issues from different vantage points including an analyst, consultant, trainer, and a plan trustee. He comes to NIRS after serving as a senior pension specialist with the National Education Association. Doonan began his career at the Department of Labor as a mathematical statistician. He then spent seven years performing actuarial analysis with Buck Consultants in the retirement practice. His experience also includes positions as a research director and labor economist. Doonan holds a B.S. in Mathematics from Elizabethtown College and is a member of the National Academy of Social Insurance.

Todd Tauzer is a Vice President and Actuary in Segal's San Francisco office, specializing in public pension funding, risk management, and plan sustainability. He is Segal's National Public Sector Retirement Practice Leader and a member of Segal's Public Sector Leadership Group. Mr. Tauzer came to Segal as Director of Municipal Pensions from S&P Global Ratings, where he helped develop a detailed framework to evaluate the sustainability and security of public pension and OPEB plans across the country. Prior to S&P, he was a senior pension actuary for CalPERS. At CalPERS, he was heavily involved in the Enterprise Risk Management and Asset Liability Management space. He is a Fellow of the Society of Actuaries with a specialty in Enterprise Risk Management, a Chartered Enterprise Risk Analyst, a Fellow of the Conference of Consulting Actuaries (CCA), and a member of the American Academy of Actuaries. Mr. Tauzer serves as Chair of the Academy's Public Plans Committee, the Chair of the SOA's Retirement Section Council, and on the CCA's Annual Planning Committee.

Ronald Temple is a Managing Director and Co-Head of Multi-Asset and Head of US Equity at Lazard. In this role, Ron is responsible for overseeing the firm's multi-asset and US equity strategies as well as several global equity strategies. He is also a Portfolio Manager/Analyst on various US and global equity teams. He joined Lazard in 2001 with ten years of global experience including fixed-income derivative trading, risk management, corporate finance and corporate strategy in roles at Deutsche Bank AG, Bank of America NT & SA and Fleet Financial Group. Ron has an MPP from Harvard University and graduated magna cum laude with a BA in Economics & Public Policy from Duke University. He is a member of the Council on Foreign Relations, the Economic Club of New York, the CFA Society New York, is the chair of Duke University's Graduate School Board of Visitors and is Co-Chair of the Duke University Talent Identification Program Advisory Board.

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EXECUTIVE SUMMARY

The Great Recession, or the Global Financial Crisis (GFC), was the severe economic downturn that occurred between 2007-2009. It impacted nearly all sectors of the U.S. economy. Individual and institutional investors lost sizeable assets as financial markets contracted, and the economic recovery period, characterized by slow job growth and high unemployment, was prolonged.

Public pension plans have made a number of adjustments to their actuarial assumptions and investment allocations since the Great Recession to adapt to structural changes in the economy. Costs and liabilities for many plans have increased due to these changes, but these plans should be better positioned for potential future market downturns.

This report considers the impact of the Great Recession on public pension plans in the U.S. It focuses on both the immediate and long-term impacts of the financial crisis as well as recent demographic and economic changes that are increasing the cost of retirement. It also reviews the asset allocation decisions made by public pension plans, and the behavior of individual retail investors during and after the Great Recession.

The report's key findings are as follows:

- The majority of public pension plans recovered their pre-recession asset levels within six years, while continuing to pay over a trillion dollars in benefits. In recent years, public plans have reported record-high asset levels.
- Discount rates, or the assumed rate of return on investments, have broadly decreased from 8% to 7% for the median public pension plan, based on actuarial and financial forecasts of future market returns.
- Generational mortality tables, possible today with more advanced financial modeling software, have been broadly adopted by nearly all large public plans and future longevity improvements are now incorporated into standard financial projections.
- Many public plans have shortened their amortization periods, or the period of time required to pay off an unfunded actuarial accrued liability, to align with evolving actuarial best practices. Tightening amortization periods—akin to paying off a mortgage more quickly—has had the effect of increasing short-

term costs; in the long run, plans and stakeholders will benefit.

- The intense focus on public plan investment programs since the recession has missed the more important structural changes that generally have had a larger impact on both plan finances and the resources necessary for retirement security.
- Plans have adjusted their strategic asset allocations in response to market conditions. With less exposure to public equities and fixed income, plans increased their exposure to real estate, private equity, and hedge funds.
- Professionally managed public defined benefit plans rebalance during volatile times and avoid the behavioral drag observed in retail investment.

In summary, public plans have modified their funding processes, continued to pay benefits, and recovered and exceeded their pre-recession asset levels as the overall operating environment has become increasingly complex since the Great Recession.

I. INTRODUCTION

The Great Recession of 2008 and 2009, sometimes referred to as the Global Financial Crisis (GFC), was the most severe economic downturn since the Great Depression of the 1930s. The recession had an impact on nearly all aspects of economic life in the United States and its effects were felt for years after, especially given the long, slow recovery that followed. Financial markets plunged as the recession set in, and many investors, both individuals and institutions, lost a significant portion of their assets.

Public pension plans were not immune from this crisis. The majority of public plans experienced sizable losses from the crash in financial markets, which resulted in a notable year-to-year decline in the funded ratio of those plans. Many public plans took years to recover their funded status, due to the drawn-out economic recovery as well as other factors. Most public plans became more conservative during the recovery by lowering their assumed rates of return, adopting generational mortality tables, and shortening their amortization periods. **Figure 1** shows that the median plan took until 2013 to recover its fiscal year 2007 asset levels.

this paper will focus on both the immediate impact of the financial crisis on public plans and the long-term effects from the structural changes that occurred in investment markets and among the public plan community.

The paper also will examine the asset allocation decisions made by public pension plans during and after the GFC to assess whether the funds are taking on inordinate risks to fill funding gaps. Finally, the paper will examine the investment decisions of retail investors as a proxy for decision making by individuals who depend on defined contribution plans for retirement savings.

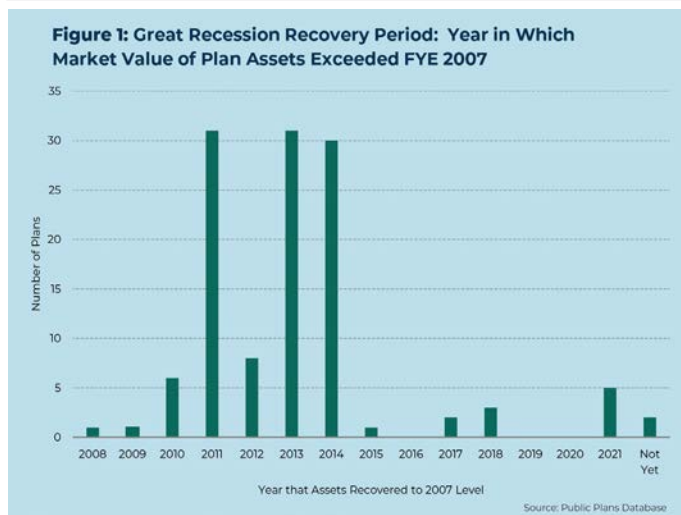
What was the Great Recession?

The National Bureau of Economic Research (NBER) is the organization that officially dates the start and end of recessions. NBER dates the beginning of the recession as December 2007 and the end as June 2009, an 18-month economic contraction.² Many of the key events of the crisis occurred during 2008.

One of the first clear signs of the crisis was the distressed sale of Bear Stearns to JPMorgan Chase in March 2008. Over the summer of 2008, shares of Fannie Mae and Freddie Mac fell sharply and in September 2008, both entities were placed in federal conservatorship. Just a week later, Lehman Brothers declared bankruptcy and Bank of America purchased Merrill Lynch. The next day, the Federal Reserve extended a loan to AIG and the federal government took an 80 percent equity stake in the company. Just over a week after that, the Federal Deposit Insurance Corporation (FDIC) seized Washington Mutual and sold its assets to JPMorgan Chase.

By early October 2008, Congress had passed and President George W. Bush had signed the Emergency Economic Stabilization Act of 2008, which created the Troubled Asset Relief Program (TARP). From 2008 to 2012, 465 banks with assets totaling \$689 billion failed.³ Above and beyond bank failures, there were widespread failures of nonbank financial institutions that added to the sense of financial panic and triggered the most comprehensive regulatory overhaul of the U.S. financial system since the Great Depression.

This economic crisis shook the foundations of financial markets. The Great Recession coincided with a bear market that began in October 2007 when all three major indices,



This paper seeks to understand the true impact of the Great Recession on public pension plans in the U.S. and to dispel common misperceptions about their funding progression and investment performance. In the aftermath of the crisis, nearly every state made changes to one, or more, of its public pension plans, ranging from benefit adjustments to plan design changes. These were mostly political decisions that followed the recession and will not be the focus of this paper as they have been well-documented elsewhere.¹ Instead,

the NASDAQ, the S&P 500, and the Dow Jones Industrial Average (DJIA), peaked and then began their decline. All three indices hit bottom on March 9, 2009, having lost more than half their value.

The causes of the Great Recession have been well-documented. The growth in the subprime and Alt-A mortgage market throughout the aughts had led to financial firms selling pools of these mortgages that were packaged into Mortgage-Backed Securities (MBS) that were then disaggregated and repackaged into Asset-Backed Collateralized Debt Obligations (ABS CDOs) and other derivatives thereof. When the underlying borrowers began to default in large numbers, the meltdown of MBS and related securities led to financial turmoil and the stock market collapse referenced above. Relatedly, another new investment vehicle called a credit derivative or credit default swap (CDS) also had grown in popularity, but was unregulated and contained unforeseen risk. The collapse of both the MBS and CDS markets contributed to the bankruptcy of major institutions such as Bear Stearns and Lehman Brothers, the distressed sale of Merrill Lynch, and the government rescue of AIG.

This financial market turmoil inflicted sizable losses on the

vast majority of investors including public pension plans. In the United States, the stock market decline wiped out nearly \$8 trillion in value between late 2007 and 2009. Americans lost \$9.8 trillion in wealth as their home values plummeted and their retirement accounts shrank. In the fourth quarter of 2007, the combined value of defined benefit plan assets held by state and local governments was \$3.19 trillion, according to the Federal Reserve. By the fourth quarter of 2008, that had declined to \$2.44 trillion, a loss of 23.5 percent.

The economy-wide effects of the recession were pronounced. Unemployment rose from 4.4 percent in December 2006 to a peak of 10 percent in October 2009. Employment began to grow again in March 2010, but it took seven years to return unemployment to the pre-GFC lows.

There also were a greater number of people considered “long-term unemployed” during the Great Recession than during previous recessions. The share of the population with a job declined to levels not seen since the mid-1980s. And the ratio of job seekers to job openings was historically high. The economic impact of the Great Recession continued for many years after its official end.⁴

II. PUBLIC PLANS BEFORE THE GREAT RECESSION

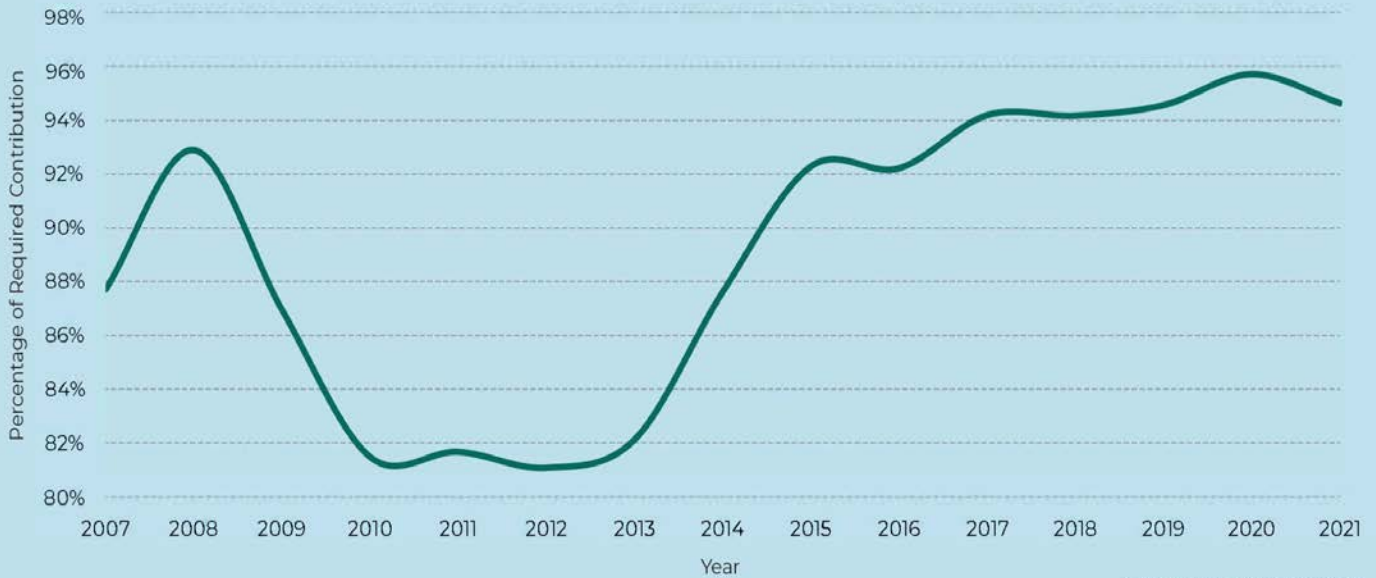
As noted above, in the fourth quarter of 2007, a period of time that includes both the start of the bear market and the official beginning of the recession, the combined value of state and local government DB plan assets peaked at \$3.19 trillion, a record high at the time, and the aggregate actuarial funded ratio for public plans was 86.3 percent.

