

# FY 2017 PBGC

PROJECTIONS REPORT

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## SUMMARY

The Pension Benefit Guaranty Corporation (PBGC) insures pension participants against loss of some or all of their pension benefit when a private sector pension plan fails. PBGC operates two separate insurance programs, one for single-employer and one for multiemployer defined benefit pension plans. The amount of benefits guaranteed, the point at which the guarantees apply and the funding sources are quite different between the two PBGC programs. This report provides long-term financial projections for both programs.

This year's projections for PBGC's Multiemployer Program show a very high likelihood of insolvency during FY 2025 and near certainty of insolvency by the end of FY 2026. Compared to last year's projections, the risk of insolvency decreases slightly prior to fiscal year 2024 but increases significantly starting in fiscal year 2025. These changes are primarily the result of the largest troubled plan transitioning to a 100% fixed-income portfolio, which eliminates most of the uncertainty of the timing of its projected insolvency date and thus eliminates most of the uncertainty about when the plan will require PBGC financial assistance.

The Multiemployer Program continues to report deficits (i.e., negative net positions<sup>1</sup>) much larger than those of the Single-Employer Program. Multiemployer Program deficits are expected to grow, in nominal dollars, over time.

New results for PBGC's Single-Employer Program are generally consistent with findings of the prior year's report but the financial status of the program is likely to improve faster and reach a higher net surplus position compared to the projections from last year. Recent increases in asset returns and decreases in expected future claims increase the likelihood that the program will reach net surplus a few years earlier than previously projected.

**MULTIEMPLOYER PLANS** About 130 of the multiemployer plans<sup>2</sup> that PBGC insures, covering over 1.3 million participants, have declared that they will be unable to raise contributions sufficiently to avoid insolvency over the next 20 years. Multiemployer plans are, as a group, less well funded than single-employer plans. While most multiemployer plans are projected to remain solvent over the next 20 years, approximately one quarter of multiemployer plans are in Critical status and will be unable to meet minimum funding requirements or remain solvent over the long term. Approximately forty percent of these Critical status plans continue to be in Critical and Declining status and have disclosed that they face insolvency over the next two decades.

Under the Multiemployer Pension Reform Act of 2014 (MPRA), Critical and Declining status plans are permitted to take steps to improve long-term solvency including permanently reducing benefit promises to participants via benefit suspensions<sup>3</sup>. To suspend benefits, plans must meet a number of conditions.

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<sup>1</sup> Deficit and negative net position are used in this report to mean the excess of the present value of the liabilities for future payments under the guarantee program over the program assets. "Insolvent," "Deficit" and "Claims" are further defined and discussed in the section "Financial Obligations."

<sup>2</sup> This is based on the latest Form 5500 information and the Critical and Declining Notices filed between 2015 and 2017. This count includes several ongoing plans that have already become insolvent and are receiving financial assistance from PBGC.

<sup>3</sup> While MPRA potentially allows temporary benefit suspensions and requires that suspensions cease if the plan no longer needs them in order to remain solvent, suspensions are generally anticipated to be permanent reductions in benefit amounts in applications for suspension received to date.

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MPRA also gives PBGC new ways to help plans remain solvent by providing financial assistance for plan partitions (undertaken in conjunction with permanent benefit reductions) or for plan mergers.

As of May 6, 2018, 19 troubled plans have made an application for suspension or partition. To date, four applications were approved for suspension (including one with partition)<sup>4</sup>.

This report illustrates two scenarios regarding the number of plans that will apply for and successfully meet the statutory and regulatory requirements for benefit suspensions and financial assistance under MPRA. The solvency of individual plans and the near-term and long-term magnitude of benefit losses to participants differ between these scenarios. However, the results show the insolvency of PBGC's Multiemployer Program is highly likely to occur during FY 2025 and almost certain by the end of FY 2026 under either scenario.

Our first scenario assumes no additional future suspensions or partitions (or financial assistance through facilitated mergers). Under this scenario, PBGC's mean projected FY 2027 Multiemployer Program deficit increases to \$68.9 billion, an increase of \$10.3 billion over last year's report, which projected a \$58.6 billion deficit for FY 2026. This projected deficit is discounted and expressed as a present value. If instead, we express it in nominal terms, the mean projected deficit in FY 2027 would be \$90.6 billion.

