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Chairman Hatch, Chairman Brown, and Members of the Committee, thank you for the opportunity to appear before you today on the topic of the solvency of multiemployer pension plans. I would like to begin with an executive summary of 9 points that I will make in my testimony:

- 1.) The logic of financial economics is very clear that measuring the value of a pension promise requires using the yields on bonds that match the risk and duration of that promise. Therefore, to reflect the present value cost of actually delivering on a benefit promise requires the use of a default-free yield curve, such as the Treasury yield curve. Financial economists have spoken in near unison on this point. The fact that the stock market, whose performance drives that of most pension plan investments, has earned high historical returns does not justify the use of these historical returns as a discount rate for measuring pension liabilities.
- 2.) Most of the justifications of a loan program to rescue the multiemployer system are built on the false logic that plans can get something for free if they receive low-cost subsidized government loans and invest the money in risky assets.
- 3.) On an actuarial basis, which as of the 2016 plan year uses an average discount rate of 7.3%, there are \$155 billion of total unfunded liabilities in the multiemployer system. Measured properly using the appropriate Treasury yield curve, there are \$722 billion of unfunded liabilities in the multiemployer system.
- 4.) I emphasize two standards for when a plan is making sufficient contributions. One standard, which I call “treading water”, is when the contributions at least meet the cost of new benefits (“normal cost”) plus interest on the unfunded liability. A more stringent standard would be contributing the cost of new benefits, plus progress towards paying down the unfunded liability. Under actuarial liability measurements, the latter is what the majority (71% as of 2016) of plans could claim they are doing. But under the correct risk-free standards, the picture looks quite different: less than 2% of plans are contributing service cost plus 30-year amortization, and only 17% are treading water.
- 5.) Minimum funding requirements for multiemployer plans have not been sufficient to keep multiemployer plans in good health, as they depend heavily on expected rates of return. Rules for single-employer plans have been comparatively stringent, depending at least in part on high-grade corporate or Treasury bond yields since 1987. More generally, Congress has adhered in the single-employer program to the basic principle of imposing strict consequences including an excise tax and PBGC-induced termination if plans do not contribute the normal cost plus amortization of unfunded liabilities. In contrast, Congress relieved multiemployer red zone plans of their obligations to continue to pay normal costs plus amortization of unfunded liabilities in the Pension Protection Act of 2006. Furthermore, since the law treats insolvency as the insurable event, and as a practical matter there is nothing that requires a failing plan to terminate, the PBGC cannot under current law limit its exposure to unfunded liabilities.
- 6.) Trustees had decades to undertake voluntary, remedial measures before resorting to trying to force participants to take cuts against promised benefits under the Multiemployer Pension Reform Act

¹ I am very grateful to Yanqiu (Alice) Wang and Rohan Sonecha for outstanding research assistance in the preparation of this testimony.

of 2014 (MPRA). Before reaching this point, they failed to use the many options that were at their disposal to ensure the solvency of plans. They have always had the right to gradually require greater contributions from employers, to make more realistic assumptions about investment returns, and to make more affordable benefit promises on a prospective basis. In fact, statute requires the plan trustees to use reasonable assumptions, and the trustees who budgeted to pay pensions using excessively high discount rates violated that statute by using unreasonable assumptions. Trustees have fiduciary obligations to plan participants, which many have broken by making unrealistic pension promises on which the plans had little chance of making good.

- 7.) As of 2016, I estimate that there were between 960,000 and 990,00 individuals in multiemployer plans with less than 5 years of service. These individuals have accrued low levels of benefits, but their employers are paying in substantial contributions on their behalf and in many cases relying on their contributions to forestall insolvency of multiemployer plans.
- 8.) To meet a rigorous funding standard, contributions would have to rise substantially. Incrementally over time, the multiemployer system must approach this standard to protect the interests of plan participants and taxpayers. Once phased in, all plans that do not follow funding rules should be subject to an excise tax, which was the rule before the Pension Protection Act of 2006; the employers and union would then be faced with the choice of funding the plan or terminating the plan in order to avoid the excise tax. In other words, if the plan does not meet required contributions, then termination should be automatic. To address the incentives that employer trustees might have to give up and terminate the plan, the rigorous funding standard should be phased in slowly, with near-term contributions initially limited to some measure of affordability for employers, such as by capping the growth in their contributions. Further, Congress should act immediately to change the withdrawal liability rules so that they reflect the true value of unfunded liabilities.
- 9.) How Congress decides to address the multiemployer pension crisis may well set a precedent for how future legislators will deal with the possibility that they will face similar calls for bailouts of state and local pension systems. On their own accounts, using discount rates of around 7.1% under GASB 67, state and local pension systems were \$1.7 trillion underfunded in the 2016 year. On the Treasury yield curve standard they were \$4.0 trillion underfunded. The stronger their belief that the federal government will bail them out, the less discipline they will choose to impose upon themselves to address these problems.

I. Measuring Pension Obligations: Logic

The basic challenge in measuring a pension benefit is how to convert the promise of a pre-specified stream of payments in the future into one value today. For example, imagine a payment of \$50,000 that is to be made in 10 years. What is the present value of that payment today? This conversion, called discounting, is critical because it allows the consumers of financial statements, the trustees of pension plans, and other stakeholders to understand what the promise to pay a given pension is worth in today's dollars. That is, discounting allows for a measurement of the cost of new benefit promises, and it allows for a measurement of the total value of promises that have been accrued to date. Along with information about the available resources to pay benefits, a measurement of the total value of pension promises is vital for establishing the financial condition of a pension plan.

When faced with this problem, there are a number of issues to be addressed. One must first specify the goal for the measurement. One clear goal would be to know how much money a pension plan would need today to be certain that the promised payment would be met. If a pension plan needs to meet a \$50,000 obligation in 10 years, it can buy a zero-coupon default-free bond, such as a 10 year Treasury STRIP. Such a security would yield around 3% in today's markets, meaning that the pension plan would need around

\$37,200 today to be sure of meeting the promise, since \$37,200 growing at 3% for 10 years will result in a payoff of \$50,000 which could then be used to pay the pension. The Society of Actuaries (2006) Pension Actuary's Guide to Financial Economics calls this measurement a **Solvency Liability**. It is the value of a portfolio of bonds that would defease the promise.

While the Solvency Liability concept relies on the measurement of the cost of guaranteeing the pension payments, an alternative measure of interest is the so-called **Market Liability**, also described in Society of Actuaries (2006). The Market Liability can be thought of as what a rational and financially unconstrained individual who was expecting to receive the \$50,000 would accept today in exchange for giving up the promise of the \$50,000 in 10 years. Why might this differ from the \$37,200 calculated in the Solvency Liability? If the sponsor of the pension plan promising the liability were at high risk of insolvency over the next 10 years, the individual hoping to receive the \$50,000 might be willing to settle for a payment today of less than \$37,200, knowing that if they do not take the payment today, they might end up with less than \$50,000 in 10 years time due to a default by the sponsor. The Market Liability would use a discount rate higher than the 3% to reflect this risk of default.

The final concept, also described in Society of Actuaries (2006), is the **Budget Liability**. This is the "traditional actuarial accrued liability used to budget cash contributions over a period of years." The Budget Liability in the case of the \$50,000 payment guaranteed in 10 years would use a discount rate derived from an expected return on plan assets. If that expected return is, say, 7.3%, which is what I calculate as the weighted-average discount rate that U.S. multiemployer pension plans are using for their budgeting and planning purposes in the latest plan year, the liability would only be marked at around \$24,700.

There is much debate about the proper way to measure a pension obligation. Pension actuaries generally support the use of the Budget Liability on the grounds that if actuaries are prudent and accurate in their budgeting and forecasting, the plan will be fully funded when it needs to be. A large number of finance economists have criticized this approach on the grounds that the value of a pension promise should be measured independently of the assets used to fund the promise. In the above example, a discount rate of 10% would take the liability down to below \$20,000, and 12% would take it down to \$16,000. Giving the plan actuary or trustee discretion over the selection of the return they believe the portfolio will earn opens up the possibility of arbitrary selection of discount rates. In the worst case, actuaries might tell their clients what those clients want to hear, which might be that the cost of deferred promises is cheaper than it actually is. Or as the late Jeremy Gold wrote:

"The pension actuarial model is broken. Excessive discounting and deferral of costs have often led to unaffordable promises.... The degree to which this overhang exists has been downplayed by vested interests, including, too often, actuaries who, arguably, should know better." (Gold (2015))

In contrast to the actuarial view, in which the expected return is supposed to be the actuary's best estimate of what a portfolio will earn, finance fundamentally conceives of the future as consisting of "states of the world."² The finance view recognizes that past performance is no guarantee of future performance. If past returns on the stock market were high, it is because those investments were risky, and not in ways that just smooth out over time. Specifically, if there is uncertainty about the underlying drivers of stock returns, or if there is some probability of a large stock market crash without recovery – one that we may not have observed in the U.S. in recent history – then the high returns we observed in recent decades were compensation for these risks, as opposed to a free lunch. Investors have been fortunate that good financial

² This idea is originally attributed to Arrow and Debreu (1954)

market outcomes (“states of the world”) occurred, as opposed to the bad ones that could have occurred instead.

By discounting a fixed, promised liability at a targeted return on a portfolio of risky assets, one is ignoring the risk that the assets will not earn that targeted return. A Chief Investment Officer of an investment fund can assemble a portfolio of securities that has a targeted return of 7%, or 10%, or even 12% per year. The CIO will call that targeted return their “expected return”. However, the higher the targeted or “expected” return, the lower the probability that that target will be met. Discounting using an expected return ignores that probability. Furthermore, there is no sense in which just waiting long enough ensures good performance. Otherwise every investor with a “long horizon” and relatively low borrowing costs, should be willing to borrow as much money as they can and invest in the stock market.

Among economists, these issues are not controversial, and in fact the inappropriateness of the Budget Liability as a measurement standard is widely agreed. As a Vice-Chair of the U.S. Federal Reserve said in 2008 in speaking about public pensions:

“[M]ost public pension funds calculate the present value of their liabilities using the projected rate of return on the portfolio of assets as the discount rate. This practice makes little sense from an economic perspective. If they shift their portfolio into even riskier assets, does the value of the liabilities [...] go down? Financial economists would say no, but the conventional approach to pension accounting says yes.”³

Evidence of the views of a range of economists on pension discount rates came in 2012 from the IGM survey of economic experts conducted at the University of Chicago. This survey poses weekly questions to an invited panel of 40 senior faculty at top U.S. research universities. While the relevant question was about public sector pensions as opposed to multiemployer private sector pensions, the issues are very similar. Indeed, the liability-weighted average discount rate used in public pension plans has been around 7.5% during this time period, and the liability-weighted average actuarial rate used in multiemployer plans in 2016 was 7.3%. The panel was asked to express an opinion about the following statement:

“By discounting pension liabilities at high interest rates under government accounting standards, many U.S. state and local governments understate their pension liabilities and the costs of providing pensions to public-sector workers.” (University of Chicago (2012))
Strongly Agree | Agree | Uncertain | Disagree | No Opinion

In this survey, a full 49% of the respondents selected “Strongly Agree”, including Nobel Laureate and MIT Professor Bengt Holmström, Nobel Laureate and University of Chicago Professor Richard Thaler, and University Chicago Professor Austan Goolsbee, who served as the chairman of the Council of Economic Advisors under President Obama from September 2010 to August 2011. A further 49% of respondents selected “Agree”. Two percent (one respondent) selected Uncertain, and none disagreed.

The university professors in the IGM panel have displayed a wide range of views in other IGM surveys on topics such as balanced budgets, deficits, and tax reform. As such, it seems likely that they would have heterogeneous views on how to pay for unfunded pension liabilities. But on this one point, that measuring liabilities using these kinds of rates understates pension liabilities and costs, the profession has been nearly unanimous.

³ Kohn, Donald L. 2008. Remarks at the National Conference on Public Employee Retirement Systems Annual Conference, New Orleans, LA. May 20.