Public plans already had experienced a recent recession before the Great Recession. When the dot-com bubble burst, the U.S. entered a relatively shallow recession from March to November 2001. The dot-com bubble had caused significant asset value appreciation in investment markets and that benefitted public plans. In 2001, the aggregate actuarial funded ratio stood at 101.8 percent. This number declined to 94.8 percent by 2002 as the impacts of the recession were realized. The aggregate funded ratio continued to decline over the next few years, but had increased in 2007, just before the onset of the Great Recession. The aggregate

funding ratio of plans declined despite asset growth in each year from 2003 to 2007, as public plans began to adopt more conservative funding assumptions during this period, a trend that was accelerated after the Great Recession and will be discussed at great length later in this paper.

Failure of state and local governments to fulfill required contributions to public plans did contribute to the decline in funded status in some, but not all, cases. During fiscal year (FY) 2007, which for many plans was July 1, 2006 to June 30, 2007 (before the start of the recession), in aggregate, 88 percent of required contributions were made to public plans. During fiscal year 2008, which for many plans began on July 1, 2007, that number rose to 93 percent, but declined to 87 percent in FY 2009 and 81 percent in FY 2010 (**Figure 2**). During FY 2007, 58 percent of plans had received at least 100 percent of their required contribution. By FY 2010, that number had declined to 52 percent.

Figure 2: Aggregate Percentage of Required Contribution Paid, 2007-2021



Source: Public Plans Database

III. PUBLIC PLANS DURING THE GREAT RECESSION

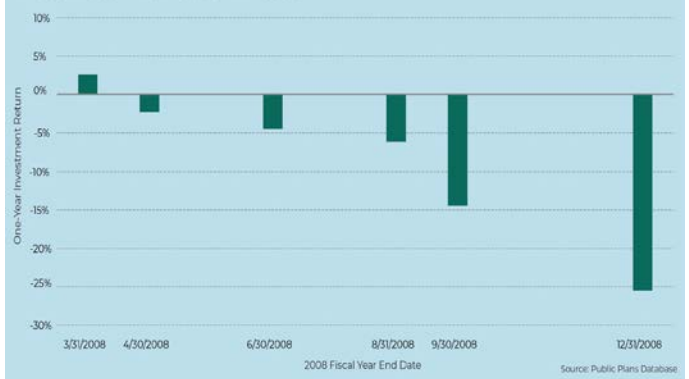
Fiscal Year End and One Year Investment Returns

Most public pension plans end their fiscal year on one of two dates: either June 30th or December 31st. A much smaller number have fiscal years that end on other dates. When comparing one year investment returns from 2008, it matters greatly whether a plan ended their fiscal year on June 30th or December 31st. Examining the plans in the Public Plans Database (PPD) reveals that the majority of plans with June 30, 2008 fiscal year ends experienced one year investment losses in the low single digits, whereas the majority of plans with a December 31, 2008, fiscal year end experienced double digit investment losses (Figure 3) reflecting the ongoing sell-off in asset prices in the second half of calendar year 2008.

Highlighting this fact is not meant to indicate anything about the relative investment performance of different public plans. Rather, the point is that timing matters. Plans whose fiscal year ended on December 31, 2008 absorbed

much more of the market downturn during their 2008 fiscal year, whereas plans ending on June 30th showed greater losses during their 2009 fiscal year. This cautions against reading too much into any single year of investment returns, whether positive or negative, as pension plans are meant to deliver benefits over decades and hence have a longer investment horizon than individuals.

Figure 3: Average One-Year Investment Returns for Various Fiscal Year End Dates in 2008



Source: Public Plans Database

FAILED PROJECTIONS OF MUNICIPAL BANKRUPTCIES

During the immediate aftermath of the Great Recession, it became common to read stories in the news media predicting municipal bankruptcies resulting from the decreased funded status of public pension plans. These media stories often relied on research that was based on flawed assumptions and a poor understanding of the funding mechanisms of defined benefit pension plans.

One set of projections that received widespread media attention focused on 77 municipal pension plans in major cities and the unfunded accrued liabilities in those plans.⁵ This study received particular attention because the authors calculated a “solvency horizon” for these plans, beyond which the authors contended that the current assets in the plans would no longer be able to cover current liabilities. The authors’ approach to assessing the funding of public plans was fundamentally flawed. The revenues in public plans come from three sources: employee contributions, employer contributions, and investment returns, which constitute the majority of revenue in most plans. Plan obligations generally are met from a combination of these three sources of revenue.

Defined benefit plans can invest on a long-term time horizon because they are not tied to any individual’s lifecycle. They are ongoing and can act and invest differently as a result. Looking at a single point in time and trying to make projections from that point fundamentally misrepresents how DB plans function. Also, a “solvency horizon” is something that can’t exist because a public pension plan can’t go bankrupt or be defensed in the way a corporate pension plan could. State governments cannot declare bankruptcy and while county and municipal governments can, public pension benefits are entitled to legal and/or constitutional protections in most states.

Another problem was the type of news coverage this study received. Even this study, which made critical and inaccurate claims about municipal pension plans and their funding, was not predicting some of the things the news media said it was.⁶ The media often would report without any criticism of the analysis and would overstate the findings. This led to many doom-and-gloom predictions about the future of public pensions that never came to pass.

Far from declaring bankruptcy, the majority of these municipal pension plans have higher asset levels today than a decade ago. Fifteen out of twenty plans examined had higher actuarial assets in fiscal year 2020⁷ than in fiscal year 2010. Moreover, these plans have continued to pay benefits while recovering their asset bases, as pension plans throughout the U.S. have done.

The years immediately following the Global Financial Crisis were worrying times for many, given both the historic nature of the recession and the sluggishness of the subsequent recovery. Unfortunately, that time of economic anxiety resulted in a number of unfounded claims being made about public pension plans. While many of those claims never came to pass, they have influenced the thinking of many to this day. A more accurate understanding of how pension plans dealt with and recovered from the Great Recession would lead to a more balanced and nuanced understanding of the status of municipal pension plans today.

IV. PUBLIC PLANS AFTER THE GREAT RECESSION

Most public pension plans experienced a notable decline in their funded status due to the investment losses experienced during the Global Financial Crisis. This decline showed up in different years for different plans depending on their fiscal year-end, but nearly all plans saw asset levels decline below fiscal year 2007 levels. Figure 1 above showed that the median plan recovered their 2007 asset levels by fiscal year 2013. The majority of plans had recovered their pre-recession asset base by 2014. **Figure 4** below similarly shows the quarterly change in the aggregate assets of state and local pension plans based on data from the Federal Reserve. It also demonstrates that aggregate assets had recovered to 2007 levels by 2013.

Not only did public pension plans recover their asset levels within six years, but they continued to pay out benefits while they did so. In fact, public plans paid benefits worth \$1.4 trillion from 2007 through 2013. The fact that public pension

plans were able to recover their asset base while paying out well over a trillion dollars in benefits is a testament to the sustainability of these plans.

As of the end of 2021, on average, plan assets were 88 percent above 2007 levels (**Figure 5**) and \$3.8 trillion had been paid out in benefits along with \$89 billion in withdrawals. It is noteworthy that, while there has been much discussion about the value received by short-term employees, withdrawals represent only 2.1 percent of total payments during 2007-2021. Therefore, if policymakers wish to significantly increase the rewards for short-term workers through better return-of-contribution provisions, the financial costs are likely to be fairly minor for most systems.

Some basic facts about public pension plans in recent years seem inconsistent. First, the aggregate actuarial funded ratio of public plans (from the PPD) has declined slightly

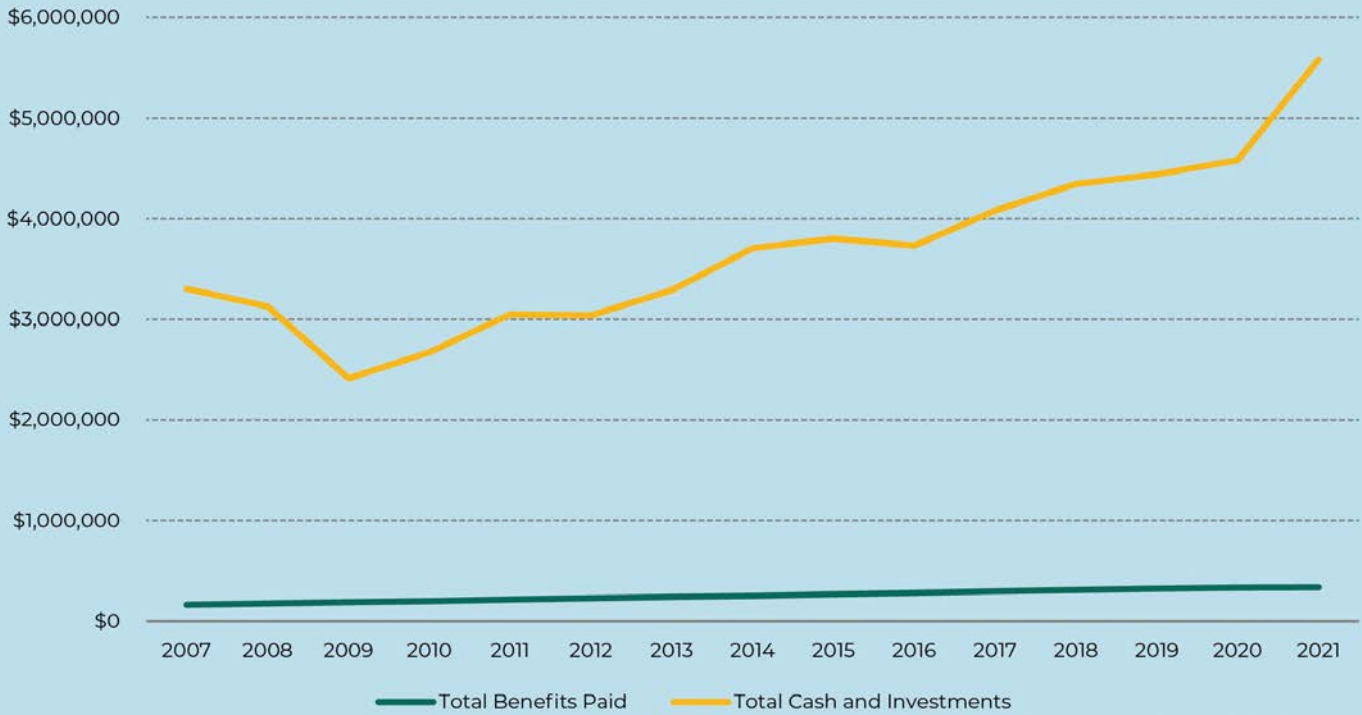
Figure 4: Quarterly Change in State & Local Defined Benefit Assets, 2003 - 2022 (in Trillions)



Recession Total Assets

Source: NASRA, using Federal Reserve data

Figure 5: State & Local Benefits Paid and Total Assets (in Millions)



Source: U.S. Census Bureau Annual Survey of Public Pensions

Figure 6: Median Annualized Public Pension Investment Returns for Periods Ended 6/30/21 and 12/31/21



Source: NASRA, using Callan data

since 2009, from 78.3 percent to 75.5 percent. At the same time, contributions have increased since the onset of the Great Recession. And, investment returns over 10, 20, and 30 years are largely meeting plan expectations.⁸ Given these three facts, a casual observer might think that the math simply doesn't work.

The real story is a consistent trend among public plans to adopt more conservative assumptions for future investment returns and longevity. This more cautious stance reflects the fact that retirement has become more expensive in recent years, for those in both defined benefit and defined contribution plans. Policies also have changed to accelerate funding. What this means is that the funding target has been moved, and significantly so, with plans generally trying to reach their targets in fewer years.