We also show an alternate scenario which assumes that some additional plans and participants will elect to use suspension and partition<sup>5</sup> under MPRA. We assume the same rates of use of suspension and partition as in our prior (FY 2016) Projections Report, but added the capability for plans that had undergone suspension to change the suspension percent based on emerging experience, and added a one-year deferral in the assumed average date of benefit suspensions from year 1 to year 2 of the 10-year projection. Under this scenario, the present value projected mean FY 2027 deficit is \$68.0 billion. The FY 2027 deficit is also projected to grow, in nominal terms, to a mean projected value of \$89.5 billion. The projected mean nominal and present value deficits are only modestly smaller than under the scenario that assumes no suspensions or partitions.

Both scenarios include changes to assumptions and updates to the programming of the modeling system. In particular, the multiemployer projections reflect the results of a preliminary update of the contributions cap analysis. As a result of this updated analysis, we modified the model's cap on contributions to be based on the contribution rate rather than the total contribution amount to better reflect the active population decline assumption. Discussion of the multiemployer simulations begins on Page 7; the changes in the model and assumptions are detailed beginning on Page 18.

**SINGLE-EMPLOYER PLANS** Simulations of the Single-Employer Program show that improvements in the program's net position remain likely during the coming decade. This year's report shows a mean projected present value surplus of \$20.1 billion for FY 2027, an increase of \$10.5 billion from the prior report. If instead, we express it in nominal terms, the mean projected surplus in FY 2027 would be \$26.4 billion. There is significant variation around this mean outcome. We also project an earlier

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<sup>4</sup> One additional plan was approved by Treasury but the participant vote is pending.

<sup>5</sup> PBGC's ability to provide financial assistance to plans for both facilitated mergers and for partitions is constrained by statutory non-impairment and net long-run loss tests as well as the limited amount of money in the multiemployer revolving fund. The facilitated merger authority is not separately modeled in ME-PIMS, but is incorporated within the modeling of the constrained financial assistance available under partition. For additional information on the assumptions, see the section "Assumed Utilization of MPRA Suspension, Partition and Facilitated Merger" beginning on Page 17.

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median date for the program to emerge from a net position deficit. This accelerates the trend seen in the past several reports.

This year's report incorporates various improvements to the model, most of which are refinements to improve performance, accuracy, and efficiency. The Single-Employer Program results are detailed beginning on Page 23.

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## FREQUENTLY USED ABBREVIATIONS

ERISA	Employee Retirement Income Security Act of 1974 as amended
ERM	Critical status plans that have determined they have “Exhausted all Reasonable Measures”
FY	Fiscal Year
ME	Multiemployer
MPRA	Multiemployer Pension Reform Act of 2014
PBGC	Pension Benefit Guaranty Corporation
PIMS	Pension Insurance Modeling System
PPA	Pension Protection Act of 2006, as amended
PV	Present Value
SE	Single-Employer

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## ABOUT THIS REPORT

This report contains estimates and projections for both PBGC's Multiemployer Program and Single-Employer Program. Projections begin with the values presented in PBGC's most recent Annual Report, as of the end of Fiscal Year 2017, and project for the following decade and beyond based on current economic conditions and current law<sup>6</sup>. PBGC uses two stochastic modeling systems to make the projections: the Multiemployer Pension Insurance Modeling System (ME-PIMS) and the Single-Employer Pension Insurance Modeling System (SE-PIMS). Each relies on running many simulations to derive a range of possible future outcomes. The report uses averages and ranges to summarize the simulations.

The purpose of the report is to provide an actuarial evaluation of the expected operation and status of PBGC's Multiemployer and Single-Employer Programs over the near term. It does so by illustrating the projected solvency (adequacy of assets and income to meet current cash needs) and balance sheet net position (assets minus liabilities) for the two programs over time under a variety of simulated future conditions. The standard for actuarial evaluations is that the estimates be reasonable and based on the use of reasonable methods and assumptions. In the professional opinions of the signers, this report meets those standards.