The basic point that financial economists have long argued is that liabilities should be discounted at a rate that reflects the fundamental risk of the liabilities that one wants to build into the measurement. If a sponsor – whether a government or a corporation or the trustees of a multiemployer pension plan – wants to measure the cost of a guaranteed pension payment under the assumption that this payment will not be raised or lowered depending on future events (a “non-contingent” payment), the sponsor must discount the promised payment using the yield on a default-free fixed-income security (“Solvency Liability”).⁴ Put simply: if from a policy perspective, one wants to value pension promises as though they will be kept, the Solvency Liability should be used.

In contrast, the Budget Liability does not reflect the true present value cost of delivering on pension promises. Furthermore, if used as a funding standard, it gives trustees and actuaries very substantial discretion over appropriate levels of funding. As I will detail below, one of the main reasons that the corporate single employer system is in better financial condition than both the state and local plan sector and the multiemployer sector is that legislation (beginning with OBRA ’87) laid a partial Solvency Liability standard on top of the Budget Liability standard selected by plan sponsors. While single-employer plans are still free to invest in risky assets and maintain a funding standard account based on actuarial valuations, they have also had to measure and remedy funding shortfalls on something closer to a solvency standard. Requiring single-employer plan sponsors to bear the costs of shortfalls leads to more prudent decisions about benefits and investment strategies.

An additional complication that often arises is whether a present-value liability is designed to measure only the pension that has been earned through service up to the present day, or whether it is designed to reflect some or even all of the pension that an employee expects to earn over their entire working career. For an employee who has only worked for an employer for several years, this could make quite a large difference. An employee who has worked for, say, 5 years, might be entitled to only a very small pension if he or she quit work today, yet the employer might be expecting that the employee will likely work for many more years and will ultimately receive a larger pension.

The selection of a so-called **Actuarial Cost Method** will impact how much of the expected future liability is reflected in today’s accrued liabilities. One of the more common methods, the Entry Age Normal standard, aims to calculate the cost of the pension as a fixed percent of salary over the worker’s lifetime. This then smooths the earning of pension credits, which otherwise would be low when a worker is young and high when he or she is older. One implication of this smoothing is that an Entry Age Normal liability reflects some costs that have not yet been earned yet, and will only be made if some future contributions come into the plan. In contrast, economists have long recognized that if one considers only benefits that have been promised up to a certain date (the “accumulated benefit obligation” or ABO in actuarial language), the present value of liabilities can be directly compared to the value of a firm’s assets as a measure of funding (Bulow (1982), Brown and Wilcox (2009)).

II. Measuring Multiemployer Pension Obligations

In this section, I provide estimates of the total multiemployer pension obligations, as well as their funding ratios. I examine the most recent plan year, as well as historical years, and I consider how these funding levels and ratios vary by plan code (green, yellow, red, and critical/declining). The main data source

⁴ The primary reason to use a higher discount rate would be if one wanted to mark down the liability to reflect a possible default (“Market Liability”), which could be useful to employees if they want to know the value of pension benefits being offered by different employers, but would be inappropriate as a funding standard. Novy-Marx and Rauh (2011) and Brown and Pennachi (2016) provide discussions of these issues.

is the public IRS Form 5500 datasets available from the Department of Labor for 2009-2016. There are three main funding standards that I consider:

- 1.) The Actuarial funding status, defined as the market value of plan assets minus actuarial liability from Schedule MB⁵. This measure uses the actuarial valuation rate to discount the benefit cash flows. The actuarial valuation rate had a liability-weighted average of 7.3% in 2016, and hence is conceptually equivalent to the Budget Liability described in Section I above. Most commonly, this liability measurement uses an Entry Age Normal standard.
- 2.) The Current Liability funding status from Schedule MB, defined as the market value of plan assets minus the current liability from Schedule MB. The Current Liability must be calculated using a discount rate within a range of the 30-year Treasury rate averaged over the previous 4 years, and must reflect accumulated benefits only (and therefore it is close to the ABO as described in the previous section).⁶ This rate had a liability-weighted average of 3.3% in 2016. The Current Liability moves in the direction of a Solvency Liability, but there is no specific economic reason to use a 30-year Treasury rate, which generally has a duration substantially longer than the duration of pension cash flows.
- 3.) A funding status based on the Treasury yield curve, which is a true Solvency Liability. To calculate this measure, I collect zero-coupon Treasury yields from Bloomberg. According to the PBGC (2016), the average maturity of retiree obligations in the multiemployer system is 8 years, and the average maturity of active employee obligations is 14 years. So the reported retiree current liability is rediscounted using an 8-year zero-coupon yield, and the reported non-retiree liability is rediscounted using a 14-year zero-coupon yield. This corresponds to an effective liability-weighted average rate of 2.3% in 2016.

How have these rates evolved over time? Figure 1 shows the liability-weighted averages of these three rate series by year from 2009-2016. The actuarial rate (1) has fallen by 15 basis points or 0.15 percentage points, while the current liability rate (2) has fallen by ten times as much or 1.5 percentage points. The fact that the current liability discount rate is so much lower reflects that fact that providing annuitized streams of income for plan participants is much more expensive in the low interest rate environment that has taken hold in recent years – and yet there has been essentially no movement in the actuarial discount rate that plan sponsors are using for budgeting and planning purposes. The solvency liability discount rate based on the Treasury yield curve in (3) shows this decline even more starkly.

It is instructive to compare the actuarial discount rate to the actual return earned by multiemployer plans over the past two decades. This is possible with information on the IRS Form 5500 Schedule H and Schedule MB for 2009-2016, plus supplemental data on Schedule H and Schedule B for 1996-2008. I define the realized investment return for each year generally as Investment Income divided by Beginning of Year Assets at Market Value. However, practices may differ as to whether to include Other Income

⁵ I use the Unit Credit statement where available, otherwise the Immediate Gain Method disclosure.

⁶ Specifically, according to instructions, filers of the Schedule MB must report a current liability using a discount rate which “pursuant to the Pension Protection Act of 2006 (PPA), must not be more than 5 percent above and must not be more than 10 percent below the weighted average of the rates of interest, as set forth by the Treasury Department, on 30-year Treasury securities during the 4-year period ending on the last day before the beginning of the 2016 plan year.” Furthermore, this current liability must be computed “taking into account only credited service through the end of the prior plan year. No salary scale projections should be used in these computations.”

(Schedule MB Section II, line 2(c)) as income, and which expenses from Schedule MB Section II, line 2(i) to include as expenses.

On average, the closest calculation to plans' own disclosures seemed to be a broad definition of income which included line 2(c) "Other Income," but a narrow definition of expenses which included only investment management expenses. Assuming that is appropriate, Figure 2 shows realized returns on this measure, as well as arithmetic and geometric average returns. I focus on the geometric average, as the use of a discount rate requires the compound annualized return on assets to equal the discount rate for full funding. The geometric average return is the actual annualized return an investor earns over a multiple time periods, while the arithmetic average is not.⁷

Over 1996-2016, the geometric average returns were 6.2%, 6.6%, and 5.9%, for the equally-weighted, asset-weighted, and median series respectively. Excluding Other Income, on the grounds that some of it might have only been earnable with the incursion of expenses other than investment management expenses, would lower the geometric average returns to 6.0%, 6.5%, and 5.8% for the equally-weighted, asset-weighted, and median series respectively. The fact that the asset-weighted returns are higher reflects relatively better performance by larger plans.

In sum, I estimate that the average plan realized returns of 5.8-6.2% over the period 1996-2016, and that the multiemployer space overall realized returns of 6.5-6.6% over the period. Thus, my analysis of the returns in the Schedule MB filings reveals that over the past two decades, compound annualized returns have fallen short of the current average level of the actuarial discount rate (7.3%), despite the fact that the period in question was part of a multi-decade bull market in stocks and other risky assets.

Unfunded liabilities are very different when measured on the different funding standards. Table 1 shows total unfunded liabilities for 2009-2016. Looking at the entire multiemployer space, on an actuarial basis there was \$155 billion of underfunding in 2016. On a current liability basis, this underfunding rises to \$582 billion, and on a solvency basis it rises to \$722 billion. It is notable that underfunding on the current liability and solvency liability standards have not improved since 2009, the near-trough of asset markets in the financial crisis; in fact the funding condition has deteriorated.

The overall 2016 actuarial funding ratio is 74%, the overall current liability funding ratio is 44%, and the overall solvency standard funding ratio is 38%. Figure 3 illustrates this funding ratio under the three standards, plus under an arbitrary 10% discount rate and 12% discount rate to illustrate that given discretion to choose the rate, funding ratios can be made arbitrarily high. If actuaries chose a 10% discount rate, the funding ratio would be 87%. If they chose a 12% discount rate, it would be 105%.⁸

Although plans on average achieved their targeted returns during the 2009-2016 period (one during which the S&P 500 index roughly doubled) funding ratios did not materially improve on any of the measures. Figure 4 shows in three separate graphs the evolution of funding ratios for plans in the different zones under the three different funding standards. This suggests that multiemployer plan funding may be quite vulnerable to a period in which markets do not continue the rapid increases seen over the sample period, and also that neither the minimum funding requirements followed by non-critical plans nor the

⁷ To give a stark example, imagine that in period 1 the stock market fell by 50% and in period 2 it rose by 50%. The arithmetic average return would be 0% (break even). But an investor who invested, say, \$100 in the market through both periods would not break even – they would end up with \$75. The geometric average return reflects the annualized return (or loss) that the investor actually faces.

⁸ In a sense, given the discrepancy between the realized and expected returns documented above and fact that an expected return is simply the wrong statistic to use as a discount rate, the expected returns that plans are using as their chosen discount rate are just as arbitrary.

funding improvement plans (FIPs) or rehabilitation plans (RPs) implemented by the endangered and critical plans have led to tangible progress in funding ratio improvement.

III. Funding and Minimum Funding Requirements: Multiemployer vs Single Employer

Both the single and multiemployer programs were initially under ERISA marked by requirements to maintain an annual funding standard account in which firms were charged with paying the present value cost of new benefits plus an amortization of unfunded liabilities. However, Congress strengthened implementation of this principle over time in the single-employer program (despite some recent funding relief measures), while essentially removing it for multiemployer plans in weaker condition in the Pension Protection Act of 2006.

The impacts of these divergent policies can be seen in the data. The PBGC also computes a funding ratio on the basis of “the cost to purchase an annuity at the beginning of the plan year” to cover vested benefits, a measure much closer to a solvency ratio. The top panel of Figure 5 compares the percent of employees in multiemployer versus single employer plans covered by defined benefit plans with different levels of this funding ratio.

As of 2015, 39% of employees in the multiemployer program are covered by plans with less than a 40% funding ratio, and 33% of employees are covered by plans with a funding ratio between 40% and 50%, so that 72% of participants in the multiemployer plan are covered by plans that have less than half of the liabilities necessary to meet the PBGC’s standard based on the PBGC rate (which is essentially a solvency standard).⁹ In contrast, as of 2016, less than 1% of employees in single-employer DB plans are covered by plans with less than 50% funding ratios on the PBGC solvency basis and approximately three-quarters of employees in single-employer DB plans are covered by plans with funding ratios of over 70%.

By international standards, the single-employer DB pension system in the US would not be considered well funded (see Rauh (2018)), but the fact that it is in much better financial condition than either the multiemployer system or the public plan system is largely a function of contribution requirements, or at least the ones that existed historically when Deficit Reduction Contributions (DRCs) were linked to Treasury yields. Specifically, between 1987 and the early 2000s, firms with underfunded pension plans operating under the PBGC’s single-employer pension program were required to make DRCs that would close the funding gap in the current liability, based on 30-year bond yields.

This standard was gradually relaxed over time for single-employer pension plans. The Pension Funding Equity Act of 2004 formally changed the required interest rate to a weighted average of yields on a composite of corporate bond rates for 2003-2006. The Pension Protection Act of 2006 extended that corporate interest rate for DRCs to 2006-2007, and then for years beginning with 2008 eliminated the dual funding standard (funding standard account and DRC) and replaced it with a “segment rate” corporate bond yield standard funding targets, with those segment rates based on a 24-month average of investment-grade corporate bonds. Further funding relief for single-employer plans came in the WRERA (2009), PRA (2010), and MAP-21 (2012), the last of which implemented 25-year smoothing of PPA segment rates.¹⁰

⁹ Adding participants in plans that the PBGC has taken over or has booked but not yet taken over, this rises further to 74%.