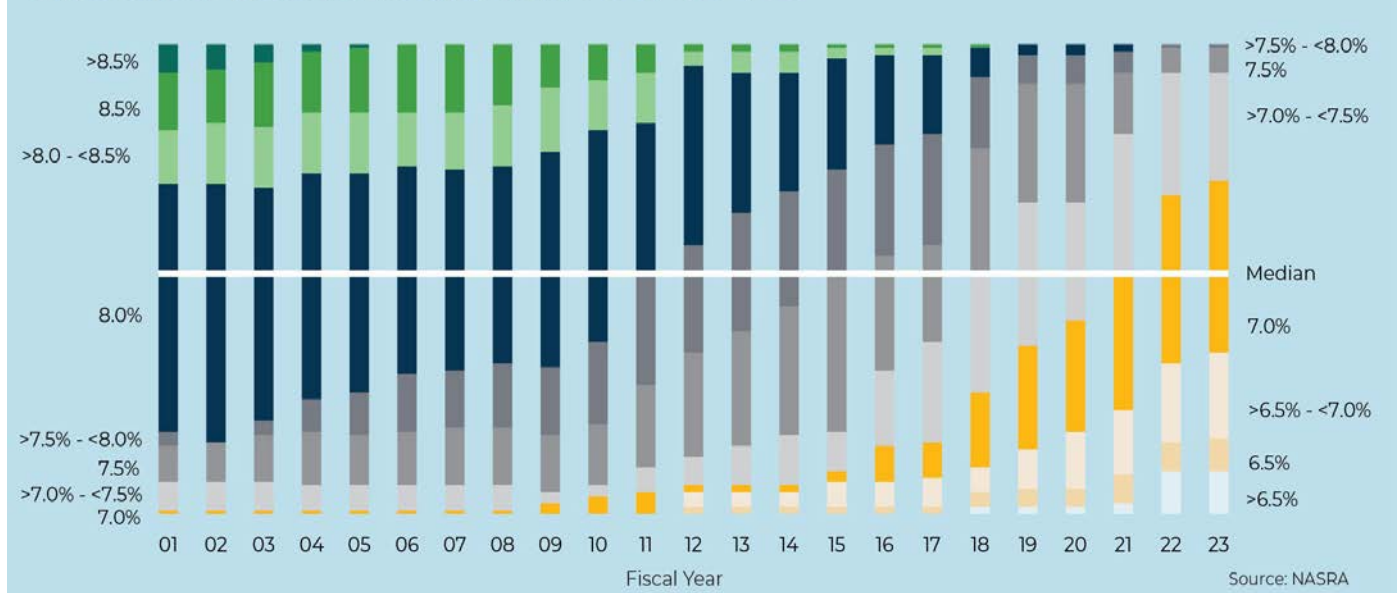
On investment returns, the median plan assumed an 8 percent return from 2001 through 2010. These years followed the boom markets of the 1990's, when pension fund returns were quite high. However, as noted above, plans began to get more conservative between 2003 and 2009. The more significant change occurred following the Great Recession. With the advent of Quantitative Easing (QE), monetary policy drove bond yields to a much lower point than seen in recent decades, and over time, the sense that this policy would quickly pass became less firm. As such, plans continued a march toward more conservative investment return assumptions until 2022 with the median plan return expectation around 7 percent.

Today, we may be seeing some of these trends reverse. After consistently falling below the Fed's 2 percent target for over a decade, inflation has reached the highest levels in nearly four decades. Surging inflation prompted the Federal Reserve to aggressively increase interest rates and shrink its balance sheet. Importantly for pension funds, Moody's Seasoned Aaa Corporate Bond yields reached 4.5 percent for the first time since 2014 after rising sharply throughout 2022.⁹ If sustained, meaningfully higher inflation and interest rates could lead pension funds to reassess certain assumptions about future returns and discount rates used to value liabilities in the future. Higher interest rates could also lead to changes in asset allocation targets for the plans going forward.

Despite recent developments, lower discount rates likely will remain. In 2021, the seven largest plans (by assets under management) tracked in the Public Plans Database had a liability weighted average discount rate of 6.78 percent. In 2008, the same plans had an average discount rate of 7.89 percent. When thinking about funding these plans, this change is roughly equivalent to adding another 15-20 yards to a football field.

The tightening of actuarial assumptions did not stop there. The practice for setting mortality assumptions for public plans, which includes projecting future longevity improvements, has evolved significantly over the last 15 years. The most significant change was a methodological one.

Figure 7: Change in Distribution of Public Pension Investment Return Assumption, FY 01 to FY 22



Around the turn of the century, plans either did not project mortality or used minimal "static" projections. This meant that a plan would build a set amount of years of improvement into their current mortality tables (let's say 10 years of improvement, for example), and those mortality assumptions would not change until the next experience study (thus the term "static"). At the next experience study, the plan would need to build out 10 years of improvement from that date, thus increasing liability and costs. Since by design this would continue to happen at each experience study, pension plans were always expecting losses when they updated mortality experience as they continued to manually push forward longevity expectations.

In the early 2000s, a new approach was developed that was computationally more challenging called "generational" mortality projections. Generational projections apply certain mortality assumptions to each "cohort" or birth year of pension plan members, and each cohort is expected to live slightly longer than the previous year's cohort. This is why it's called "generational" – longevity improvement is built in incrementally into all future cohorts, one year at a time. Now, virtually all plans have moved to using generational mortality.¹⁰ Often when making the one-time move from static projections to generational projections, plans experience a significant increase in their estimated liabilities as generational tends to anticipate future longevity improvements in a more robust way. At the same time, future experience studies will not anticipate the expected future increases in cost and liability that was caused by continually pushing out static projections.

In addition to this shift to generational mortality, most public plans have adopted two other significant changes in setting mortality assumptions. The first is that many plans moved to mortality tables set by public plan data (which were only developed in the last five years). Experience has shown that public plan participants tend to live longer than the general U.S. population, on average. So, moving to public-specific tables increased assessed liability and cost, but also should be a more accurate assessment of expected experience. The second is that research has shown that those with higher benefit levels tend to live longer than those with lower benefit levels. In general, they tend to have a higher standard of living, more access to healthcare, and other potential benefits. This means that those who are receiving higher benefits will tend to live longer than the average life expectancy of the plan, and those who are receiving lower benefits will tend to live shorter than the average life expectancy of the plan. In total, this pattern increases the cost of the plan. This has been proactively

built into many plans' mortality tables through the use of "benefit weighted mortality", where different levels of mortality expectations are set based on the level of benefits received.

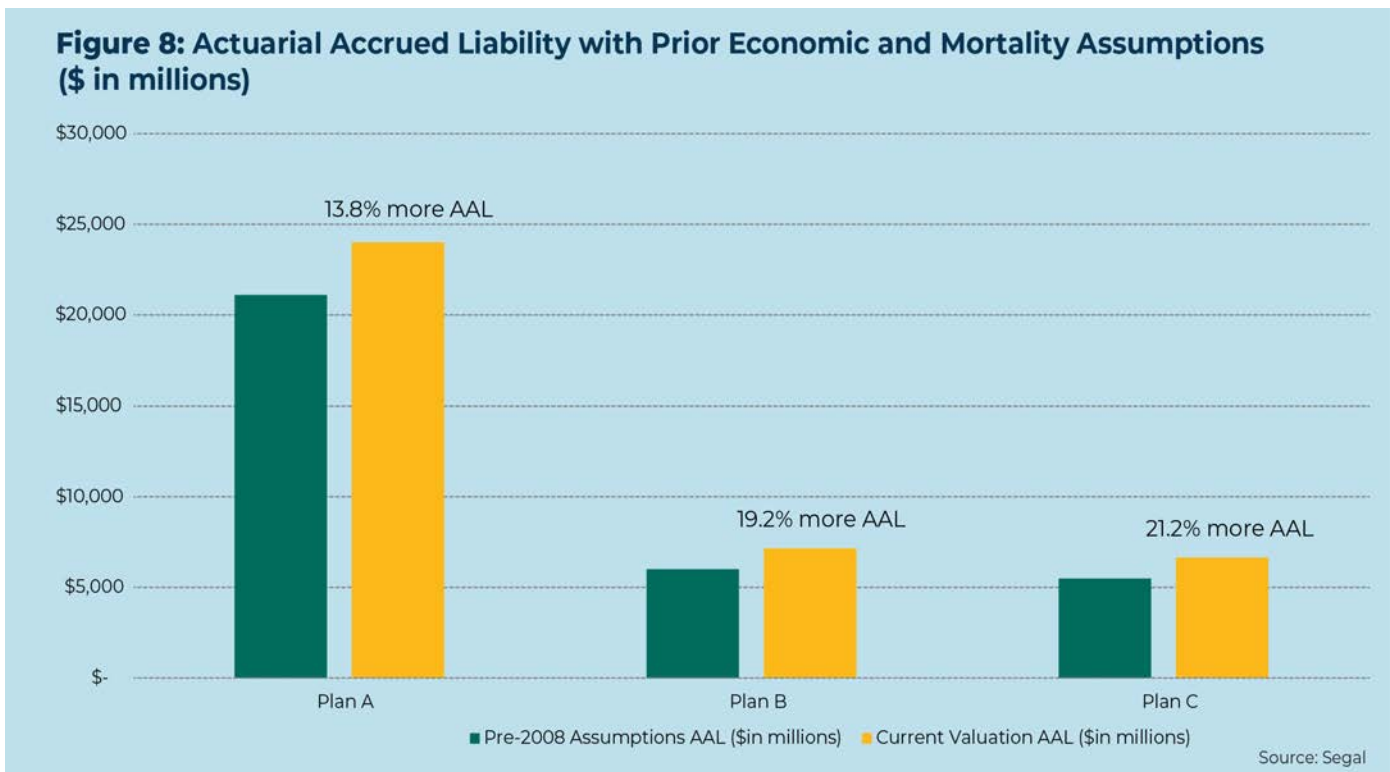
These tools allow for a level of fine-tuning of mortality projections that simply were not available to plans before generational tables became widely available, leading to more accurate projections of future benefit payments. Instead of being a one-way street that leads to higher costs, plans with generational mortality tables should expect some minor level of correction in the future. Ongoing adjustments to mortality assumptions likely will move in both directions, leading sometimes to lower and sometimes to higher costs, and are much more likely to be smaller overall adjustments.

Analysis of Three Sample Plans' Recent Experience

To get a sense of the cumulative impact of the changes in investment return and mortality assumptions, we've analyzed three large public plans under their current assumption set, as well as the results that would have been achieved had investment return and mortality assumptions remained static since 2008. This section examines the changes experienced by these three plans since the Great Recession.

Two of the three plans in **Figure 8** would have been overfunded had they not changed their investment return and mortality assumptions, and all three plans would have seen much higher funding ratios had assumption changes not increased the plan's liabilities. Figure 8 illustrates the cost of becoming more conservative. Adopting actuarial assumptions that incorporate future mortality improvement and anticipate more averse future investment markets increases costs in the near term, but it also increases the likelihood that pension systems will meet or exceed their expectations in the future.

Pension funds monitor their assumptions by conducting periodic experience studies, generally every three to five years. These studies look at economic, demographic, and other factors that impact a plan's costs. Generally, when data on participant behavior or economic conditions look different than what is currently assumed, plans react to the new trends, without overcorrecting. For instance, if a plan sees the average retirement age increase or decrease in a material way over a short period, it may be due to specific conditions that will continue or be temporary, e.g., the



This chart shows the impact of the changes to the discount rate and mortality tables, but excludes other plan-specific adjustments that are less representative of public plans more broadly.

COVID-19 pandemic, or policy changes, e.g., a temporary change in return-to-work provisions. Such temporary conditions may not be applicable to the behavior of workers who have 10 to 20 more years before reaching retirement age. So, the goal is to recognize real changes, but adjust with long-term trends in mind.

Figure 9 illustrates how this process played out for one of the sample plans.

Figure 9 shows the actuarial accrued liability for the current plan and population under the assumptions that were in place at various points in time. The data above only illustrate the impact of the changes made to economic and mortality assumptions following each experience study conducted since 2008. The majority of the increase in the accrued liability occurred in 2009, 2012, and 2015 and more recent years have seen either modest increases or decreases. While lowering the discount rate increased liabilities in the years that decision was made, we actually saw a reduction in 2018 stemming from mortality changes that reduced costs (yellow bar at the bottom) after generational mortality tables were adopted.

Figure 10 shows the attribution of actual experience

compared to expected experience, for investments and non-investment assumptions, by year for Plan A. It also shows the impact of assumption changes (in light green). The timeframe on this chart, beginning when GFC losses were starting to be felt, is unfavorable for measuring an investment program. Yet, investments were not the leading cause of increasing liabilities.

Figure 10 shows the gains and losses by year, and by the various contributing factors. Assumption changes were not made every year, but tended to have a significant impact when they were made. On the other hand, investment gains and losses show up every year, and generally tended to offset after the GFC. Figure 10 shows that the Great Recession did have a significant impact as most of the investment experience following the GFC increased unfunded liabilities. That started to change in 2013 when the plan had a positive investment experience that reduced unfunded liabilities as the market recovery led to larger than anticipated returns (after smoothing).

Figure 10 captures more than just assumption changes and investment experience. The actuarially determined contribution (ADC) of this plan is effective at reducing the unfunded liability over time, which has resulted in

a positive amortization (shown in the dark blue bars). Additionally, the plan’s sponsors have made voluntary employer contributions (on top of the ADC) since 2014 to accelerate the funding of the plan, shown in gray bars.

Another interesting element, shown in this chart, is that the mortality assumption changes were always in the direction of higher costs before 2014, when a generational mortality table was adopted. Since that change, the amortization of gains and losses from mortality experience has gone both ways and produced much smaller changes that tend to offset over time. In fact, this plan made three major changes to its mortality assumptions: moving from no projection or static projection to generational projection; moving to public-specific mortality tables; and moving to benefit-weighted mortality tables, which assumes higher earners tend to live longer. In each of these three cases, liability was increased significantly.