The values shown are estimates, not predictions. They reflect a reasonable range of values that might result based on the assumptions and behavioral relationships that underlie the models. The values are highly dependent on the stochastic projection of many highly variable factors such as future interest rates, future equity returns, and future decisions by plan sponsors. **The actual results that ultimately occur in future years can, and likely will, vary materially from the mean projections in this report.**

### ***Wide Range of Possible Outcomes***

To illustrate the uncertainty inherent in projecting even the near future, this report shows a wide range of possible outcomes associated with a given set of assumptions. These include mean (average) values and "high," median, and "low" values projected for key outcomes for FY 2018 - 2027. To demonstrate potential variation, the "high" value is set at the 85<sup>th</sup> percentile (i.e., 85 percent of the outcomes are lower), the median value at the 50<sup>th</sup> percentile, and the "low" value at the 15<sup>th</sup> percentile.

While the "high" to "low" range represents the bulk of projected outcomes, almost a third of projected results lie above the "high" or below the "low" range. Over a 10-year period it is likely that results will fall outside the "high" to "low" range several times. Because these "tail" results are also important, the report also presents discussions of the full distributions of projected financial positions for both programs.

### ***Financial Obligations***

The report presents two types of financial obligation measures: (1) liabilities (and assets) stated on both a present value and nominal basis and (2) year-by-year cash flows. PBGC's liabilities reflect the discounted present value of the retirement benefits PBGC pays for the *lifetime* of participants and their beneficiaries; these retirement benefits are generally guaranteed benefits with adjustments as set forth in ERISA and regulations. "Claims" are newly recorded (lifetime) liabilities less any associated assets and recoveries; they are generally recorded on PBGC's books when the payment of guarantee amounts is "probable." The amount that PBGC "books" is the present value of benefits payable to participants and their beneficiaries for their lifetimes plus associated expenses that PBGC would pay under the rules

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<sup>6</sup> This report generally uses data and assumptions as of September 30, 2017 (the end of FY 2017).

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governing the guarantee program, less the present value of any assets or other recoveries. Discussions of PBGC's deficit, net position, financial position and net financial position all reflect the discounted present value of lifetime total liabilities in excess of total assets as of a certain date. PIMS generally models anticipated amounts shown as liabilities or assets on PBGC's books at future points in time along alternate economic paths; it does not model amounts that are disclosed in footnotes to PBGC's financial statements but not booked, such as amounts that represent "reasonably possible" contingencies.<sup>7</sup>

The report also looks at *year-by-year* cash flows. Discussions of plan or PBGC insolvency focus primarily on the sufficiency of assets, investment returns, contributions or premiums, and other income (e.g. withdrawal liability payments) to meet benefit payments and expenses for a particular year; i.e., the report uses the term "insolvent" to mean lacking the funds to pay current benefits and expenses for a year. In contrast, the terms "deficit" and "surplus" are used to refer to the difference between the present value of liabilities for a lifetime of payments and the assets, not to year-by-year cash flow amounts.

### **About the PIMS Models**

The PIMS Models are the best available tools for this analysis; but, like most models, they are subject to limitations. The models are continually revised in light of changing law, plan sponsor behavior, and PBGC's understanding and interpretation of that behavior.

Major changes to the SE-PIMS model include more accurately modeling career average formulas, refining the calibration of flat-rate premiums by having separate factors for plans open to new entrants vs. frozen plans closed to new entrants, improving the efficiency of the random number generator and several minor system corrections.

Changes to the ME-PIMS model include adding the capability to allow updating benefit suspension percentages, updating mass withdrawal liability payments in various forecasts, treating Critical and Declining status plans as having "exhausted all reasonable measures (ERM)," updating the model's cap on contributions and several minor system corrections.

While both ME-PIMS and SE-PIMS can simulate demographic and economic factors up to 20 years into the future, they do not model all longer-term sources of uncertainty affecting the pension system.<sup>8</sup>

Estimated Multiemployer Program deficits and financial assistance shown in this report assume that PBGC will provide benefits in accordance with the current level of guarantees rather than reducing guarantee levels to those affordable by premiums.<sup>9</sup> This evaluation assumes no changes to the current law after September 30, 2017 for both multiemployer and single-employer plans.