¹⁰ IRS-5500 Schedule SB Instructions: “Generally (except for certain plans under Sections 104, 105, and 402 of the Pension Protection Act of 2006 and CSEC plans under Section 414(y)), for funding purposes, single-employer plans are required to use the 24-month average segment rates determined under Section 430(h)(2) of the Code, as amended by the Moving Ahead for Progress in the 21st Century Act (MAP-21), the Highway and Transportation Funding Act of 2014 (HATFA), and the Bipartisan Budget Act of 2015 (BBA).”

In addition, starting with MAP-21, Congress has significantly increased Variable Rate Premiums for single-employer plans. These premiums will be 4.2% of underfunding annually starting in 2019 and linked to inflation. This provides a further incentive for single-employer plans to remain well funded.

Nonetheless, despite this relaxation of funding rules since OBRA '87, the legislation surrounding the single-employer program has adhered to a key principle: if a plan cannot or does not make required contributions, the sponsor must face an excise tax or terminate the plan. Furthermore, a firm participating in the single-employer DB program knows that it will bear the costs of unfunded liabilities unless the firm goes bankrupt. The multiemployer system began with that principle in place, at least under actuarial discount rates, but the principle was substantially eroded over time in several ways. In general, funding standards in the multiemployer program are much looser and the responsibility for paying down unfunded liabilities considerably more dispersed.

The single-employer system also has several additional built-in protective measures limiting system-wide damage and taxpayer exposure should plans become troubled. Notably, single employer plans are subject to an excise tax when they fail to meet required contributions, which forces plans that are digging themselves into a deeper hole to terminate. This was the rule for multiemployer plans before the Pension Protection Act legislation of 2006. The removal of this rule has led to a situation where there is no practical way to require a failing multiemployer plan to terminate. As such, multiemployer plans under current law can become insolvent, receive PBGC assistance, and continue to promise new benefits. Furthermore, the PBGC has additional protection through its authority to terminate single-employer plans that are meeting the normally applicable funding rules if PBGC believes such plans pose a threat to PBGC's finances.

In a single-employer plan, benefits are both frozen and statutorily cut to the PBGC level immediately upon termination. This was the case for multiemployer plans before the Multiemployer Pension Plan Amendments Act of 1980, but that legislation made insolvency (running out of money to pay benefits) the insurable event instead of the termination itself. So while a multiemployer plan that terminates is no longer allowed to promise new benefits, accrued benefits in multiemployer are not cut to the PBGC-insured level until the plan runs out of resources, creating additional taxpayer liability even for terminated plans.

The CBO has concluded the rules that govern how multiemployer plans are funded expose the PBGC to the risk of large losses (CBO (2016)).¹¹ The CBO specifically highlights three sources of risk factors in the multiemployer contribution requirements. First, the fact that starting with the PPA of 2006, employers participating in plans that were deemed critically underfunded were allowed to contribute less than the minimum required contribution, with RPs that are apparently inadequate replacements. The CBO's conclusion:

“The effects of the exception to the rules governing minimum contributions can be seen in the contribution rates of plans with a funding ratio of less than 65 percent, almost all of which are following rehabilitation plans. More than half of those pension plans (weighted by liabilities) will be unable to eliminate their underfunding if they do not increase contributions or negotiate cuts in benefits.” CBO (2016)

It therefore seems clear that the rehabilitation plans are not sufficient to restore the funding to that extent that would have been possible had it been possible to continue minimum contribution levels.

¹¹ See page 2 of that report.

The second aspect of funding rules identified by the CBO as leading to inadequate funding is the framework for employer withdrawals from multiemployer plans. Some employers have testified before the Joint Select Committee that the withdrawal liability may be quite large in comparison to the employer's total assets or income. However, the size of withdrawal liability for remaining employers is in part so large because of the terms under which prior employer participants were allowed to withdraw from the plans. The withdrawal rules are complex (see Wolf and Spangler (2015)) but there are many ways in which they usually underestimate the true cost of withdrawing from a plan. Specifically:

- Regardless of an employer's attributable share of plan underfunding (and except in cases of mass withdrawal) an employer's withdrawal liability is limited to 20 annual payments, each of which is capped by the highest contribution rate of the employer in the ten years prior to withdrawal multiplied by the average contribution base of the employer in the three consecutive years with the highest contribution bases over those ten years. The 20-year limit applies regardless of what percentage of the employer's attributable share of the underfunding is met by the 20 annual payments.
- There is no interest on these payments.
- The allowable withdrawal liability is generally based on the share of contributions an employer has made during a specified number of previous years, not its share of the unfunded vested liability. Employers choosing to withdraw are likely to be ones for whom this comparison (share of recent contributions versus share of liability) is likely to be favorable.
- The total unfunded liability for purposes of computing the employer's attributable share is calculated using a discount rate close to the actuarial rate, and the plan has no recourse to the employer if investment returns do not achieve their target.¹²

Regarding the last of these bullet points, the CBO explains:

“Even if the withdrawing employer makes withdrawal liability payments to cover the entire liabilities of orphan participants, the fact of those participants' promised benefits raises the risk of future underfunding, because a withdrawing employer is not obligated to reimburse the plan for any investment losses on its withdrawal liability payments.” CBO (2016)

The mismeasurement of the withdrawal liability is therefore another channel through which understatement of the liability through actuarial discount rates has had grave consequences for multiemployer funding. A further issue with regard to withdrawal liability is that the contribution rate increases as part of a funding improvement plan or funding rehabilitation plan are disregarded for purposes of calculating the contribution rate used in determining the 20 years of annual payments. Many plans who wish to raise rates to deal with underfunding must also consider whether rate increases will lead to employers withdrawing and locking in older, lower rates.

The third factor that the CBO argues has contributed to inadequate funding and risk of insolvency is what it deems “Industry and Demographic Factors,” highlighting the decline of the manufacturing and construction sectors. As the CBO explains, the relevance of the industry declines for the solvency of plans is a cash flow issue:

¹² This is an issue being litigated. A recent case ruled that the plan in that case could not use a rate lower than the actuarial discount rate but left open room that plans might be allowed to use a somewhat lower rate in some circumstances. *The New York Times Co. v. Newspapers & Mail Deliverers'-Publishers' Pension Fund*, No. 1:17-cv-06178-RWS (S.D.N.Y. Mar. 26, 2018)]

“That decline has reduced the ability of underfunded plans to forestall insolvency because, with fewer active participants, plans have less cash coming in from normal cost contributions that could be used to pay current benefits.” CBO (2016)

That is, the industry decline is primarily relevant only if one believes that a pension plan should be allowed to pay retirees using the contributions of current workers.

Despite the slowdown in these industries, there are nonetheless many active participants who have joined multiemployer plans in the past five years. This statement highlights the risks faced by these more recent hires, whose contributions are being used to pay retirement benefits of current retirees. I calculate that in the largest 20 multiemployer plans alone, there were 369,000 employees in 2016 with less than five years of accumulated service. Extrapolating this to the universe of multiemployer plans would imply 960,000-990,000 of these individuals in the universe. That is, there are one million individuals who have begun to participate in a multiemployer plan in the past 5 years, and on whose behalf employers are contributing to a system that on standardized measures is in grave danger of failure. By allowing plans at risk of insolvency – or even already insolvent plans – to continue to take contributions from new employees, without a correction of these funding rules, the system is placing younger plan members at even greater risk than more senior members of the plans.

In sum, the funding rules for multiemployer plans have long been inadequate. The sources of this inadequacy are mismeasured costs through the use of actuarial discount rates; the failure to lay solvency-based funding requirements on top of the actuarial standard as was done in the single-employer plans; and the withdrawal liability calculations which allowed employers to leave multiemployer plans without paying the true present value of unfunded vested benefits.

IV. Standards for When Plans Are Making Sufficient Contributions

When is a multiemployer plan making sufficient contributions? One standard would be when the contributions exceed the cost of new benefits plus interest on the unfunded liability. That’s essentially a “treading water” standard – it means that the unfunded liability isn’t getting larger. Another standard would be contributing the cost of new benefits, plus progress towards paying down (or “amortizing”) the unfunded liability. Whether a plan is achieving either standard will depend on the chosen liability measurement. Plans that appear to be treading water or amortizing the unfunded liability under the actuarial liability measure may not be doing so under a solvency measure.

To what extent is the system as a whole meeting these standards? Figure 6 shows total multiemployer plan contributions relative to the cost of new benefits, the cost of new benefits plus interest on the unfunded liability, and the cost of new benefits plus amortization. The three panels show these comparisons under the three different measurements in Section II: the actuarial measurement, the current liability measurement, and the solvency liability measurement.¹³ Contributions are the same in all three graphs – they totaled \$18.20 billion in 2009 and rose to \$27.41 billion in 2016. As shown in the top graph, these are more than both the treading water standard and the amortization standard based on actuarial measurement. The middle and bottom graphs show that contributions are substantially below both the treading water standard and the amortization standard on the current liability and solvency liability measurements. Specifically:

¹³ Normal costs are presented in the Schedule MB of the 5500 filings on an actuarial discounting basis. The current liability normal cost is also provided as the plan’s expected increase in current liability during the plan year. The solvency liability normal cost is calculated under the assumption that the duration of the newly accrued pension promises is 17.5 years.

- To meet the treading water and amortization standards under the current liability, plans would respectively have had to contribute \$42.26 billion and \$43.98 billion in 2016, increases of 54% and 60% respectively.
- To meet the treading water and amortization standards under the current liability, plans would respectively have had to contribute \$42.23 billion and \$59.15 billion in 2016, increases of 54% and 216% respectively.

What percentage of plans are meeting these standards? Figure 7 shows for green zone, endangered, critical, and critical-declining plans respectively the percent of plans that are contributing at least the normal cost plus a 30-year amortization of the unfunded liability. As of 2016, 86% of green zone, 77% of yellow/orange zone, and 46% of non-declining red zone were meeting this standard on an actuarial liability basis. These figures drop to 7%, 11% and 2% on the current liability basis; and 1%, 4%, and 2% on the solvency liability basis. Unsurprisingly, very few plans that are critical and declining are meeting the standard of contributing at least the normal cost plus a 30-year amortization of the unfunded liability on any measure.

Figure 8 shows that somewhat more plans were meeting the “treading water” standard as of 2016. As of 2016, 89% of green zone, 88% of yellow/orange zone, and 55% of non-declining red zone were meeting this standard on an actuarial liability basis. These figures drop to 16%, 34% and 17% on the current liability basis; and they are 15%, 35%, and 15% on the solvency liability basis.

Overall as of 2016, 71% of all multiemployer plans are contributing at least the normal cost plus a 30-year amortization of the unfunded liability, and 75% are at least “treading water” under the actuarial measurement. But under the much more appropriate Treasury yield curve solvency basis, the picture looks quite different. Only 1.4% of multiemployer are contributing service cost plus 30-year amortization, and only 17% are treading water.

V. Public Plans

How Congress decides to address the multiemployer pension crisis may well set a precedent for how legislators will deal with the possibility that they will face similar calls for bailouts of state and local pension systems. In this section I present an update of analysis in my paper “Hidden Debt, Hidden Deficits: 2017 Edition” (Rauh (2017)), which calculates stated and solvency-based measures of unfunded pension liabilities for state and local governments for plan year 2015. The methodology is based on Novy-Marx and Rauh (2011). The update in this section presents statistics using the same methodology for plan year 2016.

The study is conducted in a sample of 269 state pension plans and 387 local pension plans, for a total of 656 plans. The state plans consist of all primary plans sponsored by U.S. states. The local plans consisted of all municipal plans in the top 170 cities by population according to the U.S. Census, and the top 100 counties by population. I estimate that this covers over 95% of the public plan universe by assets.

I calculate that as of 2016, unfunded liabilities had reached \$1.74 trillion under recently-implemented governmental accounting standards (GASB 67). However, they amount to \$4.01 trillion under solvency valuation techniques that use the Treasury yield curve as of December 2016 to value the liability. This represents an increase of \$160 billion over 2015.

The GASB 67 standards first implemented for plan year 2014 still preserved the basic flaw in governmental pension accounting: the fallacy that liabilities can be measured by choosing an expected return on plan assets. As with the multiemployer actuarial liability, this procedure uses as inputs the forecasts of investment returns on fundamentally risky assets and ignores the risk necessary to target hoped-

for returns. The GASB 67 accounting standards tempered the effects of this assumption slightly by requiring some systems (58 plans or 8% of the sample) to use somewhat lower rates in their liability measurement for GASB 67 purposes.