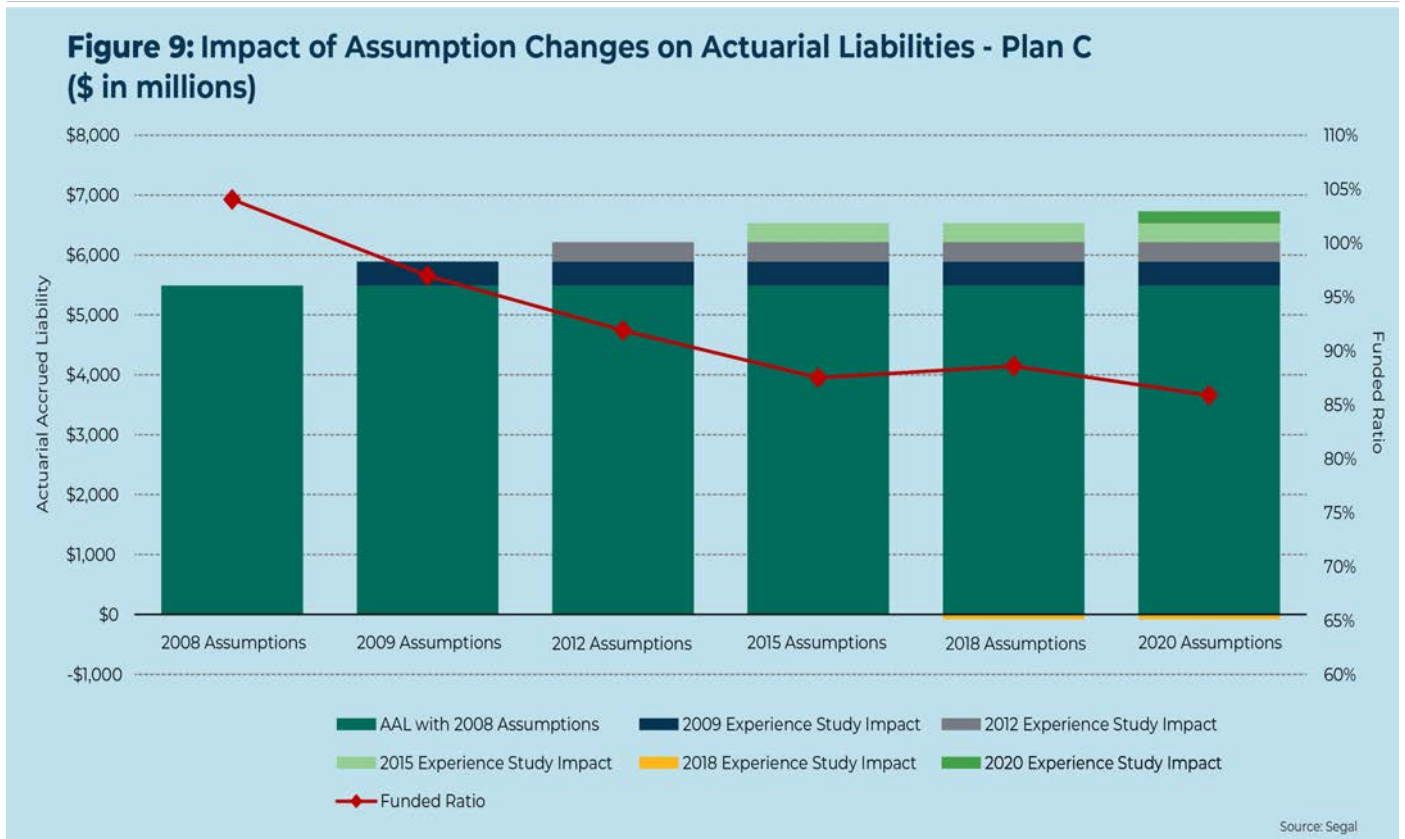
Figure 11 shows that for Plan A, the cumulative impact of assumption changes on contributions dwarfs the other impacts, which mostly offset each other. In short, the combination of the contributions made and non-investment experience that reduced the UAAL was slightly greater than the impact of investment losses. That left assumption changes being responsible for more than the

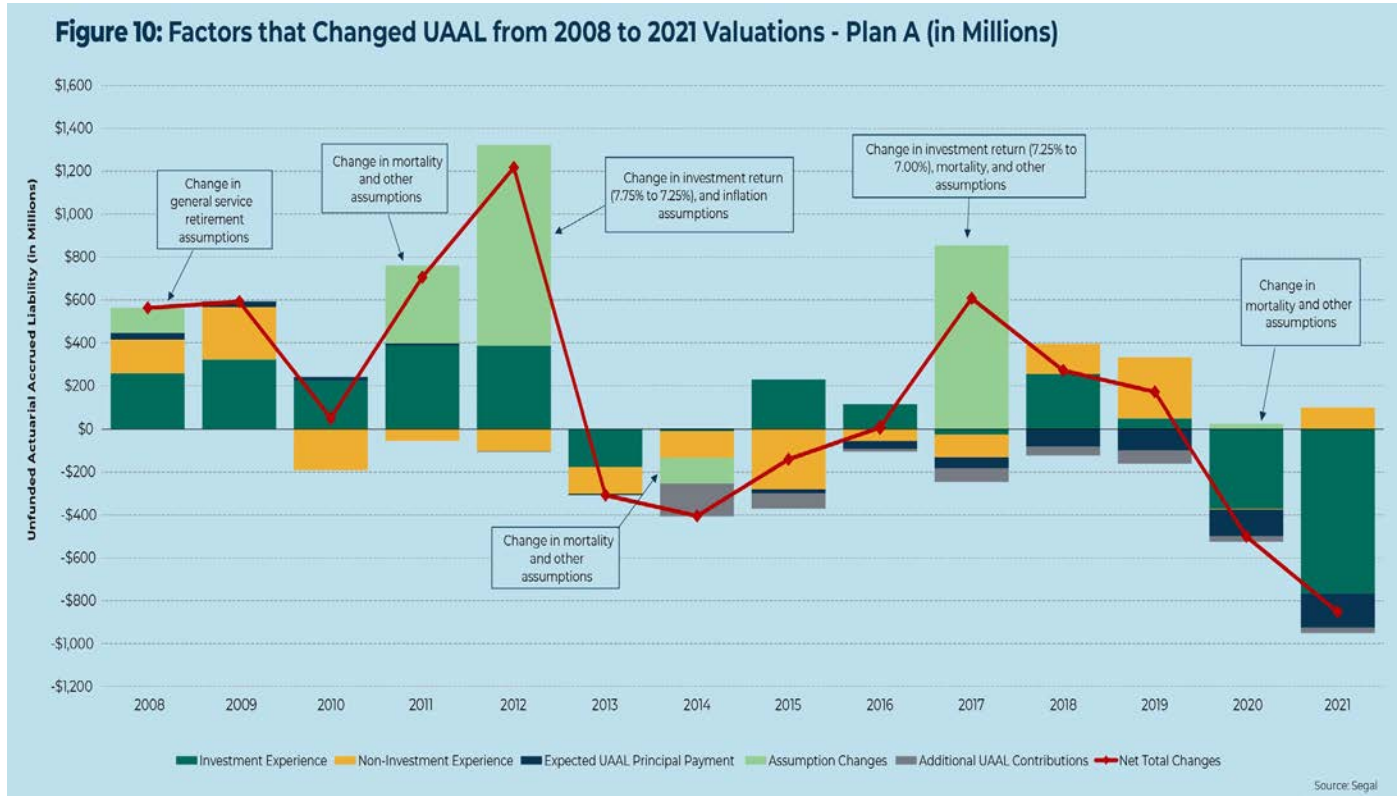
total increase in UAL during 2008-2021. And, this chart uses data starting just before the Great Recession, so it captures the full investment experience of the plan from the recession through the recovery.

In short, there is not a problem with how pension math works. Instead, this is what adopting more financially cautious assumptions looks like for pension plans: there is a greater likelihood of meeting or exceeding the assumed targets in the future, however, it creates the appearance that the plan is in a weaker position, and it requires more funding to reduce future risks. It is worth noting that paying to reduce risk is a very common trade-off in financial decision-making. Also, these assumption changes reflect the reality that retirement is becoming more expensive for all American workers, not just pension plan participants.

Another key takeaway is this: given the number of assumption changes made since 2009 and the fact that changes typically are amortized over long periods of time to keep costs stable, no one should expect public plans to have reached full funding under the new assumptions by this point in time. That is especially true if plans continue to reduce investment return assumptions.

Authors’ note: we are not, in any way, arguing that these

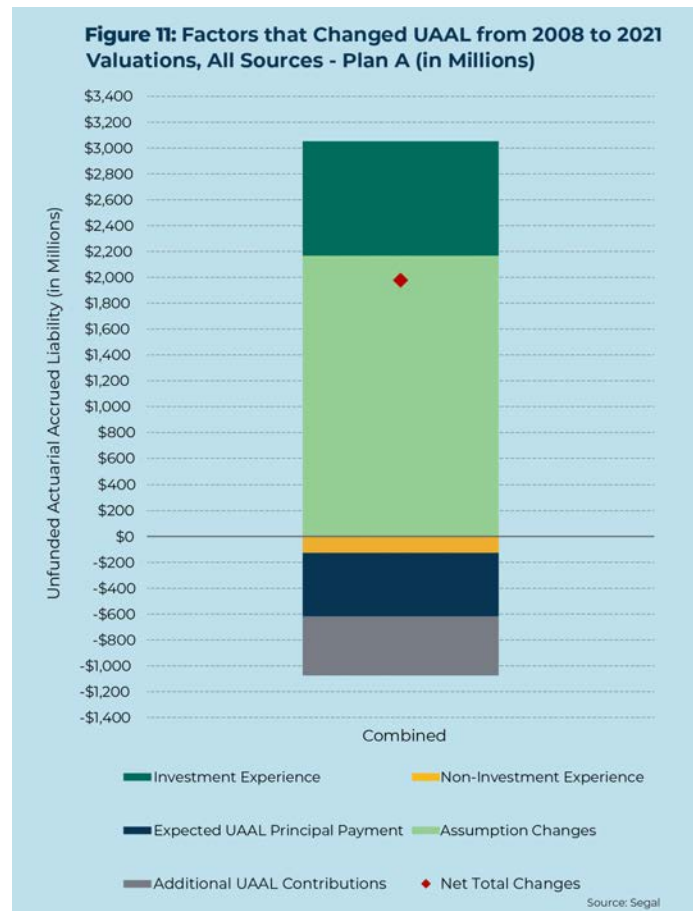


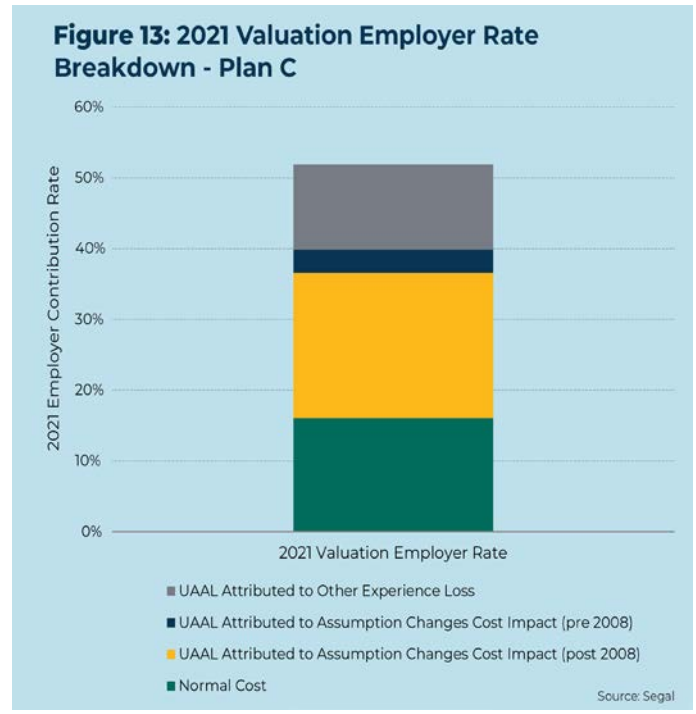
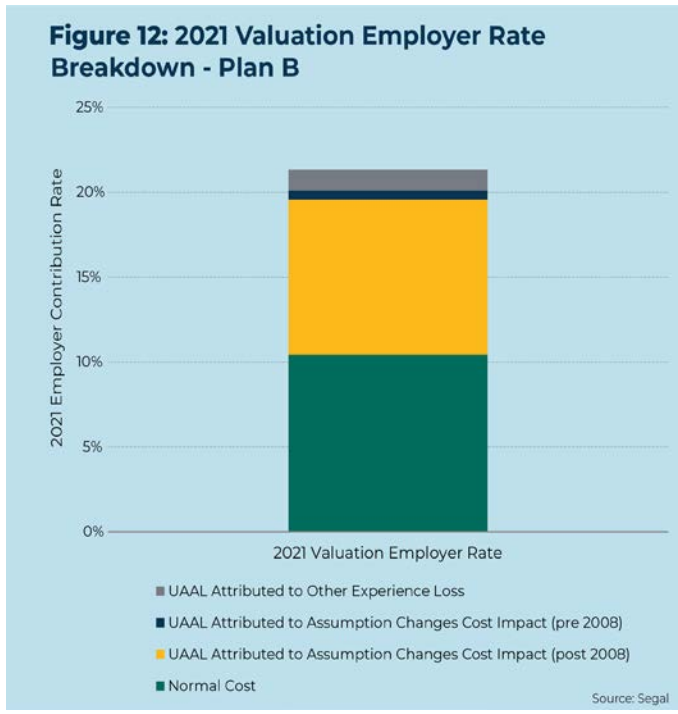


assumption changes are not appropriate or advisable. Plans should adopt assumptions that they believe are realistic. We are simply pointing out the impact of these decisions on the standard metrics that are commonly relied upon.