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<sup>7</sup> Reasonably possible contingencies are discussed in Note 9 of PBGC's Annual Report. As of the end of FY 2017 they were \$238 billion for the Single-Employer Program and \$14 billion for the Multiemployer Program.

<sup>8</sup> For more information on PIMS, including links to user publications and peer review papers, see the PIMS Web Page <http://www.pbgc.gov/about/projections-report/pension-insurance-modeling-system.html>.

<sup>9</sup> This enables the measurement of the size of the promised benefits from the PBGC program and the resources PBGC has to meet those payments. Under current law [ERISA §4022A(f)(2)(C)], if premiums and PBGC Multiemployer Program assets are insufficient to pay guaranteed benefits, and Congress does not respond to the formal PBGC submission of alternative actions, guarantees are reduced to the level affordable by premiums.

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## MULTIEMPLOYER PROGRAM

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### MULTIEMPLOYER PROGRAM OVERVIEW

The current multiemployer system, covering approximately 10 million participants in about 1,400 plans, remains under severe stress. Multiemployer plans are collectively bargained plans that are maintained by one or more unions and multiple companies and are generally in the same industry or members of an association.

By law, PBGC’s insurance program for multiemployer plans operates differently than its Single-Employer Program. The insured event is plan insolvency (i.e., the year in which a plan is anticipated to have insufficient funds to pay benefits and expenses). Even after a plan becomes insolvent, PBGC does not take over the administration of an insolvent multiemployer plan, but rather provides financial assistance to cover the plan’s guaranteed benefits and its expenses. Technically this financial help is in the form of loans. However, with one exception over PBGC’s history, the loans have not been repaid.

Multiemployer plans’ premium rates for PBGC coverage are lower than those for single-employer plans and are based solely on participant count. The amount and structure of the benefit guarantees provided under the program also differ significantly. Assets of PBGC’s Multiemployer Program are separate from those of the PBGC Single-Employer Program by statute; assets from one program cannot be used to fund obligations of the other program.

The Pension Protection Act of 2006 (PPA) required multiemployer plans to be categorized based on funded status, compliance with minimum funding standards and duration to likely insolvency. This is also known as “zone status.” The most troubled plans are characterized as Critical status plans<sup>10</sup>. Generally these are plans that are likely unable to meet minimum funding requirements and/or are likely to become insolvent in the near term. The Multiemployer Pension Reform Act of 2014 (MPRA) defined a

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<sup>10</sup> “Critical status plans” are defined in ERISA § 305 (b)(2) under a variety of alternative criteria that target plans with severe funding or liquidity issues. Critical status plans must establish a rehabilitation plan detailing how they intend to emerge from Critical status (generally within 10-13 years), but if they are not projected to emerge during the rehabilitation period after exhausting all reasonable measures, they must develop an alternative scenario that allows them to emerge at a later time or to otherwise forestall possible insolvency. These Critical status plans are referred to as “exhausted all reasonable measures” (ERM) plans.



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subcategory of Critical status plans which are “Critical and Declining”. These are Critical status plans whose actuaries project that plan insolvency will occur within 20 years or less.<sup>11</sup>

MPRA gives Critical and Declining plans additional options to address the risk of insolvency, but the use of these options presents difficult choices for plan sponsors and participants. Under MPRA, Critical and Declining plans may take steps to improve long-term solvency by permanently reducing benefit promises to participants via benefit suspensions if they meet certain requirements of the law, including application to and approval by the Department of the Treasury. MPRA also changes PBGC’s ability to provide early financial assistance to plans, either by assuming part of the plan’s liabilities via a plan partition or by providing facilitated merger assistance. In order to receive partition assistance, the plan must take all reasonable measures to avoid insolvency including the maximum benefit suspensions, if applicable. Mergers can stabilize or increase the base of contributing employers, combine plans’ assets for more efficient investing, and reduce plans’ administrative costs. MPRA provides for PBGC to be able to facilitate a merger of plans by providing technical assistance. Critical and Declining plans may also apply for financial assistance to facilitate a merger, if necessary to avoid plan insolvency. Partition, or any facilitated merger, must also reduce PBGC’s long-term loss and cannot impair its ability to provide financial assistance to the many other plans that are anticipated to need assistance in the future.