The liability-weighted average discount rate that plans in this study chose as of 2016 for the purposes of their GASB 67 disclosures was 7.1%, in contrast to a weighted-average expected return of 7.5%. Funding decisions are still generally made with respect to the expected-return benchmark, not the GASB 67 rate. The solvency standard I calculate using the Treasury yield curve selects the point on the Treasury yield curve closest to the duration of the liabilities, which is implied by the GASB 67 disclosure on rate sensitivity. The average rate used for the solvency yield based on the December 2016 yield curve is 2.7%.

Table 2 summarizes further results. Panels A and B show assets, liabilities, and discount rates. Panel C shows cash flows into and out of state and local plans. Total state and local employer contributions were \$114.2 billion in 2016, plus supplemental state government contributions of \$14.2 billion, for a total of \$128.4 billion in governmental contributions. These plus the \$46.9 billion in member contributions total \$175.9 billion in total contributions against \$278.6 billion in payouts. For plan funding to remain stable, the difference must be made up for with investment returns.

The first line of Panel D shows that under the expected return actuarial standard, state and local governments in total fell \$8.4 billion short of meeting the “treading water” standard of normal cost plus interest on the unfunded liability. Under the solvency standard, \$130.7 billion of additional contributions would be required to tread water and prevent negative amortization.

As with the measures of unfunded liabilities for multiemployer systems, the total unfunded liabilities of public systems have not improved substantially in the past five years. In response to my estimate in 2012 that public pension liabilities were approaching \$4 trillion, Robert Merton, an economics professor at MIT and Nobel Laureate was quoted in the Financial Times: “ ‘This \$4tn figure is a lower bound,’ argues Robert Merton, economics professor at MIT.”¹⁴

This is relevant for the multiemployer private plan discussion for several reasons. First, many of the issues are parallel. Second, the stronger the belief by state and local governments that the federal government will bail them out, the less discipline they will choose to impose upon themselves to address the funding problems on their own.

VI. Loan Programs and Pension Math

Several proposals have been made to create loan programs for multiemployer plans. Notably, S.2147 (Butch Lewis Act of 2017) would “amend the Internal Revenue Code of 1986 to create a Pension Rehabilitation Trust Fund, to establish a Pension Rehabilitation Administration within the Department of the Treasury to make loans to multiemployer defined benefit plans,” and S.1911 (American Miners Pension Act of 2017) would “transfer certain funds [from the Abandoned Mine Reclamation Fund] and provide loans to the 1974 United Mine Workers of America (UMWA) Pension Plan in order to provide pension benefits for retired coal miners.”

The logic behind a loan program is generally based on the same fallacies that underlie the measurement of pension obligations using expected return on assets. The proposals are often sold as a win for taxpayers under the idea that the plan will pay a low fixed rate of interest to the federal government, and

¹⁴ “Pension Gap Spells Trouble for Muni Bondholders,” Gillian Tett, 24 February 2012, Financial Times

then invest the proceeds in its portfolio of risk assets which it hopes will earn the actuarial expected rate of return. But if this were clearly a good policy, then voters would want to urge the federal government to borrow far greater amounts of money and invest it in the stock market on its own behalf.

For example, consider the federal government's projected budget deficit for the current fiscal year. The CBO has projected an \$804 billion budget deficit for Fiscal Year 2018. Federal budget deficits generally must be covered through additional borrowing. So an FY18 budget deficit of \$804 billion would add \$804 billion to the federal debt until the time that it could be paid back. Without a plan to pay it back, that addition to the federal debt would be assumed to be indefinite, and would certainly appear on the horizon of a standard 10-year budget window.

According to the same flawed logic behind the loan program, however, the Federal government could solve its problem of creating debt over a 10-year budget window in the following way. Instead of borrowing just \$804 billion today, it could borrow \$1.608 trillion today (twice the budget deficit) from taxpayers. Of the \$1.608 trillion it borrowed, half of that (\$804 billion) could go to pay for the unfunded expenditures this year, and the other half (\$804 billion) could be invested in a portfolio of assets similar to that of a pension fund.

If these funds are assumed to have a return of 7.2% per year, the entire \$1.608 trillion could be assumed to be paid off in 10 years, as the \$804 billion growing at 7.2% per year would double in 10 years, appearing to eliminate the debt. Of course, the federal government would have to pay around 3% annual interest on the borrowing, so this program would cost \$24.1 billion per year over each of the next 10 years – but that \$241 billion spread over 10 years would be a comparatively small price to pay for apparently “eliminating” an \$804 billion current budget deficit. The government would essentially be assuming that it could book as profit the spread between the 3% borrowing rate and the 7.2% investment return.

Furthermore, the problem of the interest costs could be “solved” by investing more aggressively. Many institutional investors have return targets of 8% or even more. If the government could assume an 8.9% rate of return, the \$804 billion portfolio would grow enough to pay off the \$1.608 trillion borrowing plus all accrued interest at the end of the 10 years. Assuming the 2.9% June 2018 year-on-year CPI-U inflation rate persists for 10 years, this assumption could be disclosed as a “real return assumption” of just 6%. By borrowing more than necessary to fund the deficit and investing the balance in risky assets that it assumes will earn high enough returns to repay all the debt, the federal government could assume its budget deficit away.

The clear flaw in this logic is that it ignores the risk that the asset pool will not achieve the expected return. Loans to multiemployer plans, which those plans would then invest in portfolios of assets, are analogous. The fact that the federal government would not undertake such transactions on its own account reflects that fact that it would be concerned about the inherent risk in doing so. By loaning money to the multiemployer plans to invest in their portfolios, the federal government would be acting in a way similar to the buyers of pension obligation bonds (POBs) issued by some state and local governments. The federal government would thus be placing taxpayer money at risk if the loans were not able to be repaid in full due to investment returns that fall short of the target.

VII. Concluding Remarks and Policy Proposals

To protect the interests of all stakeholders, it is critical in the management and regulation of pension plans to ensure proper measurement of costs and liabilities. While there is hardly any disagreement among financial economists as to the appropriate way to measure pension liabilities for the purposes of determining solvency, the pension actuarial community has largely rejected the financial economics view. One source

of the disagreement seems to be the fact that disclosure requirements and funding requirements are often linked (Lucas (2017)). Simply reporting the appropriate solvency-based defeasement measure of a pension promise reveals its true cost in today's dollars. The mere disclosure of the number that the finance profession agrees is the right way to measure the solvency of a pension system should not be controversial. While multiemployer plans are required to disclose the "current liability," which is considerably closer to a true solvency standard than the actuarial rate, a true solvency number based on the Treasury yield curve, with very limited or preferably no smoothing, should be required for multiemployer plans.

The optimal approach to funding a pension plan, particularly one that is already as underwater as the typical multiemployer plan is on a solvency basis, is a more difficult challenge. In order to protect the interests of both plan participants and taxpayers in the multiemployer system, it is important to move (gradually) to a funding standard that ensures that underfunded plans take real steps to remediate unfunded liabilities as measured on an intellectually solid basis, as opposed to one based on wishful thinking. This is the logic that supported the introduction of deficit reduction contributions to the single-employer system in 1987, as well as the provisions of the Pension Protection Act of 2006 that required single-employer plan sponsors to use segment yield curves as a funding standard measure.

To address the incentive that employer might have to withdraw, the rigorous funding standard should be phased in slowly, with near-term contributions initially limited to some measure of affordability for employers, such as by capping the growth in employer contributions for a period of years. Further, Congress should act immediately to change the withdrawal liability to reflect the true value of unfunded liabilities.

In sum, the approach to fixing the multiemployer system has focused on funding relief for troubled plans and opening the door for trustee boards to cut benefits (MPRA 2014). This has been the wrong approach, and it hurts employees, retirees and taxpayers. The correct approach is to stop digging the hole.

Specifically, given the risk that plan participants face, Congress should require multiemployer systems not paying the normal cost plus long-term amortization to stop making new promises (freeze the plan). Frozen plans should be required to stabilize the funding level by contributing interest on unfunded liabilities plus any additional contributions that might be necessary to ensure that they do not run out of money in the next several decades. Plans that do not follow these rules should be subject to an excise tax in the amount of the missed contributions, which was the rule before the Pension Protection Act of 2006. Knowing that the consequences of not meeting required contributions is the excise tax, the employers and union would then decide on their own to either come up with the required contributions, or if they are unable or unwilling to do so they would choose to terminate the plan rather than pay the excise tax. Termination should be automatic rather than discretionary so that PBGC is not subject to political pressure not to terminate plans on a case-by-case basis

The PBGC under current law is backed solely by the premiums paid by the plans, not by Federal taxpayers. It is therefore important that PBGC be shored up through risk-based premiums, so that PBGC will be able to provide the statutory guarantee to retirees in any plans that should fail. It is equally important that the PBGC has the authority to protect its own financial condition by initiating terminations if plans are putting unreasonable risk on the insurance program, and by reducing benefits to the PBGC level upon termination. This was the rule for multiemployer plans before the Multiemployer Pension Plan Amendments Act of 1980, and is still the rule for single employer plans today. These principles remain the same even if Congress were to vote to extend funding for the PBGC, as they would be essential to protect the interest of taxpayers as well as plan participants.

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Figure 1: Liability-Weighted Averages of Discount Rates for Multiemployer Plans by Year

This figure illustrates the liability-weighted averages of Actuarial Valuation Rate, Current Liability Rate, and Duration Matched Treasury Rate by year from 2009-2016. Rates are as of the beginning of the plan year.