Of course, if unfunded liabilities are impacted, so are costs. **Figure 12** illustrates the employer contribution rate from the most recent valuation for another one of the sample plans. It has four components: normal cost, experience losses, pre-2008 assumption changes, and post-2008 assumption changes. Normal costs are expected to occur each year and represent new benefit accruals, and normal costs are also impacted by assumptions. However, it is instructive to look at the source of additional costs above the normal costs. For this plan, the cost of post-2008 assumption changes dwarf the other sources of UAAL. The unfunded liability contribution makes up nearly half of the total employer rate for this plan, and the main driver of that is assumption changes that occurred after the Great Recession.

Similarly, **Figure 13** shows the same breakdown for the third sample plan (Plan C). While the costs of this plan can attribute more to experience losses than the plan highlighted in Figure 12, the post-2008 assumption changes constitute the greatest portion of the employer rate, greater even than the normal cost.





V. EVOLVING FUNDING POLICIES GENERATING FASTER PAYOFF OF UNFUNDED LIABILITIES

During the Great Recession, many states faced the dual challenges of pension assets falling in value while tax revenues were declining. The result was that pension contributions were not always sufficient to make plans sustainable in the long run (without a future correction). Contributions that are not sufficient to stabilize unfunded pension obligations often are described as negative amortization.

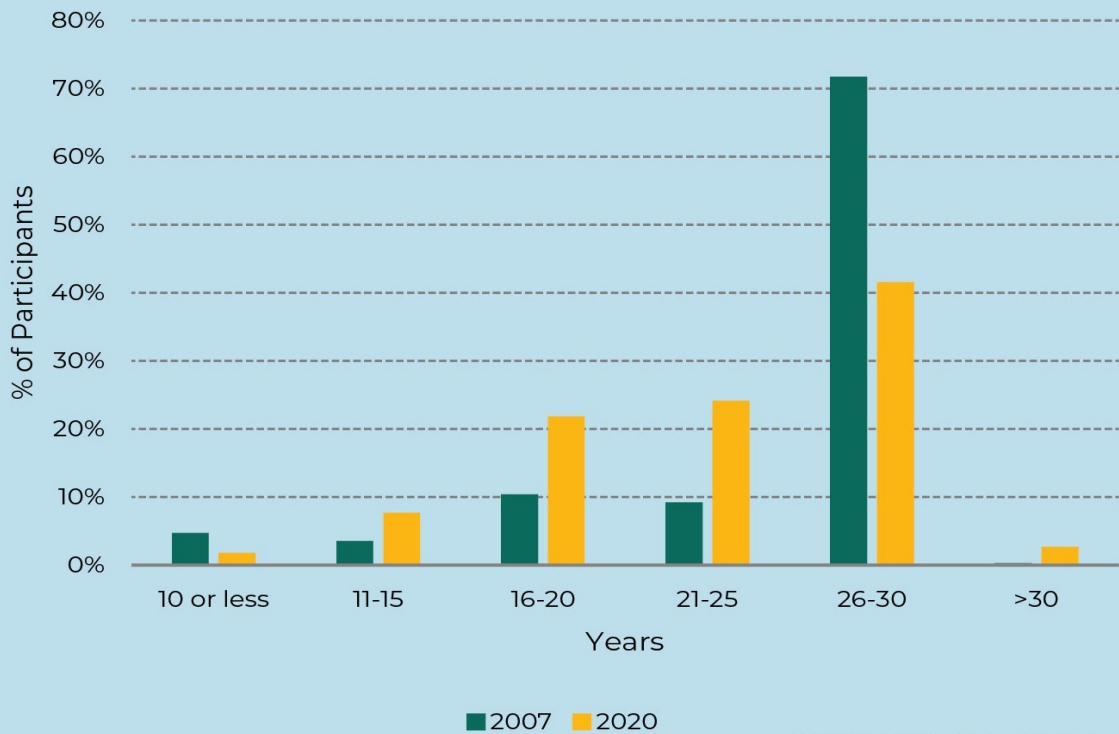
Negative amortization can be acceptable, at times. If negative amortization occurs because payroll is projected to grow (and unfunded liabilities are being paid as a percentage of growing payroll), then an actuarially determined contribution can produce temporary negative amortization. However, if negative amortization is a persistent condition over long periods of time, one would expect unfunded liabilities to grow even if current assumptions are met. Sponsors could choose to have negative amortization during a period of fiscal distress to sustain public services, with shortfalls to be made up at a later date, but many

pension professionals are hesitant to embrace this strategy, particularly in jurisdictions with weak economic growth, a history of underfunding, or other aggravating factors.

Actuarial organizations have looked closely at this issue in recent years and have provided more guidance on the appropriateness of various funding methods. This guidance has considered both the length of amortization periods and other issues, such as whether open or closed amortizations were being used, and whether amortization bases are layered or combined.

The Conference of Consulting Actuaries produced a paper, *Actuarial Funding Policies and Practices for Public Pension Plans* (also known as the “White Paper”), which notes some unacceptable practices including closed, layered periods exceeding 30 years and open amortization with periods using combined bases that amortize unfunded liabilities over periods exceeding 25 years. This guidance aims to further strengthen funding practices, as amortization

Figure 14: Remaining Amortization Periods of Public Plans in 2007 and 2020: Share of Participants



Source: Public Plans Database

policies generally used longer periods of time before the Great Recession. Given that the funding of public plans was generally improving significantly from the 1970's through 2000, the common perception was that funding policies were working well. However, the extreme volatility of the Great Recession and the maturation of public plans, combined with other factors have caused the profession to reconsider its guidance.

Those changes are visible in the data available today. By comparing the remaining amortization periods of plans in the Public Plans Database, the participant-weighted results (**Figure 14**), we see significant changes in the length of amortization periods since 2007. At that time, 72 percent of participants were in plans with amortization periods of 26 years or longer, and nearly half (47 percent) were in plans using a 30-year amortization. By 2020, 42 percent of participants were in plans using 26-30 year periods. Meanwhile, the share of participants in plans with remaining amortization periods between 11-25 years has more than doubled.

It is worth noting two things when considering these changes: first, this occurred during a difficult period of time, as public plans recovered from the Great Recession. Second, similar to lowering the discount rate, employing shorter amortization periods creates the appearance that long term costs are rising, though existing costs are simply being paid down more quickly and will lead to lower costs down the line. But, like assumption changes discussed above, the impression created by simply looking at high level data, like contribution (ADEC) trends, is that costs keep rising.

This tightening of funding practices follows the general trend that has been observed over many decades during which public plans have moved to strengthen prefunding of future benefits. In fact, before the 1970s, prefunding was uncommon.

The results of these changes—along with improved contribution discipline—are visible in other macro metrics, such as the contribution adequacy research that has been produced by the Pew Charitable Trusts. In their recent report¹¹, they note:

“In 2019, states were on the cusp of meeting minimum contribution standards—measured using the net amortization benchmark—for the first time this century, and preliminary 2020 data suggests that this benchmark was met that year. Pew measures the adequacy of state pension contributions by comparing employer pension payments to a net amortization benchmark, calculated as the amount needed to keep pension debt from growing, assuming investment returns hit their target. In 2014, when Pew first introduced this measure, only 17 states met or exceeded the benchmark; overall, states fell short of the metric by \$28 billion. Five years later, the 2019 data reveals that 35 states achieved the minimum contribution standard, with the remaining 15 states accounting for a deficiency of less than \$1 billion.”

Among industry leaders, it is commonly believed that being on a strong funding trajectory is a better indicator of future success than a simple funding ratio, which essentially provides a snapshot of a moment in time when markets might be significantly above or below longer term trends.¹²

This progress was hard-earned, particularly as it was coupled with the adoption of more conservative assumptions as described above. However, it will contribute to an increased probability that plans remain in a strong fiscal position to pay benefits in the future and with more stable costs.

Not all public plans started from the same funding position entering the recession and have not had the same funding experience since the crisis. This had an impact on how benefit reforms affected plan participants in the wake of the crisis. According to recent research from the *National Bureau of Economic Research, Reductions in the Generosity of State and Local Employee Pensions: Comparison of Plans with and without Social Security Coverage*, public plans that had a funding level of less than 75 percent experienced much larger benefit reductions (19.1 percent) than plans that were better funded (10.5 percent) during the period from 2000 to 2020.¹³ While changes to discount rates, mortality assumptions, and amortization periods have been widespread, their impacts on plan members have not been.

VI. INVESTING AGAINST AN EVOLVING BACKDROP

Thus far, we have focused on the funding and liability side of public plans, but we have not discussed the actual investment decisions made by public plans. Nor have we discussed defined contribution plans, the most common alternative to defined benefit plans. In this section, we review the evolution of public plan asset allocation decisions and the institutional processes intended to ensure that plans adhere to a consistent long-term plan. We also review empirical data regarding the behavior of retail investors to illuminate the shortcomings of defined contribution plans that are often proposed as a replacement for defined benefit programs. While defined contribution plans can be a helpful supplement to defined benefit programs, the evidence continues to suggest that individuals are ill-equipped to bear the responsibility for a) saving enough during their working years, b) investing the savings appropriately, and c) withdrawing their savings at an optimal pace.

Investment Market Changes

Before diving into the actual investment decisions made by plans, it is important to understand the role played by different investments as part of a strategic asset allocation.

Then, we can discuss how the changing market environment has affected the optimal allocation to each type of asset.

Several decades ago, asset allocation was a much simpler exercise for many public plans (and institutional investors more generally) with the choices being limited to public equities and fixed income.

Public equities were the core of public plans as they offered capital appreciation, dividend income, and an inflation hedge, as companies could pass through price increases to consumers in many cases. Fixed income served as the ballast in a portfolio by providing relatively low volatility, steady income, and defensive characteristics, as interest rates typically fall during periods when risk assets sell-off, leading to price appreciation for bonds. When equity market returns and yields on risk-free treasury bonds were in the high single digits, the combination was sufficient to deliver meaningful nominal and real (net of inflation) returns to public pension plans.

In the 1980s, for example, the average level of the U.S. 10-year Treasury yield was 10.57 percent¹⁴ while inflation

compounded at a ~5.1 percent rate as measured by the U.S. Consumer Price Index, implying that investors who bought and held government bonds earned an attractive nominal and real return. In a time where returns of ~8 percent were typically projected for pension plans, investors didn't need to reach for risk.

Even better, however, were public equity returns. The total return of the S&P 500 Index was 17.54 percent per annum through the 1980s, despite the stock market crash of 1987 that wiped out 22 percent of the market value in a single day.

In the 1990s, the story was even better for public equities with the total return of the S&P 500 Index rising to 18.17 percent per annum with returns late in the decade inflated by the bubble in technology, media, and telecom (TMT) stocks. Bonds held their own with an average yield on the U.S. 10-year Treasury at 6.64 percent through the 1990s, a level that

was still high compared to inflation that compounded at 2.9 percent per annum.

At the turn of the century, the story changed. From March of 2000 to October of 2002, the TMT-heavy NASDAQ Composite Index declined by 78 percent and the S&P 500 Index fell 50 percent as the TMT bubble burst. The Federal Reserve cut interest rates sharply during this time, taking the U.S. 10-year Treasury yield below 4 percent by late 2002. The need for new tools became evident to public pension plans. While investor appetite for alternative investments such as hedge funds and private equity had begun to increase in the 1980s and to "take off" in the 1990s, the 2000s were a watershed.