Recent Form 5500 data<sup>12</sup> show that the financial condition of the multiemployer universe as a whole has improved slightly. More plans are showing improvement in their zone status over the last few years. However, the data also show that, in aggregate, the multiemployer universe suffered a 12 percent decline in active participation over the last 6 years. Contributions to multiemployer plans are directly related to active participation. Continued decreases in active participation will have a devastating impact on troubled plans and their ability to recover.

As of May 6, 2018, 19 plans applied for suspension (including four plans that applied for partition). To date four plans were approved for benefit suspension (including one with a partition). As of the end of 2017, two plans have implemented benefit suspensions (including the one with a partition).

Given the limited experience of plans successfully applying for suspensions and/or partitions, this report continues to use the same utilization assumptions as in the FY 2016 Projections Report, but defers the assumed average date of commencement of benefit suspensions from year 1 to year 2 of the 10-year projection and makes certain changes to how we model suspension.

The estimate of the average projected deficit increased from last year’s projected 2026 mean present value deficit of \$57.8 billion to this year’s projected 2027 mean present value deficit of \$68.0 billion, assuming some future suspensions and partitions under MPRA. Assuming no future use of suspension and partition yields a projected 2027 mean present value deficit of \$68.9 billion, an increase of \$10.3 billion from the comparable numbers in our prior report. While the present value of the year 2027 mean projected deficit is comparable to the September 30, 2017 starting value, in nominal terms the deficit is projected to grow, rising to a mean projected deficit of \$89.5 billion or \$90.6 billion in 2027 depending on the assumed use of suspensions and partitions.

The PBGC’s Multiemployer Program is estimated to have a likelihood of insolvency of over 90 percent in 2025; the likelihood rises to 99 percent by the end of 2026, regardless of scenario. The likelihood of

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<sup>11</sup> ERISA §305(b)(6). Under MPRA, plans in Critical status must perform either a 15- or 20-year projection to determine whether they will become insolvent and thus “Critical and Declining.” Almost all Critical plans satisfy conditions that require a 20-year test.

<sup>12</sup> Based on 2009 through 2015 MB data.

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insolvency does not vary greatly with the future use of suspension and partitions under MPRA. Comparing to the FY 2016 results, this represents an increase of more than 30 percent likelihood for PBGC's Multiemployer Program to run out of assets by the end of FY 2025.

The model runs 500 simulations of the economy and how plans react to changes. While these results are highly variable, none of the simulations, under either of our two MPRA use scenarios, show PBGC's program in surplus. Instead, the model shows PBGC's Multiemployer Program will have a net deficit in 100 percent of our 10-year projection simulations.