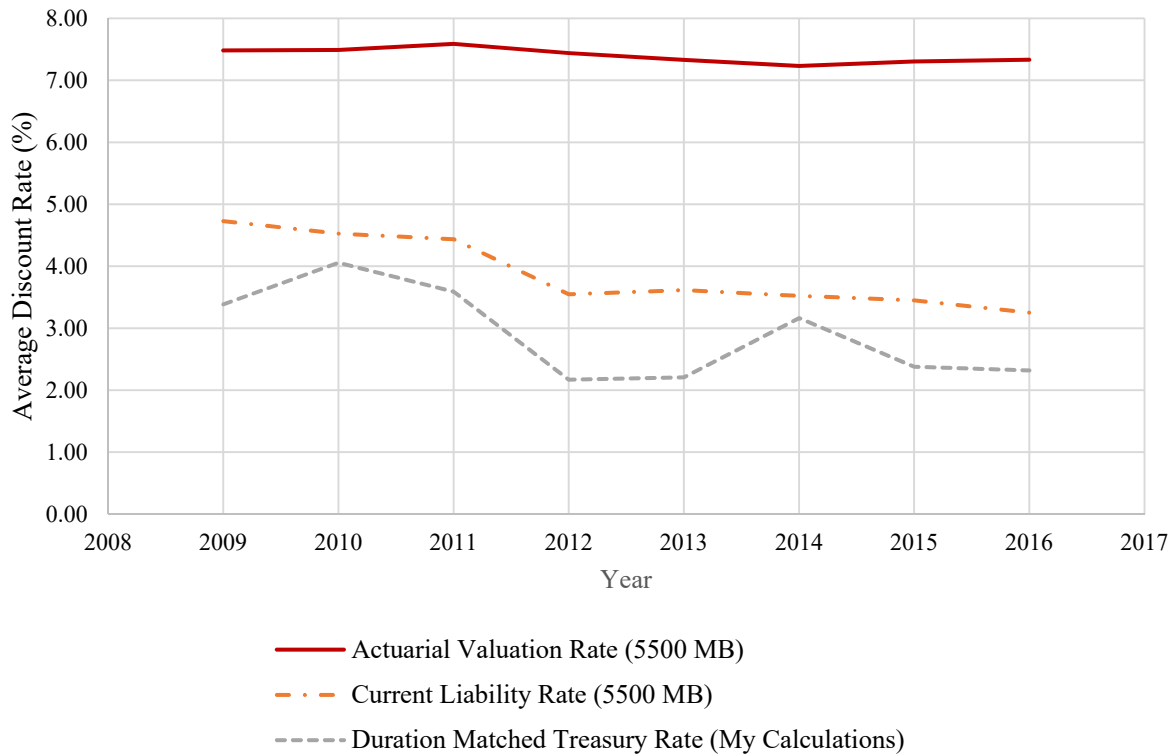


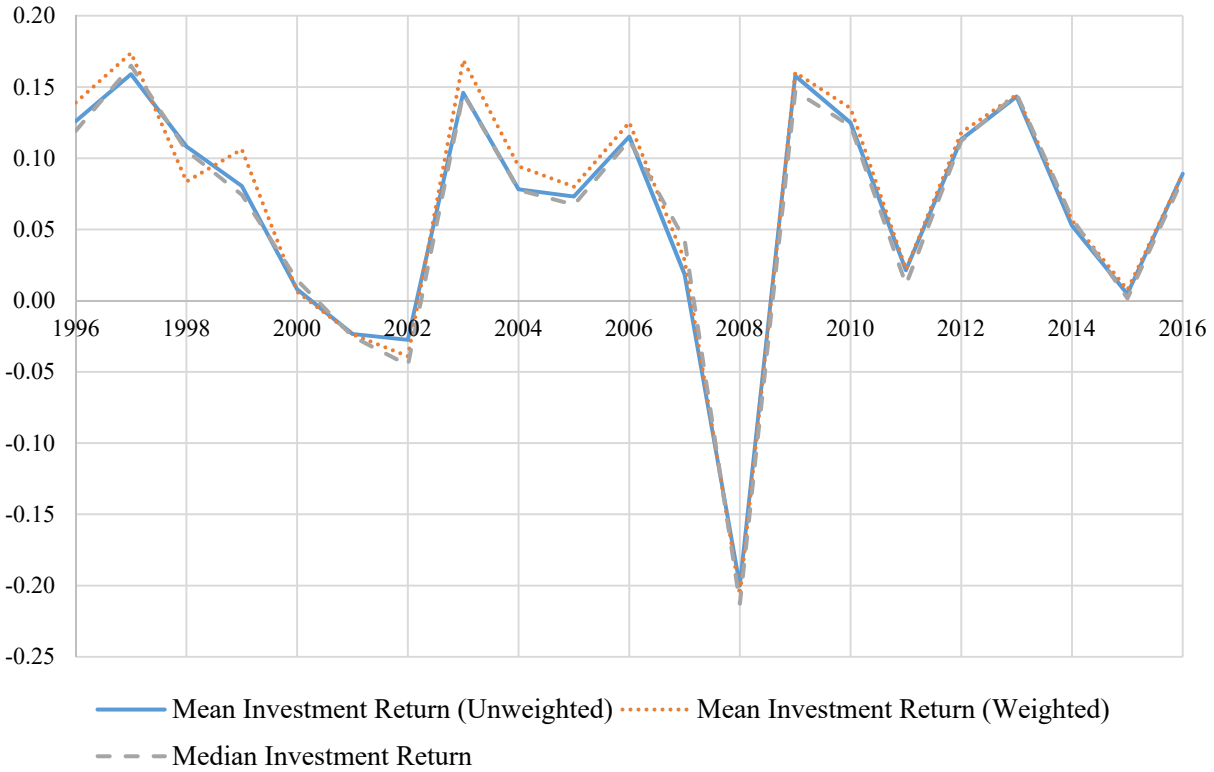
Table 1: Total Unfunded Liabilities Under Different Standards (\$ billions)

This table shows the total unfunded liabilities under three different standards – actuarial, current liability, and solvency – as of the beginning of the plan year, from 2009 to 2016. The actuarial and current liability measures are from the IRS 5500 Form MB datasets from the Department of Labor. The solvency liability is calculated using duration-matched points on the Treasury yield curve.

	(1) Actuarial	(2) Current Liability	(3) Solvency Liability
2009	(175.3)	(398.9)	(538.0)
2010	(154.1)	(405.0)	(490.6)
2011	(144.8)	(406.3)	(546.8)
2012	(170.0)	(474.2)	(719.0)
2013	(152.6)	(539.7)	(769.2)
2014	(129.6)	(525.5)	(627.0)
2015	(138.3)	(561.2)	(722.3)
2016	(154.6)	(581.9)	(721.7)

Figure 2: Investment Returns in Multiemployer Plans

This figure shows the unweighted average, liability-weighted average, and median net investment returns between 1996 and 2016. The net investment return is found by calculating the ratio of net investment income to the total assets at the end of the fiscal year. The net investment income is calculated by subtracting total contributions and investment management fees from the plan’s total income of that fiscal year.



Baseline

	Mean Investment Return (Equally-Weighted)	Mean Investment Return (Weighted)	Median Investment Return
Arithmetic Average	6.52%	7.00%	6.31%
Geometric Average	6.17%	6.61%	5.94%

Excluding “Other Income”

	Mean Investment Return (Equally-Weighted)	Mean Investment Return (Weighted)	Median Investment Return
Arithmetic Average	6.34%	6.86%	6.19%
Geometric Average	6.00%	6.47%	5.83%

Figure 3: 2016 Multiemployer Weighted-Average Funding Ratios Under Different Discount Rates

This figure shows the weighted-average 2016 funding ratios for multiemployer plans under five different standards: (i) the actuarial discount rate; (ii) the current liability rate; (iii) the solvency rate; (iv) an arbitrary discount rate of 10%; and (v) an arbitrary discount rate of 12%. (N = 1,170 plan observations for year 2016)

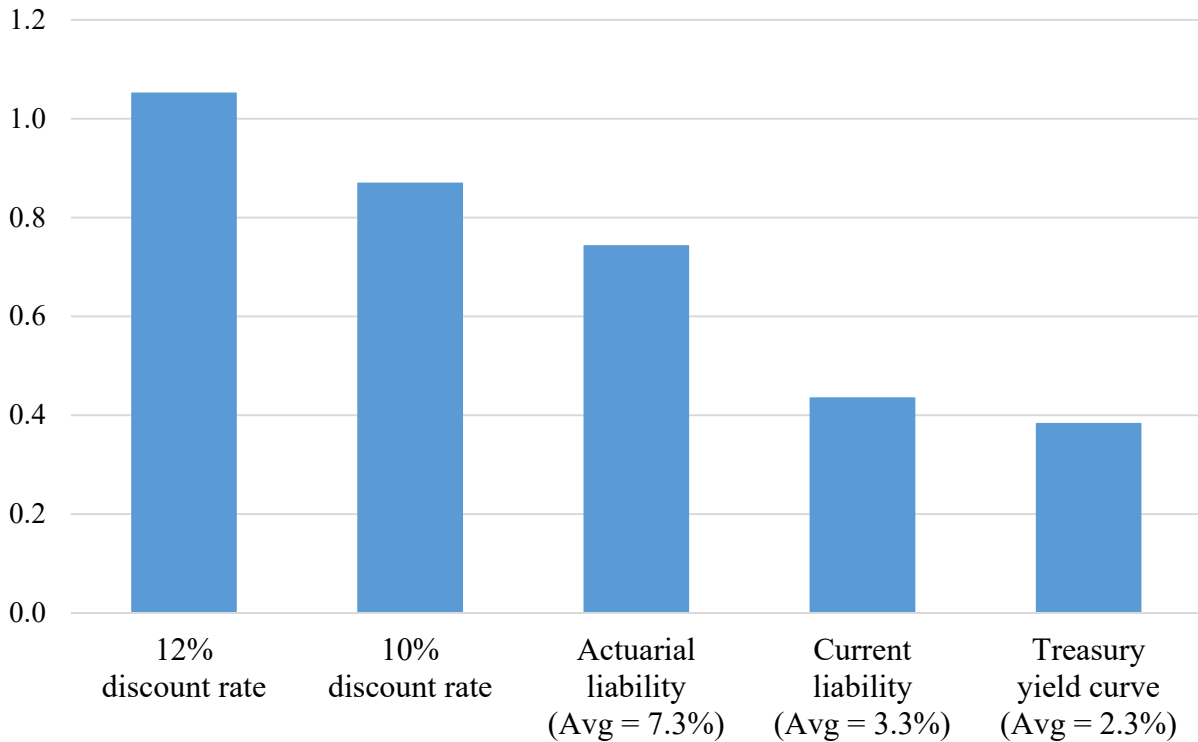
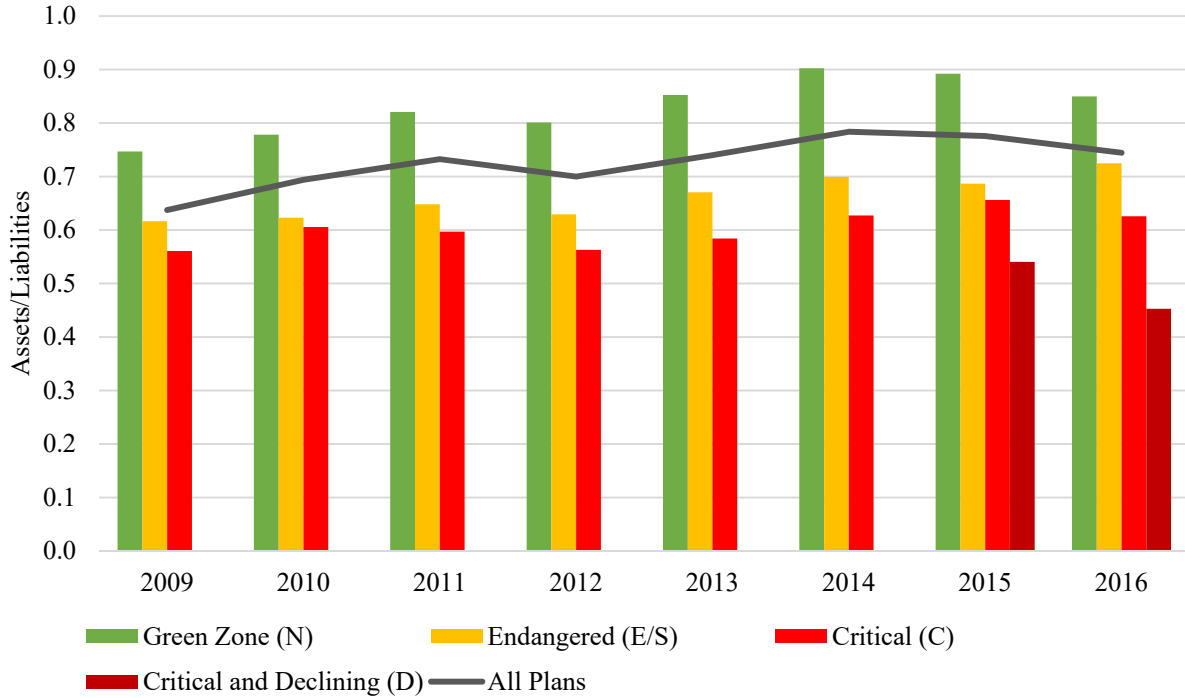


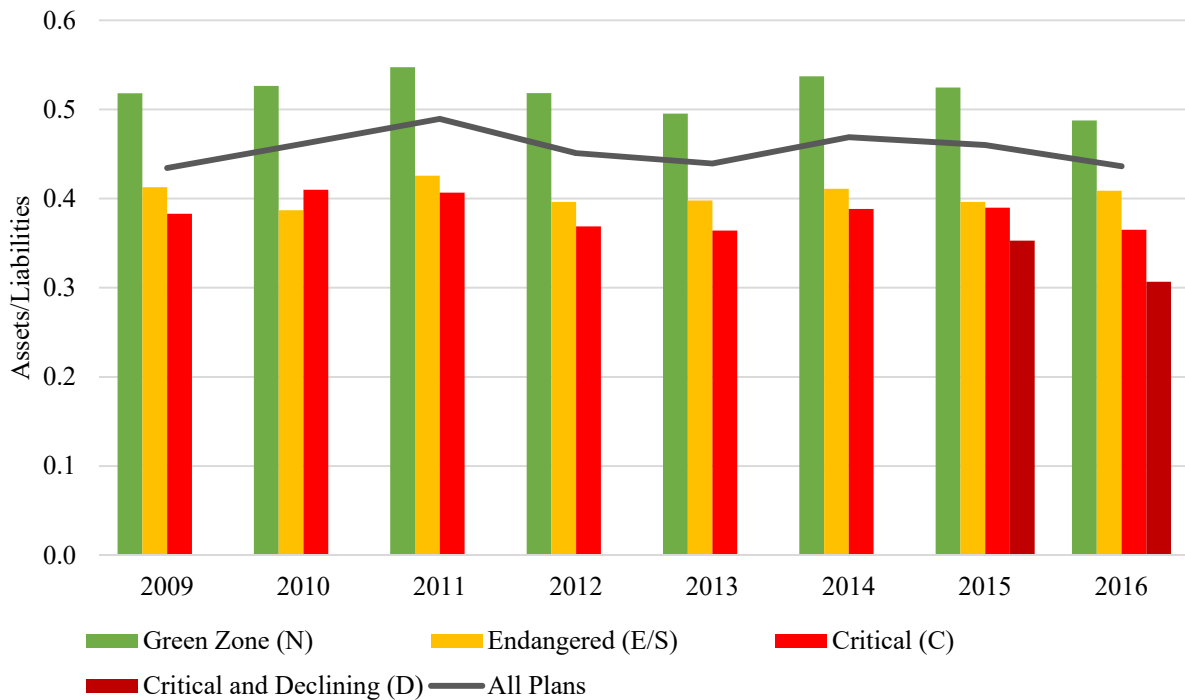
Figure 4: Funding Ratios for Plans by Year and Status

Each of the three figures shows the evolution of funding ratios from 2009 to 2016 for plans in the different zones (Green, Endangered, Critical, Critical and Declining) under the three different funding standards: actuarial discount rate (Panel A), current liability discount rate (Panel B), and solvency liability (Panel C).