While the first hedge fund dates to the 1940s, it was only in the 1990s that hedge funds began to attract sizable asset flows. The appeal of hedge funds was that they could profit from investing in assets that were expected to appreciate

Figure 15: Public Plan Target Asset Allocations, 2001-2021

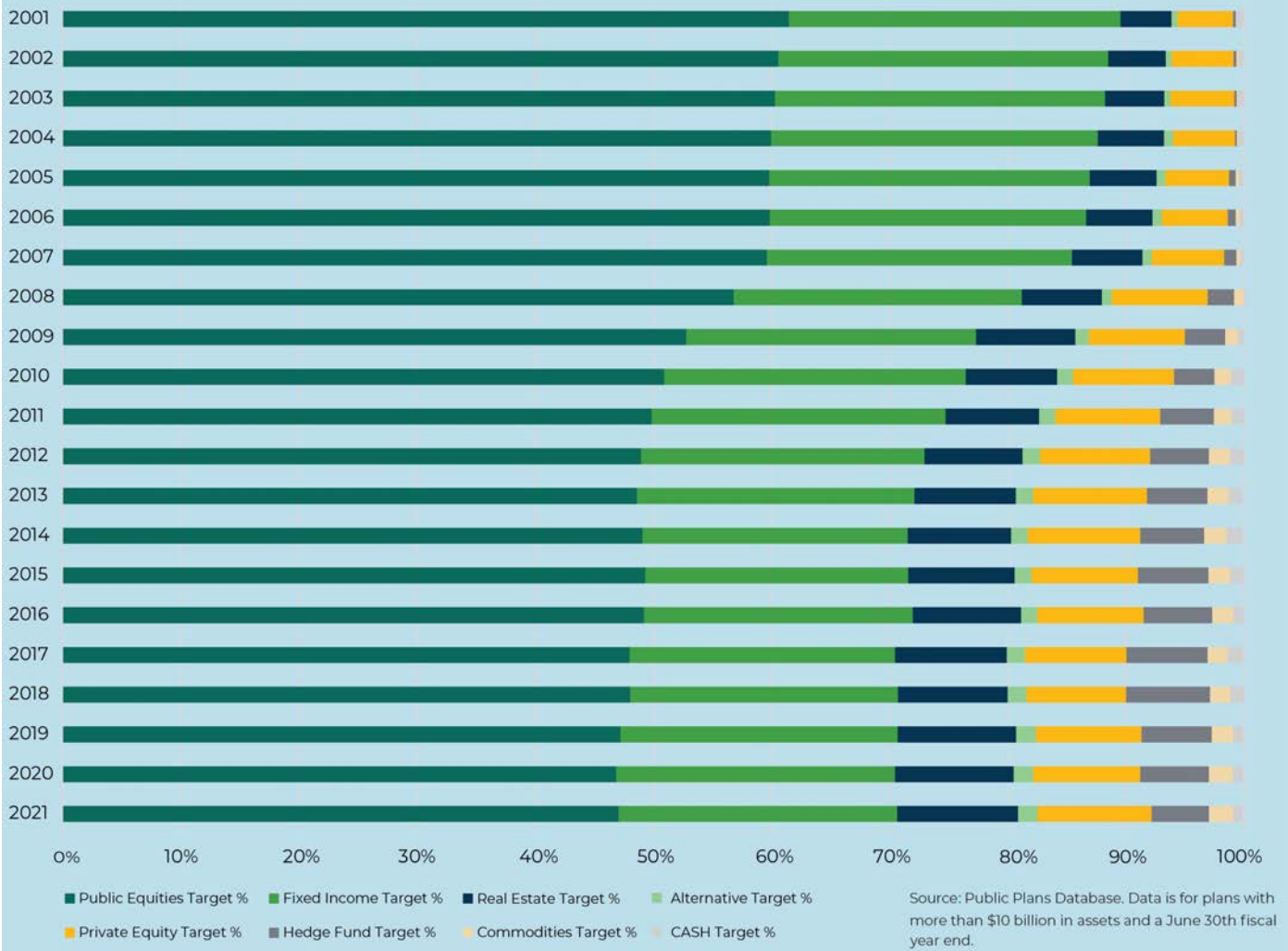
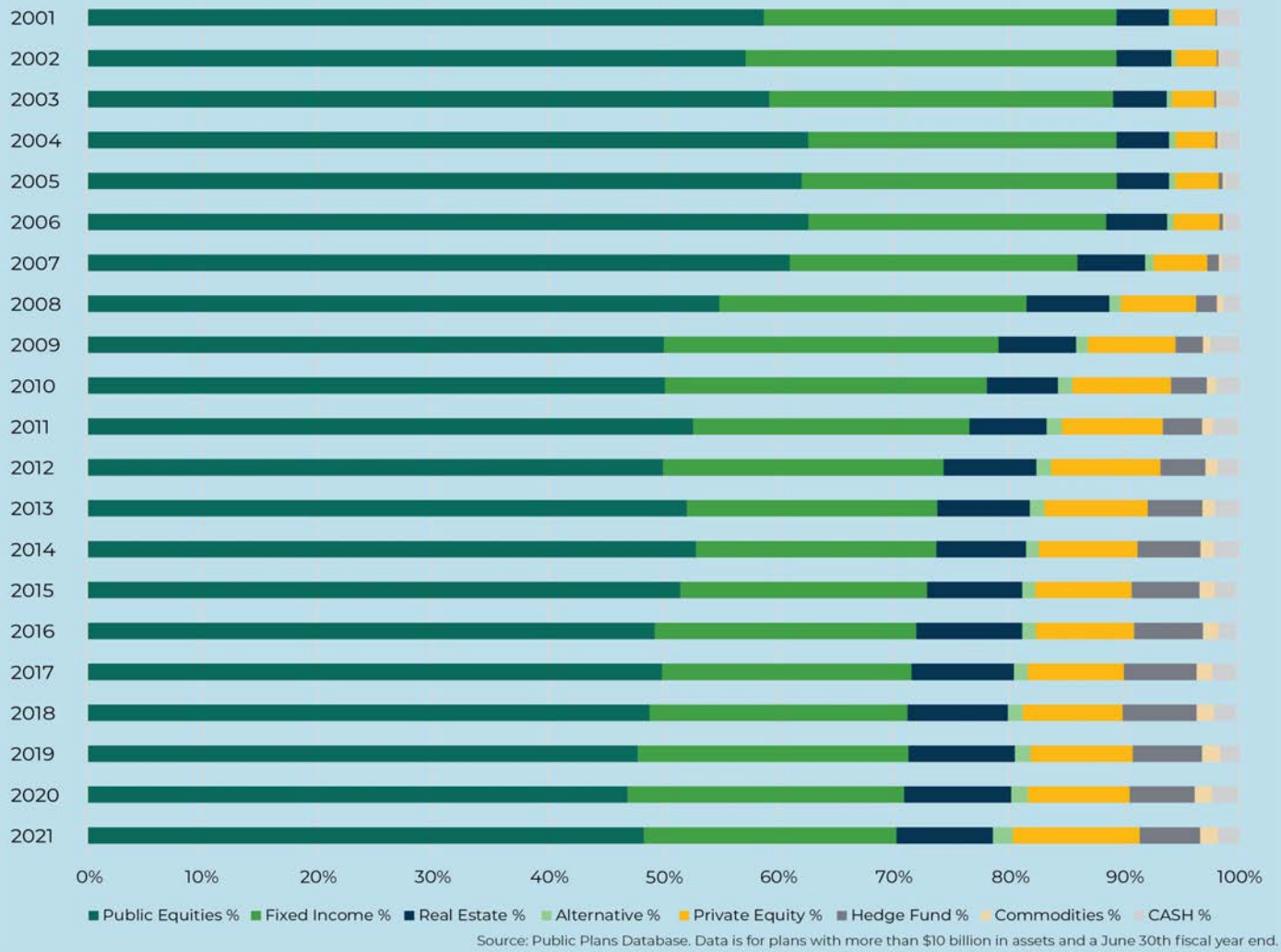


Figure 16: Public Plan Actual Asset Allocations, 2001-2021



while also selling short assets they expected to depreciate. The net effect of the long and short positions was to mitigate the sensitivity of the funds to the wider market volatility, hence reducing perceived risk, while purportedly not giving up potential rewards. Hedge funds were particularly appealing in periods of elevated market volatility, especially when there was high dispersion across sectors and securities that allowed for profitable trades on both the long and short side of the trading book. Hedge funds did not perform as well during strong bull market runs, as their short positions were a drag on performance, not to mention the very high fees typically charged for such strategies.

Many of the household names in private equity originated in the 1970s including KKR, Thomas H. Lee Partners, Clayton, Dubilier & Rice, among others. However, fundraising was counted in the single digit billions of dollars through the early 1980s and only began to take off late in the 1980s when

the infamous leveraged buyout of RJR Nabisco occurred at a then record price of \$25 billion (which would remain the largest take out until well after 2000).

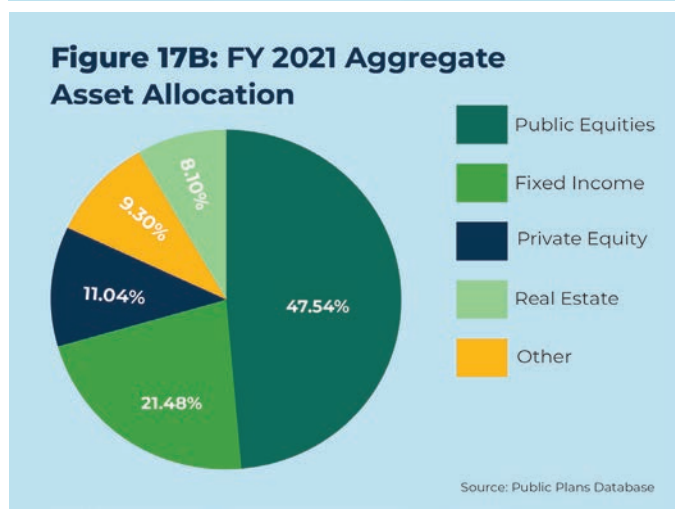
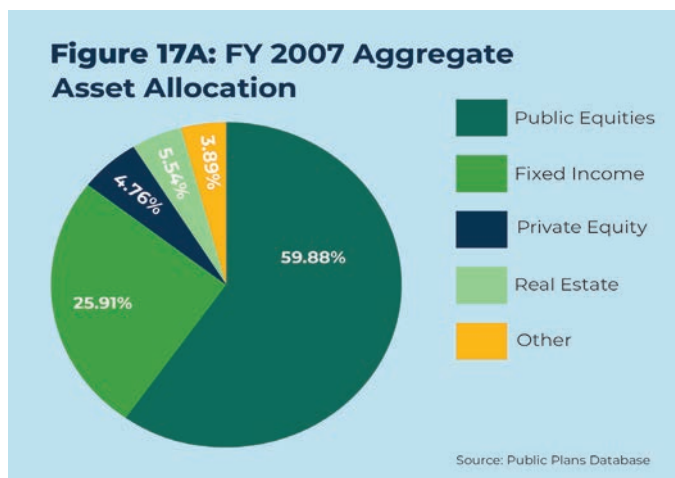
The original premise of private equity was that by buying and running an entire company, private equity managers could change the firm’s strategy, manage operations more efficiently, and/or optimize the company’s capital structure (often by applying significant amounts of leverage to the balance sheet). There was legitimate appeal to the structure as PE firms selectively acquired and worked to transform companies into higher performing entities. In many cases, over time returns increasingly relied more heavily on leverage with less of the upside driven by strategic or operational initiatives. In private equity, the leverage is on the target company’s balance sheet, and the debt is nonrecourse to the private equity sponsor taking over the company. This structure creates a “Heads, I win; tails, you

lose” scenario in which success leads to large returns for the PE firm and its investors while failed acquisitions that end in bankruptcy or restructuring create disproportionate losses for the lenders and other stakeholders in the company relative to the owners. As interest rates fell and credit terms eased, adding leverage to buyout targets became an even more appealing way to inflate returns. A rising public equity market added further to potential returns as exit valuations, i.e., the price at which a PE firm would sell the company back to the public or to another strategic or financial buyer, rose.

Looking at public fund investment decisions since the GFC, we see an ongoing reduction in exposure to public equities for both large (over \$10bn of assets) and mid-size plans (\$1-10bn). Interestingly, if we differentiate between target allocations (Figure 15) and actual allocations (Figure 16), we can see that the decreases in allocations to public equities from 2007 to 2010 primarily reflected depreciation of existing assets, as the S&P 500 Index declined by over 55 percent from the market peak in October 2007 to the trough in March 2009. Since fiscal 2011 (for both June and December fiscal year plans), target allocations for public equities have been reduced by 300-500bps cumulatively over the ensuing decade for mid-size and large plans. Among large plans, the decrease in target allocation to public equities has been offset by an increased target allocation to real estate which is viewed as both an inflation hedge and a source of income. Contrary to popular opinion, target allocations for private equity have been relatively stable within a 100bps range through the last decade (for large plans with a June fiscal year).

In sum, public pension plans materially shifted their asset allocation from 2007 to 2021, but the shifts were largely in response to changing market dynamics that warranted a different approach to asset allocation. Where in 2007, the combined allocation to public equity and fixed income totaled almost 85 percent of assets, by 2021, the two categories comprised 69 percent of assets (Figure 17).