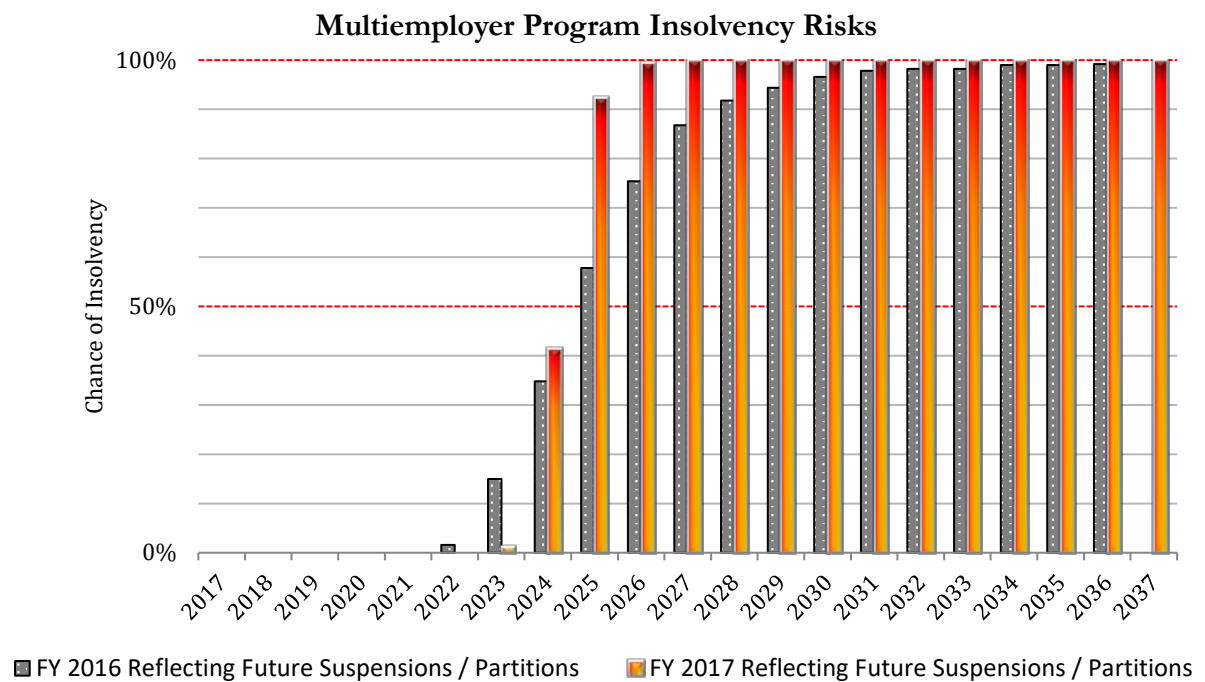
## **WILL PBGC HAVE FUNDS TO PAY MULTIEMPLOYER GUARANTEES?**

**The multiemployer guarantee program remains at risk of running out of money.** Participants in insolvent plans face benefit reductions to the level of PBGC guarantees upon plan insolvency. They also face an additional risk that PBGC's multiemployer guarantee fund will run out of money to provide financial assistance, leaving PBGC unable to pay the current level of guarantees.

Projections show that the Program is likely to become insolvent by the end of FY 2025, absent changes in the law, rising to a near certainty by FY 2026. This significant increase in the insolvency probability is due to the transitioning of the asset allocation towards 100 percent fixed income for the largest troubled plan, which eliminates most of the uncertainty of the timing of its projected insolvency date. This shift in asset allocation also eliminates most of the risk that the plan would require PBGC financial assistance earlier than expected. Based on current estimates, at about the point in time this plan becomes insolvent and requires PBGC financial assistance, we expect PBGC's Multiemployer Program will have run out of money and will not have enough premium income to cover benefits at the current guarantee level for any plan then receiving PBGC's financial assistance.

**In this year's projections there is no more uncertainty of running out of money.** Figure 1 compares the results for the prior (FY 2016) and current (FY 2017) insolvency risk projections. The columns show results assuming future MPRA suspensions and partitions. PBGC's Multiemployer Program insolvency risk is at 100 percent beginning FY 2027.

**Figure 1 – Multiemployer Program Risks Compress –Insolvency by 2026 Almost Certain**



Because PBGC’s ability to offer assistance to plans is constrained by the resources of its Multiemployer Program, and because PBGC must certify to Congress that offering partition or merger assistance will not impair its ability to provide assistance to certain other plans, this report reflects an assumption that the number and format of partitions will be limited so as to not significantly accelerate PBGC’s insolvency. Thus the insolvency risk after reflecting future suspensions and partitions is very similar to that shown when reflecting no future suspensions and partitions.