Panel A: Actuarial Discount Rate



Panel B: Current Liability Discount Rate



Panel C: Solvency Liability Discount Rate

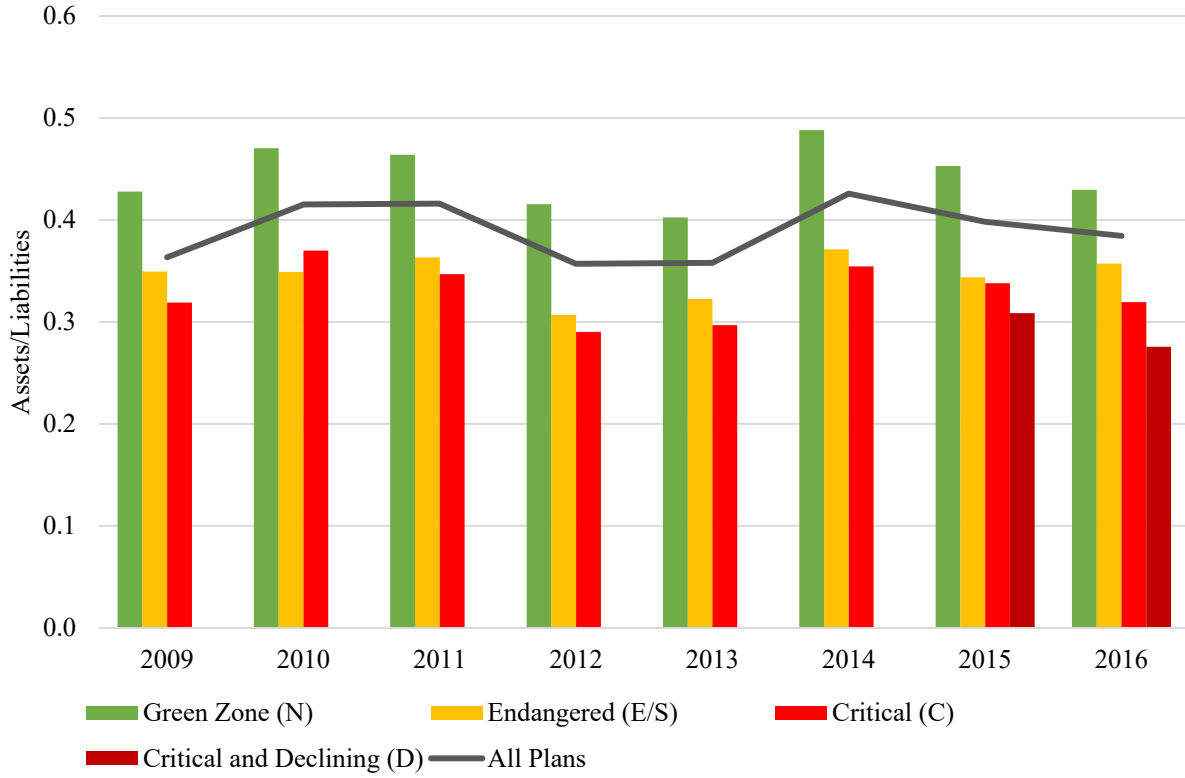
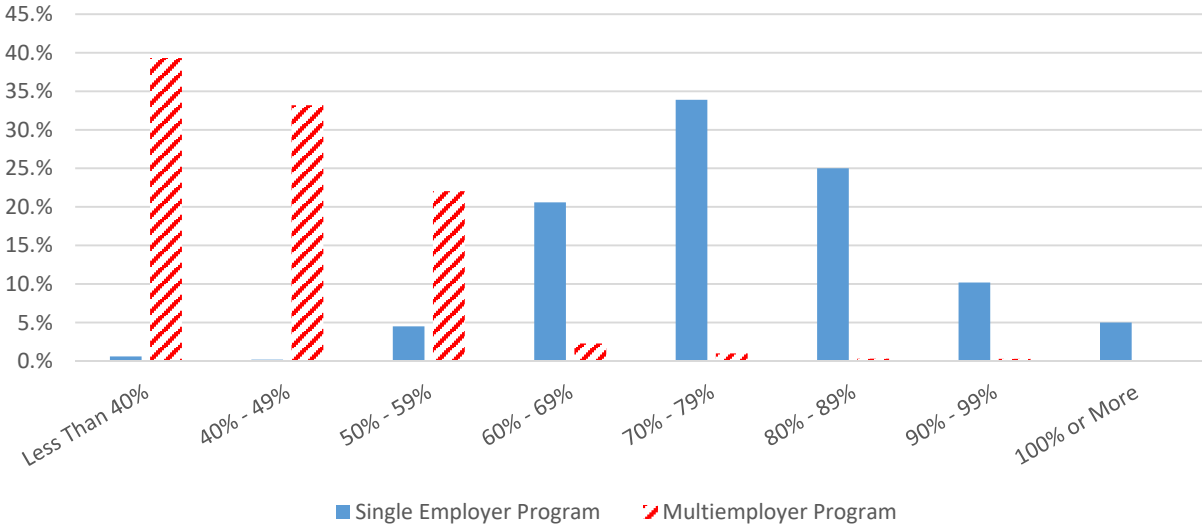


Figure 5: Comparisons of the Single-Employer and Multiemployer Systems

Panel A of this figure shows the percent of participants in various funding ratio categories in both the single employer and multiemployer programs. Panel B depicts the change in the funding ratio of the single employer and multiemployer programs from 1980 to 2015.

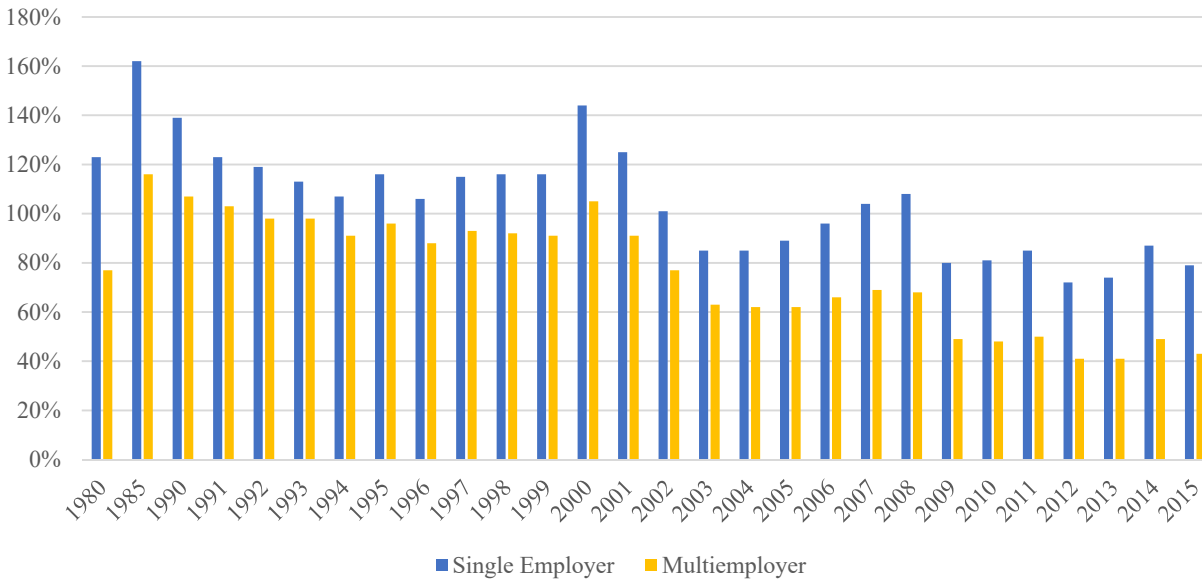
Panel A: Percent of Participants in Funding Ratio Categories



Source: 2016 PBGC Data Tables -

https://www.pbgc.gov/sites/default/files/2016_pension_data_tables.pdf (Tables M-13 and S-48)

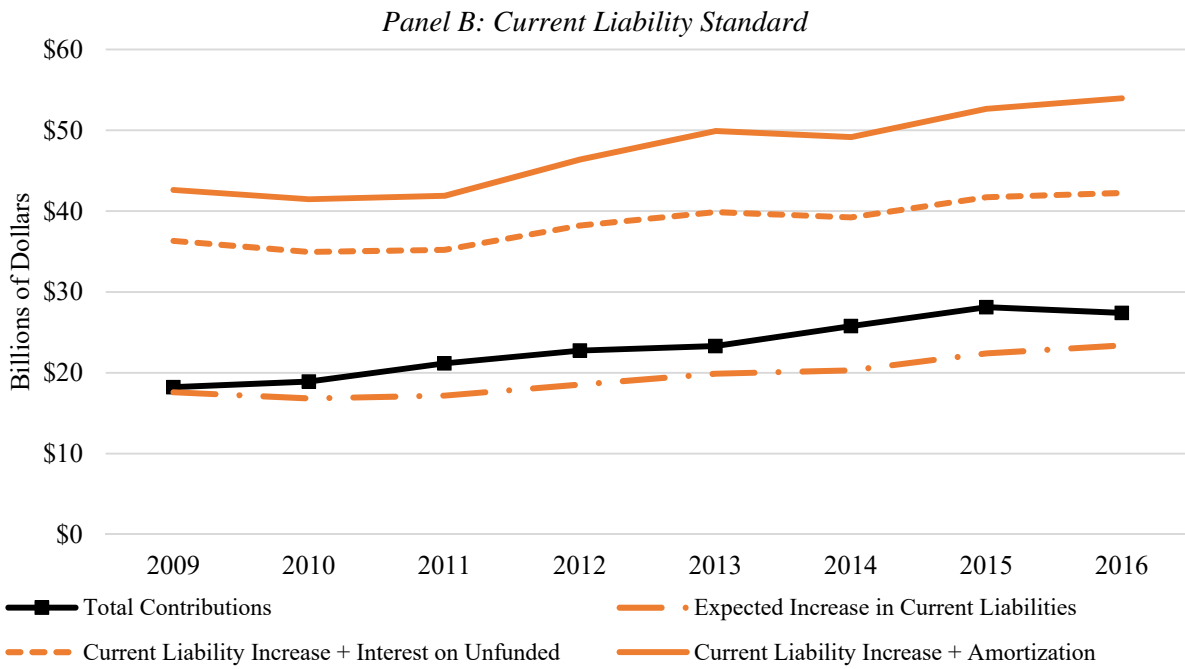
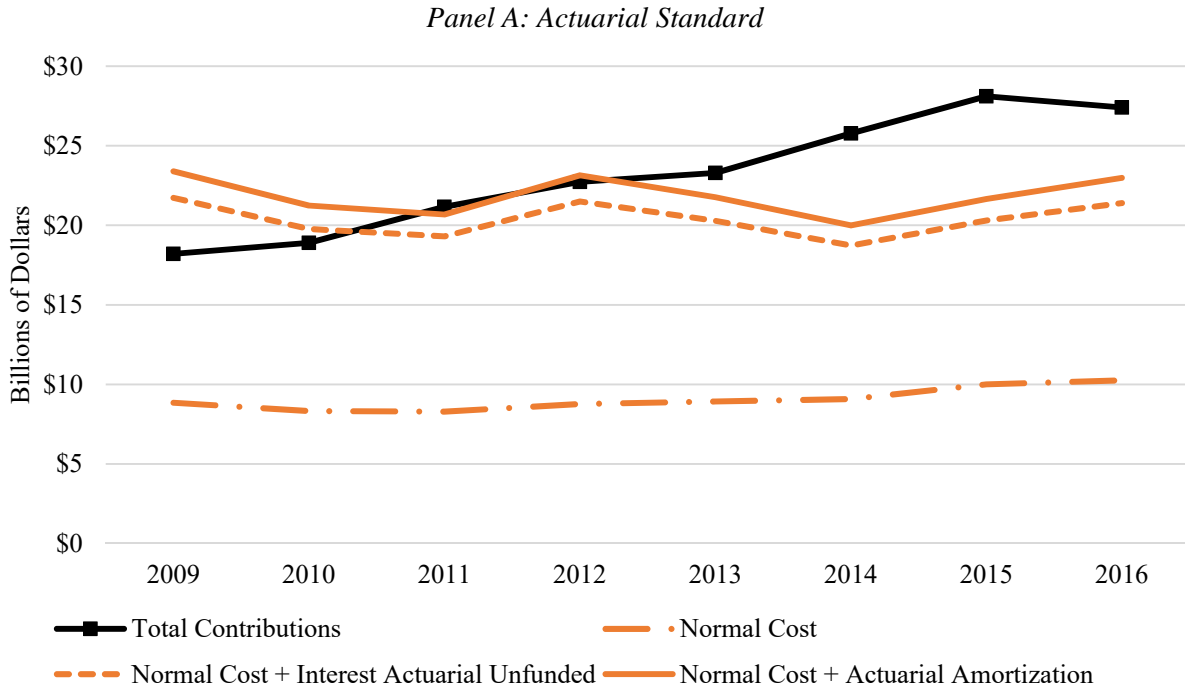
Panel B: Funding Ratio by Year