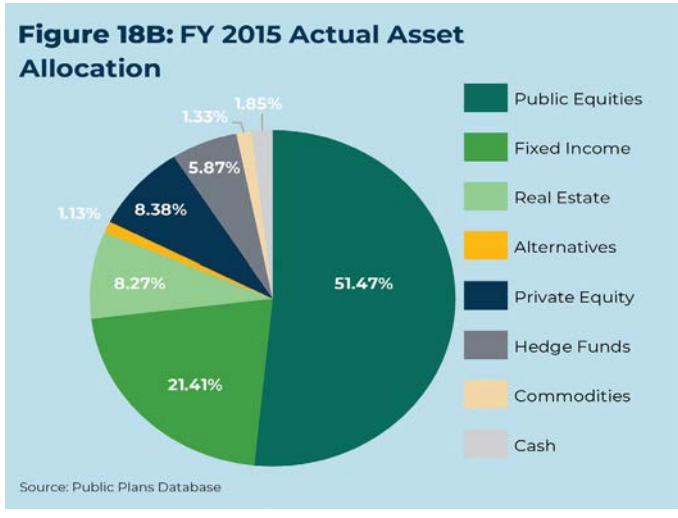
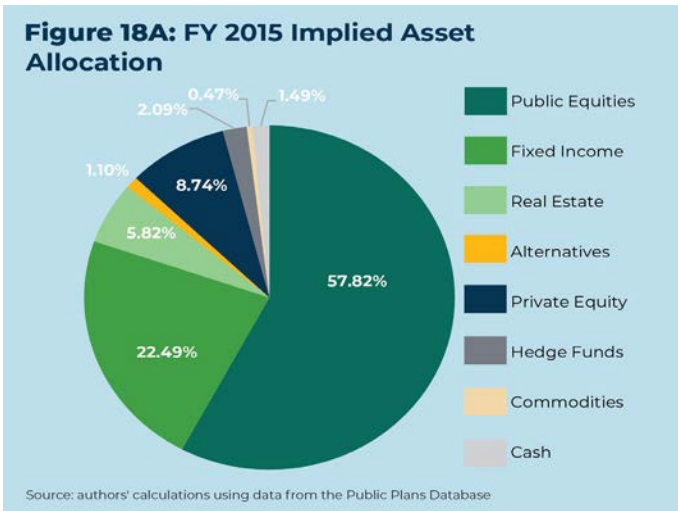
Importantly, the 2010s were an extraordinarily difficult period for public plans in some regards. The average level of the U.S. 10-year Treasury was only 2.4 percent through the decade with CPI compounding at 1.8 percent. With an average allocation of 23 percent of assets to fixed income, public plans were effectively seeing their returns dragged lower by the asset that was supposed to reduce risk. True, fixed income assets reduced portfolio volatility, but the low absolute level of returns made achieving return targets more challenging. Through the decade, we saw a meaningful shift into real estate assets (~+250bps to actual allocations and target allocations for large June filers) as well as a ~250 –



300bps increase in allocations to hedge funds. During this time, the target fixed income allocation for large June filers declined by only 100bps, but the actual allocation fell by 550bps, funding the entirety of the increase in real estate and hedge funds.

The investment consulting firm Callan has studied this issue.¹⁵ They found that to achieve a 7.5 percent return in 2015, an investor would need to take on three times as much risk as they did two decades before. An investor also would need to invest in a more complex and expensive mix of assets than they did before. This shift in the investment environment has led to changes in the asset allocations of public plans as explained below.

Target and actual asset allocation figures can tell us a lot about investment decisions when viewed alongside total return figures for each asset class in any given year. What becomes clear from viewing the last 15 years of data is that public pension plans have prudently implemented processes that lead to buying risky assets when prices are lower and selling them when prices are higher. For example,



levels implied by the simulation, but private equity, hedge fund, and real estate allocations were 327bps, 207bps, and 178bps higher than the simulation suggested, implying significant reallocations to riskier asset classes after they had underperformed.

Taking a different approach, if we assess the period after risk assets bottomed from 6/30/2009 to 6/30/2014, had the plans made zero allocation changes, we would have expected to see public equity balances grow from just over 50 percent of the asset allocation to 57.8 percent (Figure 18A). This large increase would have been the result of a cumulative total return of 113 percent from public equities in the five-year period, which outpaced every other asset class handily. However, public plans did not allow the gains to accrue. Instead, they reallocated capital away from public equities into other assets that had appreciated less in order to remain more closely aligned with their target allocations (Figure 18B). Doing so was advantageous as the following two years delivered a total public equity return of -0.3 percent versus a total return of over 26 percent for real estate, 16.6 percent for private equity, and 7.5 percent for fixed income.

The key point here is not to isolate individual anecdotes. Our goal is to highlight that the ongoing process of professional management of public plans ensures that strategic asset allocation targets are established based on forecasted cash flows to satisfy liabilities and that managing assets to these targets avoids trading decisions based on prevailing market conditions (e.g., panic selling), which may result in suboptimal positioning. Our assessment indicates that professionally managed plans not only have access to more asset classes at a substantially lower cost than do individuals in defined contribution plans, but they also add sustained value to the plan assets through their methodical approach to rebalancing assets in response to major market moves and/or adjustments to plan structure or expectations.¹⁶

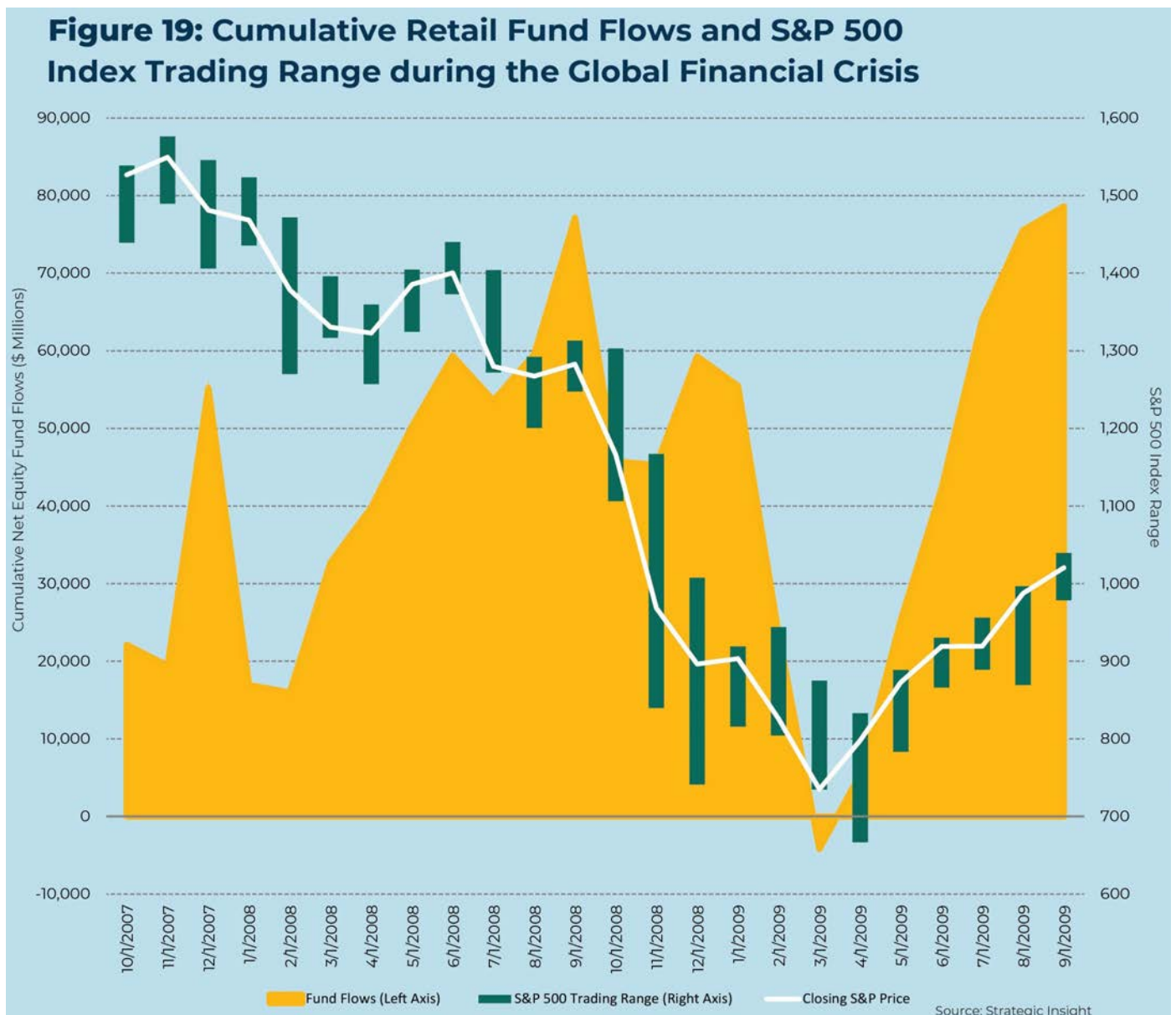
if we look at the more than 60 plans that have over \$10 billion of assets and report on a June fiscal year, there are two periods of time that highlight the value of reallocating capital among asset classes.

The first instructive phase is during the GFC. From the end of the 2007 fiscal year (6/30/2007) to the end of the 2010 fiscal year, plans endured a sharp decline in the value of riskier assets such as public equities, private equity, and real estate. If we simulate the asset allocation that would have resulted with no reallocations of capital and no inflows or outflows for plans, the fixed income allocation would have increased from 25 percent of assets to 35.7 percent in only three years. This increase reflects the fact that bond yields declined during the GFC, raising the value of the bond portfolios owned by pension plans even while other assets declined in value. In contrast to this simulated level, however, fixed income assets did not rise to 35.7 percent. Instead, they rose to 27.9 percent, a difference of 7.8 percentage points. Interestingly, public equity allocations ended the period at

VII. CONTRASTING PROFESSIONALLY MANAGED PUBLIC DEFINED BENEFIT PLANS AGAINST RETAIL INVESTMENT DECISIONS

Previous studies have demonstrated the superior value add of professionally managed defined benefit plans over the alternative of defined contribution plans,¹⁷ while others have shown that retail investors often sell when they should be buying and vice-versa.¹⁸ We have attempted to examine

the question of retail investment behavior in a different way. By examining equity mutual fund and exchange-traded fund (ETF) flows, we can gain a sense of when retail investors buy and sell different asset classes and the context in which they make such decisions. We acknowledge that mutual fund and

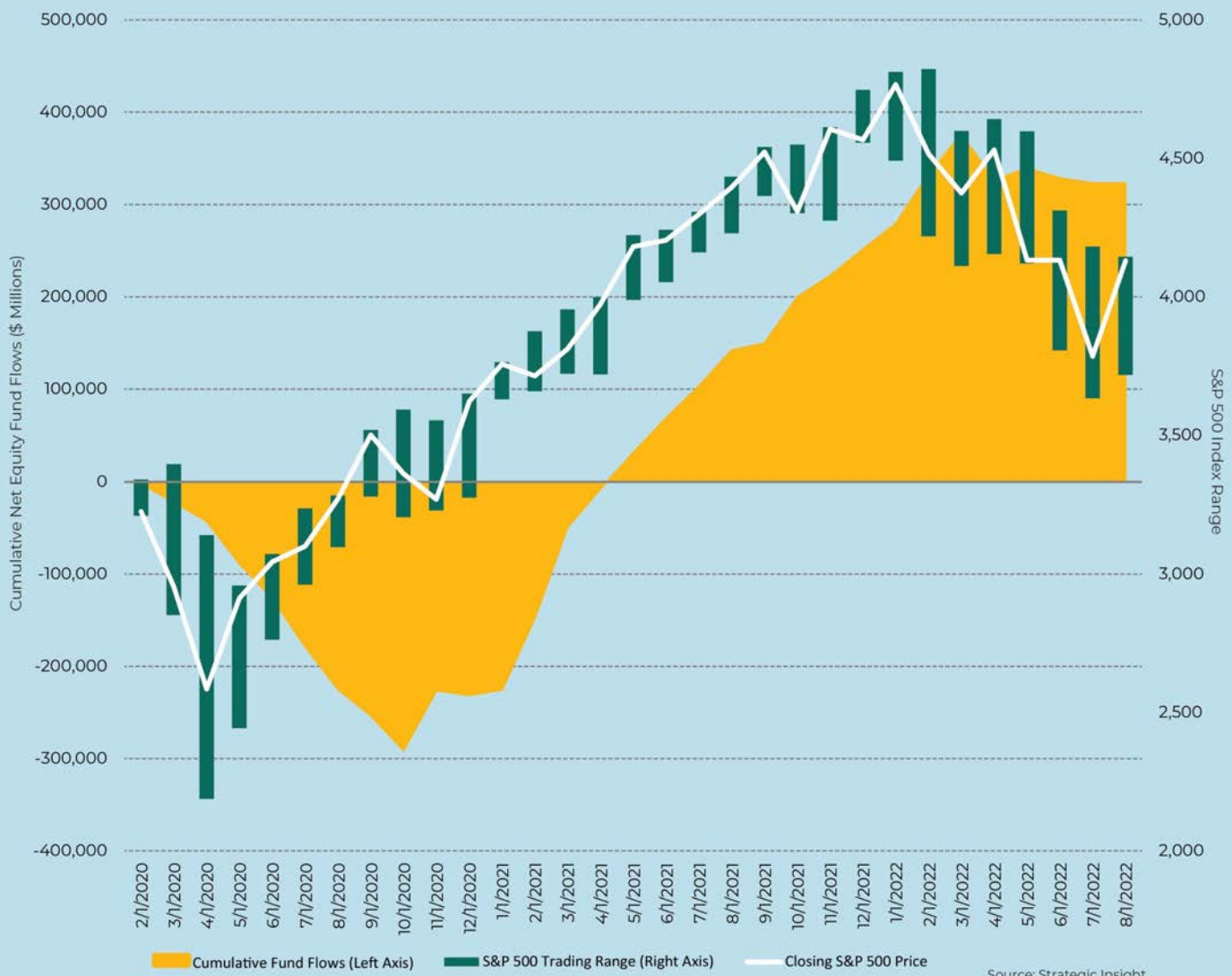


ETF flow data also does include some institutional flows, but we would assert that aggregating flows at a monthly level should strip out much of the noise of fast money inflows and outflows. For example, we know that institutional asset managers will often use ETFs to gain exposure on a short-term basis to a sector or a theme. However, for longer-term investments, these managers typically prefer to select their own securities or develop custom baskets that would not skew this fund flow data. As such, we feel confident that the insights derived from examining monthly flows are predominantly reflective of retail activity.¹⁹⁾