### HOW QUICKLY WILL THE MULTIEMPLOYER FUND BE EXHAUSTED?

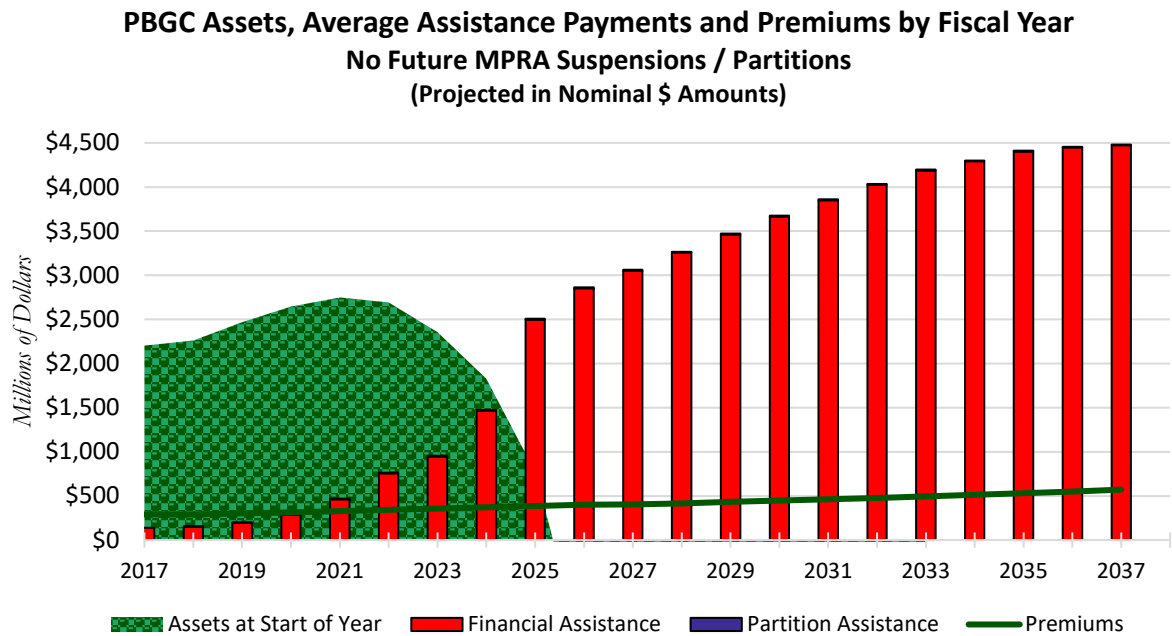
As shown in Figure 1, our model estimates that the PBGC’s Multiemployer Program risk of insolvency rises steeply after FY 2023. Our FY 2017 projection shows greater certainty compared to last year’s projection on the likely timing of the insolvency of the Multiemployer Program – now exceeding 90 percent in FY 2025. To derive the 90 percent level we simulate PBGC premiums paid and the potential financial assistance to plans under 500 economic paths. The insolvency likelihood rises to 99 percent by FY 2026.

To provide additional insight into the drivers of multiemployer fund insolvency we have also prepared an illustration of PBGC’s multiemployer fund balance, assuming no additional future benefit suspensions or partitions. The illustration uses the average of the projected premiums and the financial assistance derived from our simulations. Figure 2 compares the assets as of the beginning of the fiscal year to the projected premiums and projected average financial assistance payments for that fiscal year<sup>13</sup>. Assets projected as of the beginning of 2024 are anticipated to exceed the financial assistance granted through 2024 and to significantly exceed the portion of the financial assistance that is in excess of anticipated

<sup>13</sup> Assets are shown as of a point in time -- the beginning of the fiscal year -- and compared with the cash flow generated due to premiums and financial assistance for that following year (less-material items, including investment income and administrative expenses, are not shown).

premiums. However, as of the beginning of FY 2025, projected assets are significantly less than the anticipated financial assistance net of anticipated premiums, illustrating the expected insolvency of the Multiemployer Program fund in that year.