Source: 2016 PBGC Data Tables - https://www.pbgc.gov/sites/default/files/2016_pension_data_tables.pdf (Tables M-9 and S-44)

Figure 6: Contributions and Cost Measures

This figure shows total multiemployer plan contributions relative to the cost of new benefits, the cost of new benefits plus interest on the unfunded liability, and the cost of new benefits plus amortization. The three panels show these comparisons under the three different measurements described in Section II of the testimony: the actuarial measurement, the current liability measurement, and the solvency liability measurement.



Panel C: Solvency Liability Standard

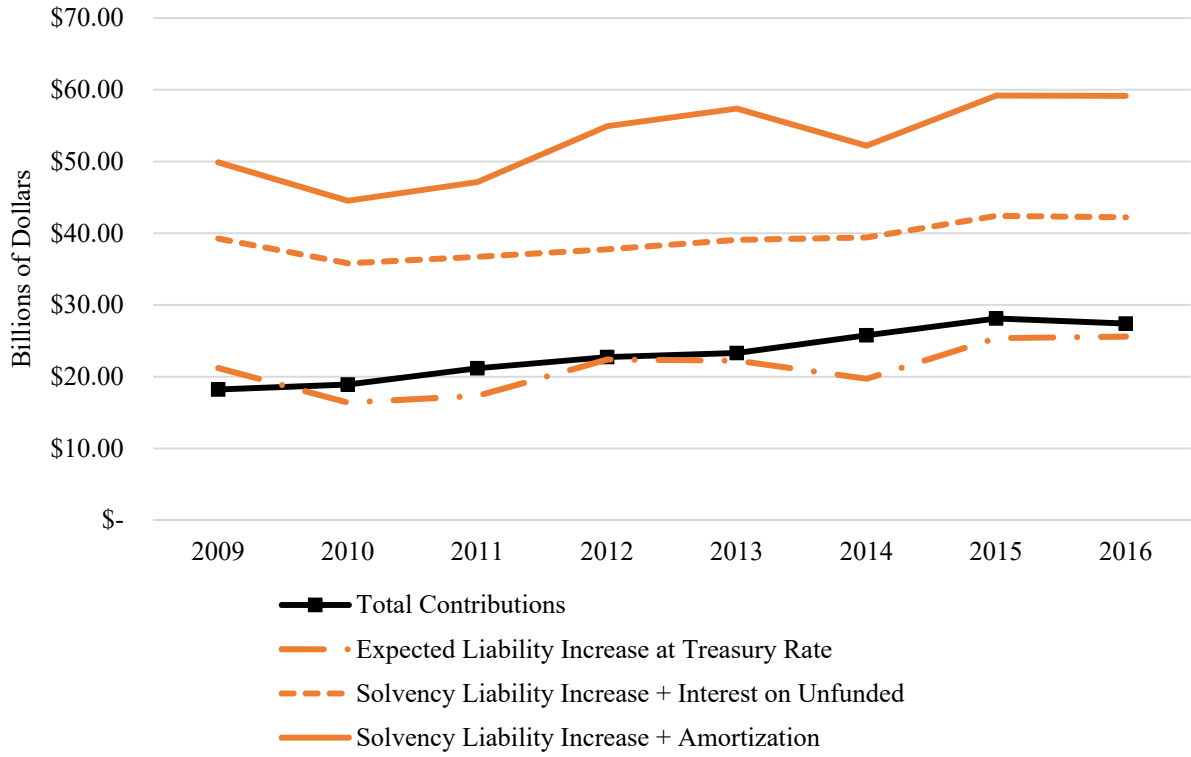
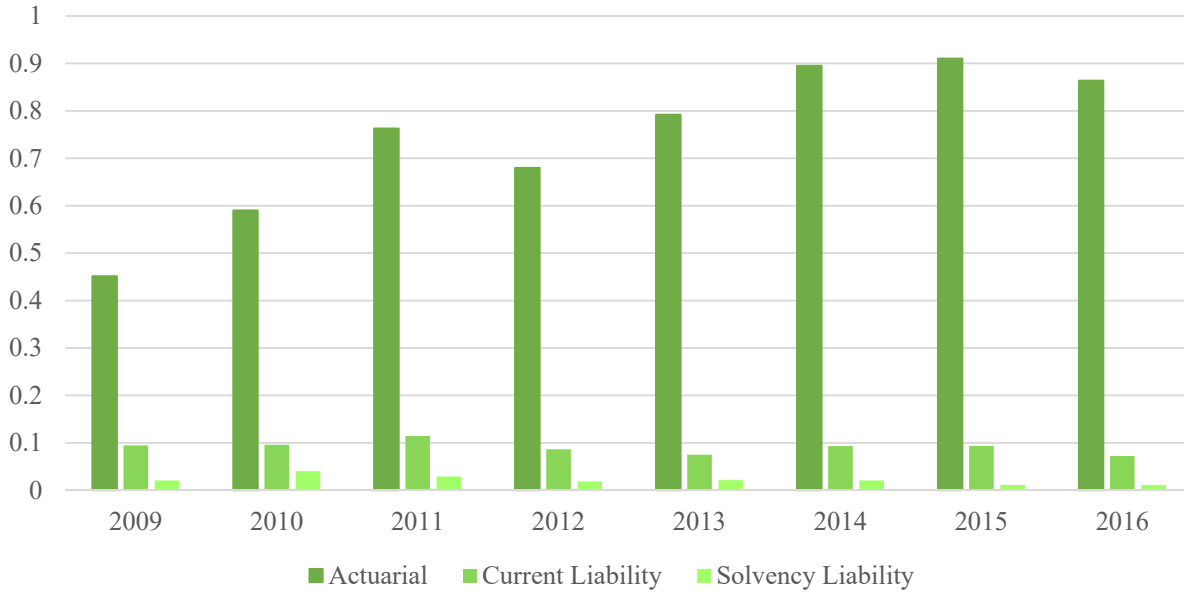


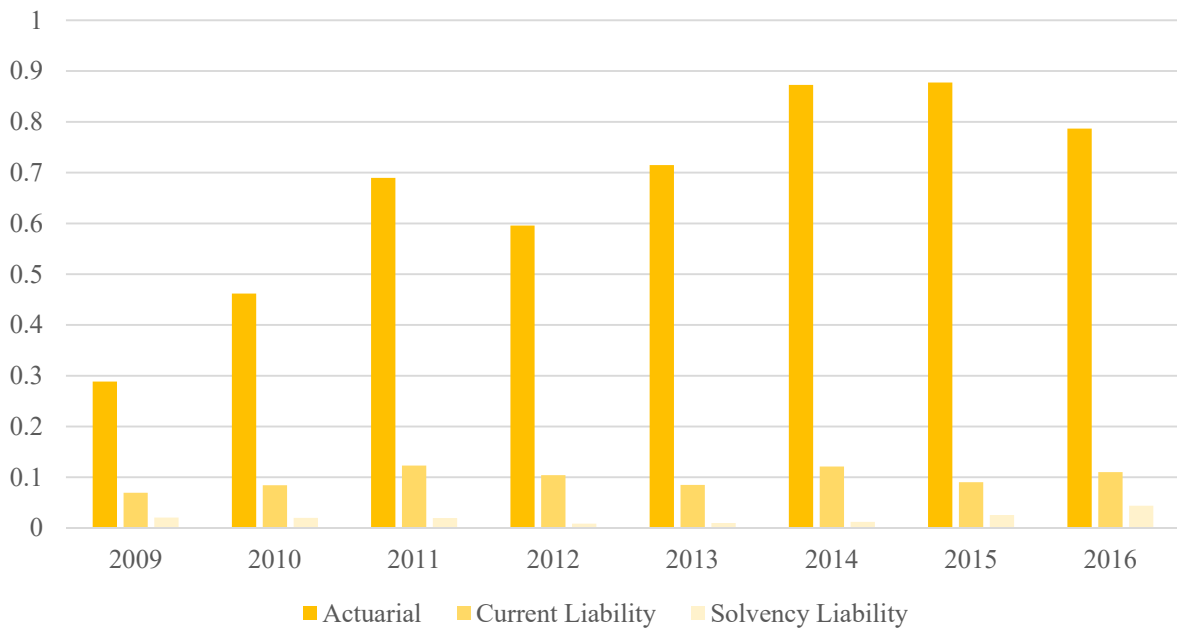
Figure 7: Percentage of Plans Meeting Normal Cost Plus Amortization of Unfunded Liability by Zone and Standard

The four panels in this figure show the evolution of the percent of plans that are contributing at least the normal cost plus a 30-year amortization of the unfunded liability under three different standards - actuarial, current liability, and solvency liability - from 2009 to 2016. The plans are divided up by zones: Green Zone Plans (Panel A), Endangered Plans (Panel B), Red Zone Plans (Panel C), and Critical/Declining Plans (Panel D).