We examined monthly mutual fund and ETF flows back to 1993. Notably, the scale of flows has increased significantly

over time as the balances invested in retail accounts (both defined contribution and all other investment accounts) have grown. Looking beyond scale, we found a consistent pattern of retail buying at market peaks and selling at or near market troughs. More recent years have seen this pattern become even more extreme, likely reflecting the dependence of retail investors on their own self-directed assets to fund retirement in the absence of defined benefit programs. Put simply, the assets involved have grown in scale and the retail investors responding to markets cannot afford to lose their nest eggs. Unfortunately, the reality is that the fear that leads investors to sell often means they are locking in the very losses they are trying to avoid and then missing the recovery in share prices that follows.

Figure 20: Cumulative Retail Fund Flows and S&P 500 Index Trading Range during the COVID-19 Pandemic



Source: Strategic Insight

Two specific experiences highlight this pattern: the Global Financial Crisis and the 2020 COVID-19 Pandemic. In the case of the GFC (**Figure 19**), as discussed above, the S&P 500 Index declined by over 57 percent from its October 2007 peak to the March 2009 low. In the 12 months from October 2007 to September 2008, retail investors bought \$77 billion of equity mutual funds and ETFs at a dollar weighted average of the S&P 500 Index at 1416 (versus the then all-time high of 1576). One could argue that this behavior was reasonable as investors saw a buying opportunity after the market fell from record highs to more attractively valued territory. However, the subsequent six months undermine that argument, as investors pulled over \$81 billion out of mutual funds and ETFs from October 2008 to March 2009, at an average S&P level of 846, effectively locking in a 40 percent loss, with net selling at levels not seen since 1996. It took six more months for investors to reinvest this \$81 billion, at an average S&P 500 level of 929. Keep in mind, the purchases from April 2009 merely got investors back to the positions they had before they started locking in 40 percent losses in October 2008.

Once again, during the COVID-19 Pandemic, retail investors displayed a tendency to sell low and buy higher. From February to October of 2020, retail investors sold over \$290 billion of equity mutual funds and ETFs at an average S&P 500 Index level of 3,150 (**Figure 20**). From November of 2020 to early May of 2021, the investors then bought back an equivalent amount of equity mutual funds and ETFs at an average S&P 500 Index level of 3,850, 22 percent higher than the average sales only months earlier.

These two anecdotes are powerful on their own, but our analysis of equity fund flows indicates that over the last 25 years, investors have pulled money out of equity mutual funds and ETFs in 41 percent of the months in which the market fell and in 63 percent of the months in which they fell more than 5 percent. In other words, the sharper the sell-off, the more likely retail is to sell shares. Conversely, while it is clear that on average through the last 25 years, retail investors have been more likely to buy shares in a given month than sell (due to demographic trends and the need to accumulate retirement savings), we found that in months preceding a market decline of 5 percent or more, investors made net purchases of equities in 79 percent of cases while they were net purchasers in only 68 percent of the months that preceded a market rally of 5 percent or more. One could interpret this to be a signal of retail investors being afraid to invest just before sharp rallies that might follow previous market slides, but also being too optimistic about buying equities just before a market correction after a steep ascent. Both cases show that retail investors historically have not been particularly good at timing the market.

To be clear, we in no way intend to impugn the decisions of retail investors. Instead, the point of these observations about retail behavior is to contrast their decisions against those of professionally managed pension plans that typically have guidelines that prompt, if not require, them to add to assets when prices are down and reallocate away from assets when prices are up. Moreover, the disciplined process put in place for most public plans means there is ongoing monitoring and decision-making, while individuals managing their own retirement savings might only be aware of material changes in markets when they make headlines or when investors receive a quarterly statement, by which time it might be too late to act on a major sell-off or rally.

Investment decision making processes and outcomes are only part of a lengthy list of reasons why defined benefit plans lead to better outcomes for participants and society. It is clear that professionally managed plans benefit from economies of scale when negotiating fees for asset management services while defined contribution participants often pay “retail” for their mutual funds and ETFs. While 401(k) plans themselves have made significant progress on lowering investment fees assessed to participants, personally managed investments outside of employer plans (including throughout the post-retirement years when workers usually take their money out of their plans that have fiduciary protections) continue to be a weak spot for individually-managed retirement structures.

Over decades, the fee advantages alone compound out to material amounts of retirement wealth that is foregone for investors. As importantly, the asset allocation decisions of an individual are often dictated by the risk of outliving her retirement assets, or conversely the risk of losing too much money from investing in higher return assets that are more volatile. Participants in pooled retirement vehicles are much less susceptible to these risks as new participants who are younger allow older participants to remain invested in riskier, higher return asset classes like public and private equity and real estate. As they age, individuals typically need to sell-off these higher return asset classes and shift the funds into fixed income, at much lower returns, to manage the risk of capital losses in the short-term. Reducing short-term risk in these cases generally entails guarantying long-term opportunity costs.

Overall, the evidence from our analysis and multiple studies before it supports the view that defined benefit plans deliver superior outcomes to defined contribution. This is not to say that defined contribution plans are a bad idea. Rather, they are a great idea as a complement to defined benefit plans, as individuals can accrue additional retirement funds knowing they have a dependable stream of annuitized

benefits from their pension. In the future, there are areas of further research that could be very valuable. For instance, are there ways to make DC plan decision-making more similar to that of DB plans? Also, are participants who invest in lifetime funds less likely to buy and sell due to short-term market changes, given that their funds hold different asset

classes that would get rebalanced? Ways to professionalize the decision-making of DC investments and methods to pool risk to allow participants to optimize their asset allocation more effectively would be valuable additions, as would the purchasing power related to asset management fees that would come with larger sums of capital to be invested.

VIII. TAKEAWAYS

The Great Recession sparked a prolonged period of time when investment markets slumped, presenting a major challenge to retirement plans and individual investors alike. Looking back through this difficult period, and the years that followed, presents an opportunity to see how public pension plans dealt with the greatest economic challenge since the Great Depression.

First, it took a number of years for asset levels to recover from the Great Recession. The median plan needed six years to return to the level of assets that were under management in 2007. Throughout the period of the downturn and recovery, roughly 2007-2013, public plans still made \$1.4 trillion in benefit payments. Over the entire period from 2007 to 2021, public plans have paid out \$3.8 trillion in benefits and another \$89 billion in withdrawals.²⁰ Meanwhile, by the end of fiscal year 2021, public plan assets rose to levels that—on average—are 88 percent higher than in 2007. That public plans still were able to pay benefits while recovering and then growing their asset base demonstrates that these plans are built to weather the ups and downs of the market, while still providing retirement security to their members.

Second, public plans have been adopting a more fiscally cautious approach, including a more pessimistic outlook for future market returns, to develop their contribution levels. This strengthens a plan for the future, but causes the plan to look more poorly funded in the short term as this inflates liabilities. These assumption changes continue to have a material impact on stated funding levels and ratios today.

Among the three sample plans analyzed for this paper, assumption changes have moved the funding goal line by 13 to 21 percent, depending on the plan. For these plans, most of the increase in unfunded liabilities and contribution amounts that surfaced between 2008-2021 stems from the changes in plan assumptions, not investments falling short of targets.

Callan notes that over the past 46 years, public plans have

done very well in achieving their investment goals.²¹ They note that “The average fiscal year return between 1976 and 2021 was 9.7% and the median was 9.6%.” And relevant to this paper, “the loss experienced during fiscal 2009 due to the Global Financial Crisis was greater than all the other fiscal year losses combined.” A long-term perspective helps to assess the performance of public plans more accurately. Those who have allowed their views on public pensions to be shaped by one year of historically bad investment performance are missing the bigger picture that public plans have actually done remarkably well in the decades since the switch to prefunding of pension obligations.

Third, in addition to adopting generational mortality, which builds future mortality improvements into today’s assumptions, and lowering discount rates, funding policies have evolved significantly to pay down outstanding liabilities more quickly in future years. This move towards stronger prefunding and shorter amortization periods continues a broader trend that started after 1970 when most plans still used pay-go funding and were just beginning the shift to prefunding.

In the last 10 years there’s been a massive shift in the assessment of future mortality expectations for public plans, through adoption of generational mortality projections, public-specific tables, and benefit-weighted tables, all of which have increased the assessment of liability and cost to the plan in the near term. At the same time, these changes have led to more accurate and sometimes even conservative assessments of total liability, and are built in such a way that actuaries do not expect significant changes in the future like they used to 15 years ago. The strength of these assumptions has improved dramatically over that period. The experience studies actuaries are conducting today (for plans that have adopted these three changes) tend to have very little liability change due to mortality assumptions (only minor calibrations up or down), and it is expected that will continue going forward, despite the expectation that public plan members will continue to live longer as time goes on.

Even while plans changed assumptions, they also continued to deliver strong investment returns by rebalancing assets to stay aligned with strategy asset allocation targets. These reallocations typically involved moving capital out of asset classes that appreciated substantially into other asset classes that had underperformed. The net outcome was that public pension plans were selling high and buying low.

Since the Great Recession, public plans have reduced their exposure to fixed income and to a lesser degree to fixed income assets while increasing their holdings of real estate, hedge funds, and private equity. These decisions were sensible in a period of extraordinarily low inflation and interest rates and when equity valuations were rising at a double-digit pace year after year. In the environment facing

investors in 2022 with multi-decade high levels of inflation and rising interest rates, the future course of asset allocation decisions could look materially different from what we have seen since the GFC.

The behavior of public pension plans stands in sharp contrast with the actions of retail investors who tend to react to sharp market sell-offs by selling near the lows and tend to become excessively optimistic when markets are near highs. While defined contribution plans are an excellent complement to defined benefit plans, the evidence suggests that shifting responsibility to individuals for retirement savings and asset allocation decisions is likely to lead to suboptimal outcomes for the individuals involved and society at large.

IX. CONCLUSION

The devastating effects of the Great Recession lingered over the American economy for years after the official end of the recession. Public pension plans in particular have felt the impact of the crisis reverberate for years, especially as the period of the recession seemed to color many people's views regarding public pensions. A more balanced and nuanced view with the perspective of more than a decade since the recession's end shows that public plans actually managed the crisis as well as could be expected and have used the period of the recovery and the years that followed to strengthen their underlying position in preparation for a future crisis on the scale of the Great Recession.

Plans have adopted a number of strategies to fortify their funding basis, so they will be better equipped to weather future shocks. Nearly every plan has lowered its discount rate (the assumed rate of return on investments) and the median assumed rate has moved from eight percent to seven percent. This reflects signals from financial markets that returns will not be as high as in years past. Most plans also have made the move to generational mortality tables, which assumes that people will live longer in the future, and have built the costs of that increased longevity into their contribution rates. Finally, many plans have adopted shorter amortization periods to pay down any unfunded liability more quickly.

The investing environment for public plans, as well as other institutional and individual investors, has become more complex and expensive in the years following the Great Recession. Plans today have to carry more risk in order to

achieve the same returns that they could with safer assets three decades ago. This has led to marked changes in the asset allocations of public plans over the past fifteen years; however, the professional management of public plan assets does lead to positive outcomes as investment staffs actively work to rebalance portfolios and take advantage of moves in the market.

The Great Recession was a significant event for nearly everyone involved in the American economy and public pension plans were no exception. The Great Recession ended more than thirteen years ago and it is clear now that public plans have taken what they learned from the recession and made adjustments to better prepare for future economic downturns. The remarkable growth in public plan assets over the past decade, coupled with a series of major assumption changes, attest to the strength and longevity of these plans.

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