Panel A: Green Zone Plans



Panel B: Endangered Plans



Panel C: Red Zone



Panel D: Critical/Declining Plans

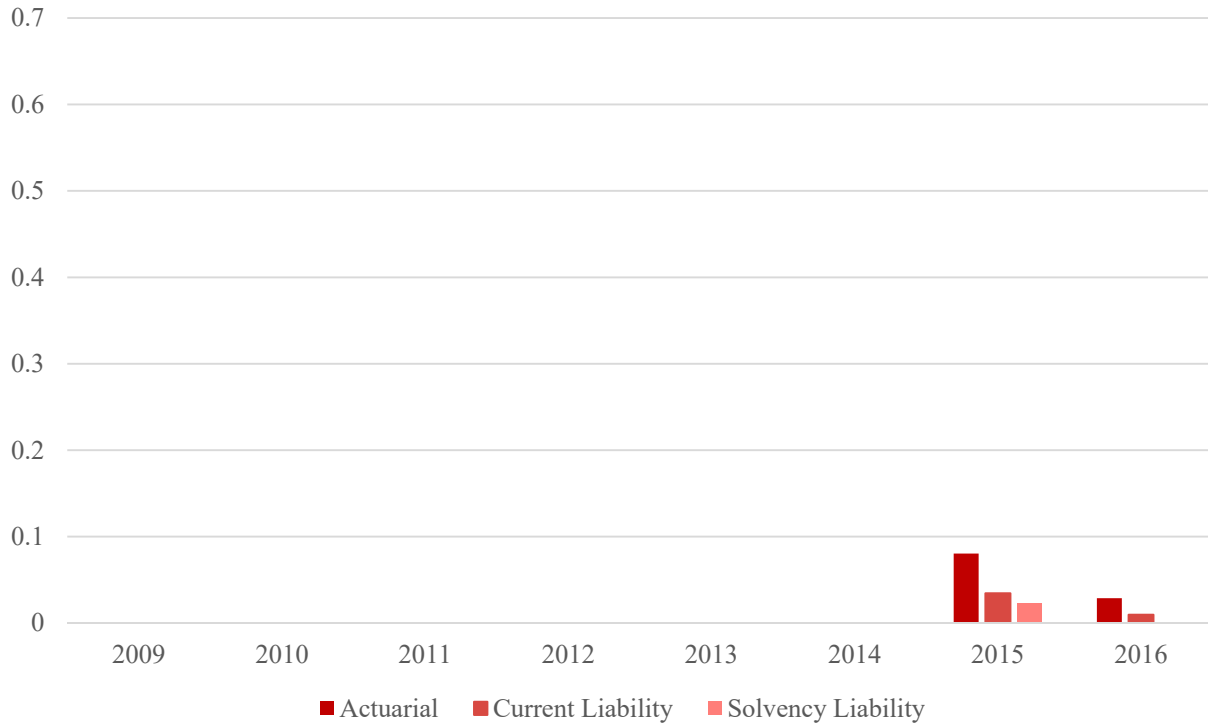
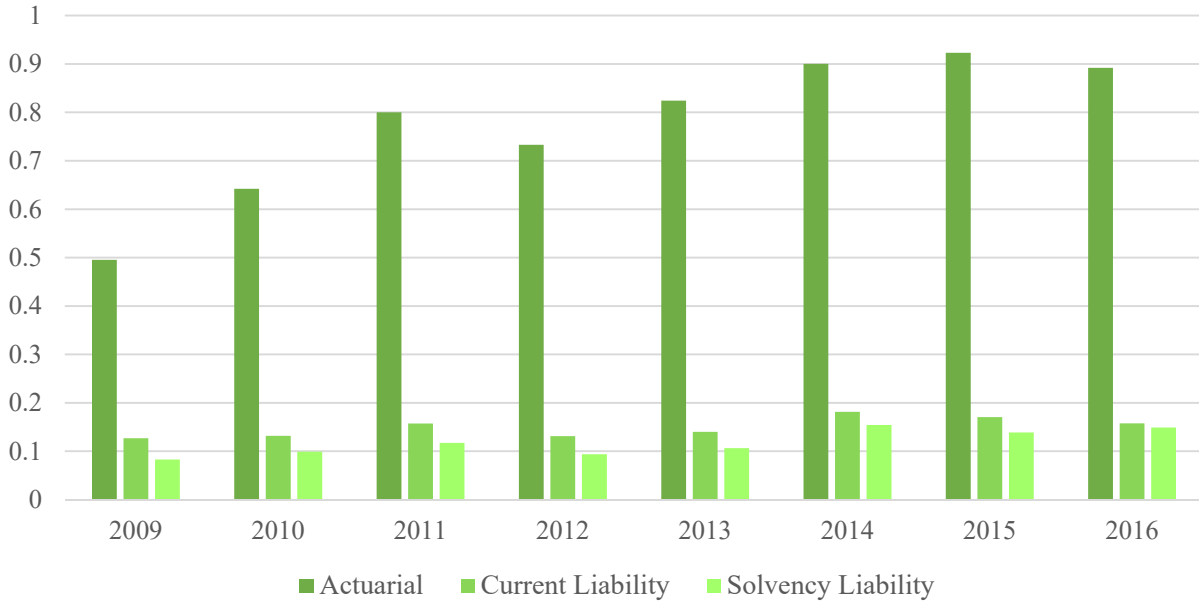


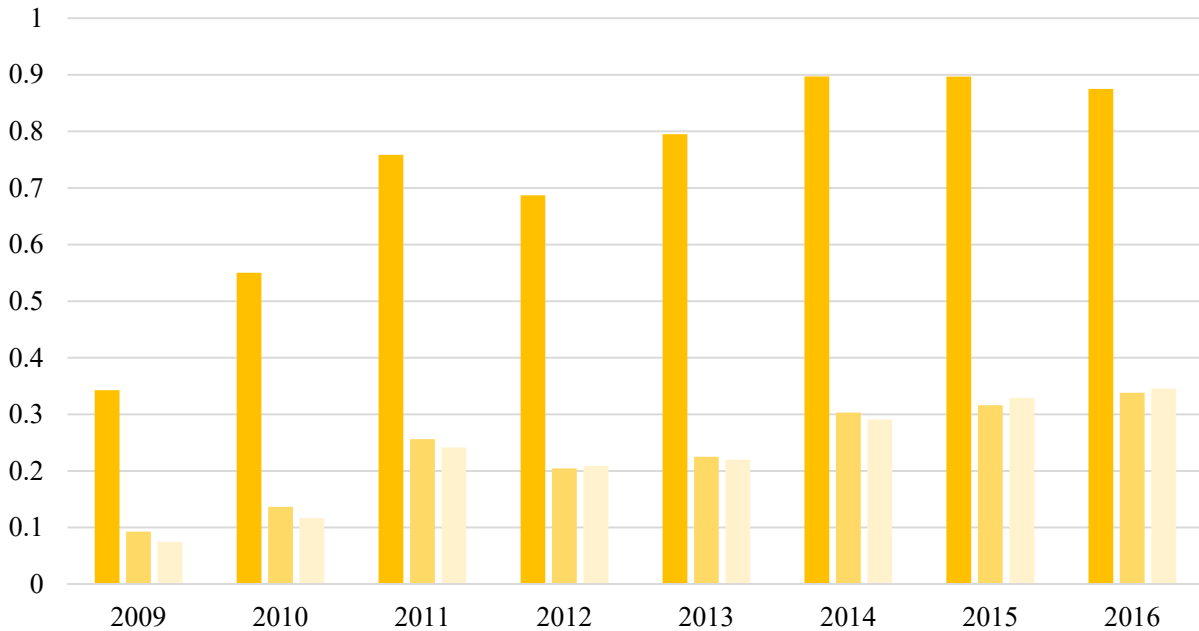
Figure 8: Percentage of Plans Meeting Normal Cost Plus Interest on Unfunded Liability (“Treading Water”) by Zone and Standard

The four panels in this figure show the evolution of the percent of plans that are contributing at least the normal cost plus interest on the unfunded liability under three different standards - actuarial, current liability, and solvency liability - from 2009 to 2016. The plans are divided up by zones: Green Zone Plans (Panel A), Endangered Plans (Panel B), Red Zone Plans (Panel C), and Critical/Declining Plans (Panel D).

Panel A: Green Zone Plans



Panel B: Endangered Plans



Panel C: Red Zone



Panel D: Critical/Declining Plans

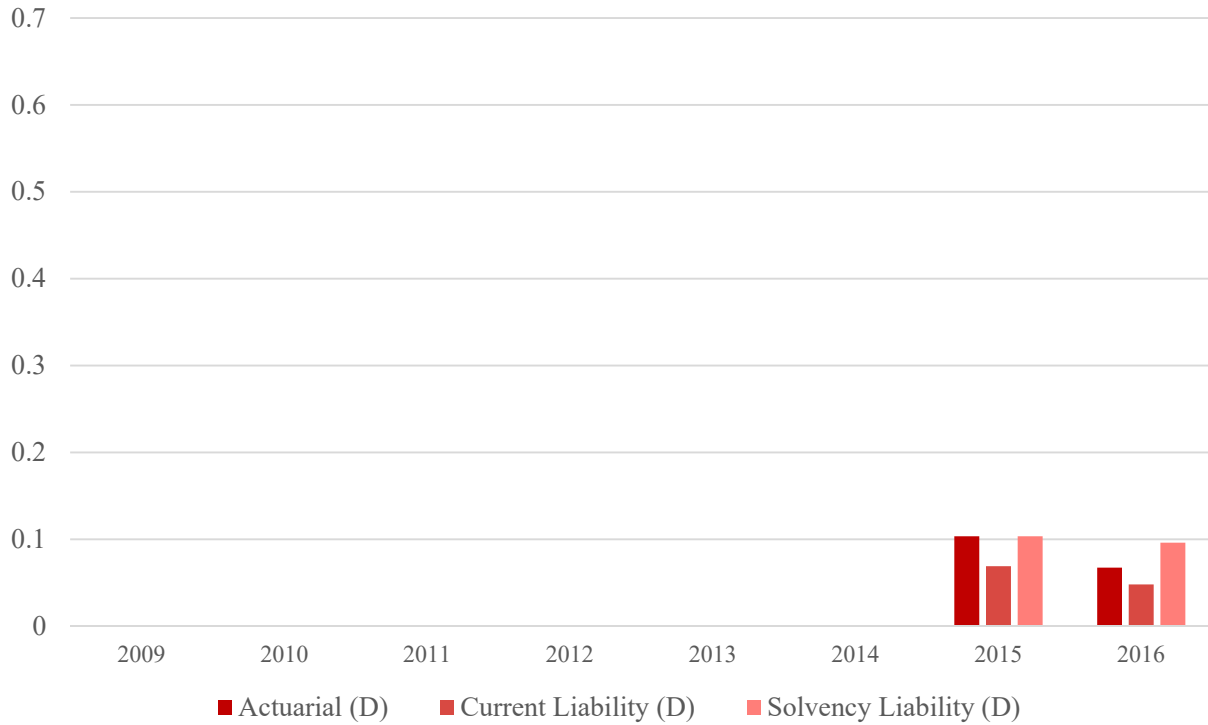


Table 2: State and Local Government Pension Funding (2016)

This table shows the 2016 summary totals for all public pension plans in the US, including assets, liabilities, discount rates, flows into and out of state and local plans, and the additional contributions necessary to meet normal cost plus interest on unfunded liability under the expected return actuarial standard and the solvency standard.

	\$ Amounts in Billions		
	State Pensions (N=269)	Local Pensions (N=387)	State & Local Pensions (N=656)
I. Assets and Liabilities			
<i>GASB 67 Standards</i>			
Total Pension Liability (TPL)	4,403	841	5,244
Assets	2,953	547	3,500
Net Pension Liability (NPL)	1,450	294	1,744
GASB 67 Funding Ratio	67.1%	65.1%	66.7%
<i>Solvency Standards</i>			
Accumulated Benefit Obligation (ABO)	6,295	1,218	7,513
Assets	2,953	547	3,500
Unfunded Solvency Liability	3,336	671	4,007
Solvency Funding Ratio	46.9%	44.9%	46.6%
II. Discount Rates			
<i>GASB 67 Standards</i>			
Average Discount Rate			
Liability Weighted	7.09%	7.05%	7.11%
Unweighted	7.01%	7.17%	7.11%
<i>Expected Return</i>			
Average Discount Rate			
Liability Weighted	7.46%	7.23%	7.45%
Unweighted	7.34%	7.24%	7.28%
<i>Market Value Standards</i>			
Average Discount Rate Liability			
Weighted	2.71%	2.73%	2.72%
Unweighted	2.70%	2.67%	2.68%
Average Duration			
Liability Weighted	11.27	11.29	10.43
Unweighted	11.33	10.61	10.91
III. Flows			
Benefits and Refunds	235.1	43.5	278.6
Employer Contributions	87.3	26.9	114.2
Member Contributions	40.5	6.4	46.9
State Contributions	14.4	0.3	14.7
Total Contributions	142.3	33.6	175.9
IV. Accrual Basis: Necessary Additional Contributions*			
Additional Necessary Contributions			
to prevent rise in unfunded actuarial liability	9.5	-1.1	8.4
to prevent rise in solvency liability	112.7	18.0	130.7

*Note – to meet normal cost plus interest on unfunded liability