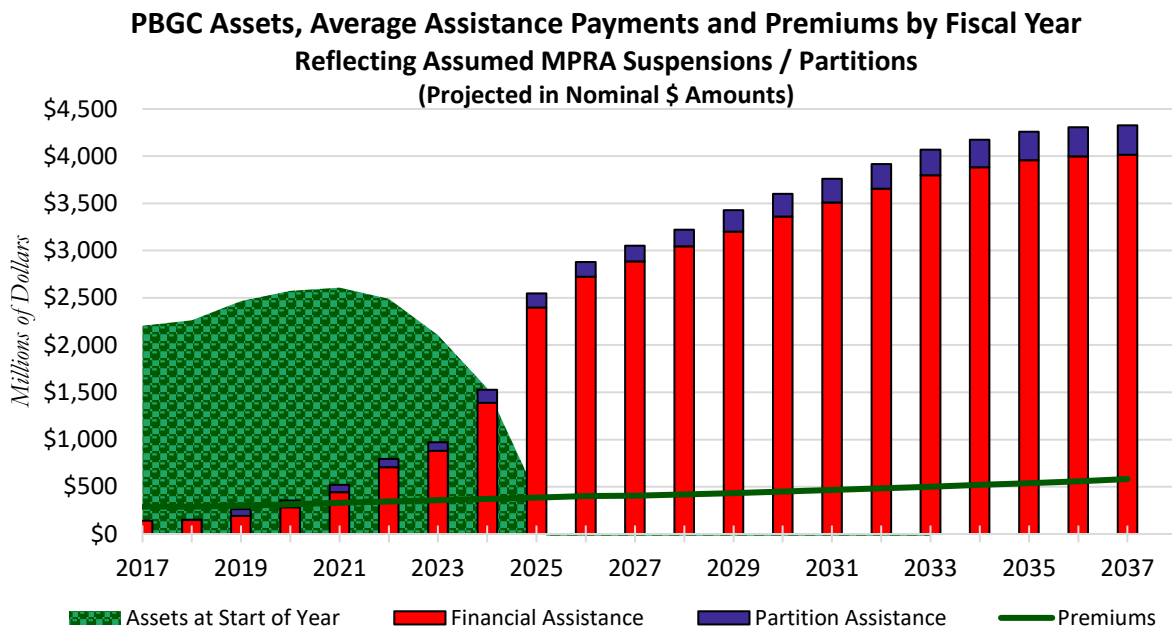
**Figure 2 -- PBGC Multiemployer Fund Projected to Be Drained**



Average projected financial assistance payments rise dramatically over time, as indicated in Figure 2, due to the rising needs of plans that enter insolvency in the 2020’s. Annual financial assistance payments rise much more rapidly than premiums, in the second decade exceeding \$4 billion per year, or nearly twice the current level of assets in the multiemployer fund.

Figure 3 incorporates assumptions about the use of benefit suspensions and partitions. It also compares the assets as of the beginning of the fiscal year to the projected premiums and projected average financial assistance payments for that fiscal year – financial assistance in Figure 3 includes estimates of early financial assistance granted in partition or facilitated merger. Figure 3 also shows an exhaustion of fund assets in FY 2025.

**Figure 3 -- PBGC Multiemployer Fund Insolvency Illustration Unchanged by Assumed Benefit Suspensions and Partitions**



The projections shown in Figure 2 and Figure 3 use the average (mean) level of financial assistance across all of our simulations in each year. Since the average level of financial assistance includes simulations of economic paths where plans become insolvent at relatively earlier dates, the average financial assistance level is somewhat larger than the median, but is expected to get closer to the median result as insolvency draws closer, until the point where, shortly before insolvency, they are equal. This year’s report shows increased confidence level in the projections, with the year of insolvency based on average cash flows occurring in FY 2025, the same year as the median year in our projections. In addition, the likelihood of insolvency rises to 99 percent in 2026. As noted above, this represents a significant increase in the confidence level of the projected insolvency date from our prior (FY 2016) Projections Report.

## SUMMARY PROJECTIONS

### *Projected Net Position*

The 10-year projections show the Multiemployer Program’s net position deteriorated from last year’s projections. If there are no future suspensions and partitions under MPRA, ME-PIMS projects that the present value of PBGC’s 2027 multiemployer obligations will be higher than last year’s projections (a mean present value deficit of \$68.9 billion for FY 2027 compared to the previous projection of a mean present value deficit of \$58.6 billion for FY 2026, an increase of \$10.3 billion). This projected mean deficit estimate, expressed in present value terms, is also similar to PBGC’s current deficit reported in the most recent Annual Report of \$65.1 billion as of the end of FY 2017.

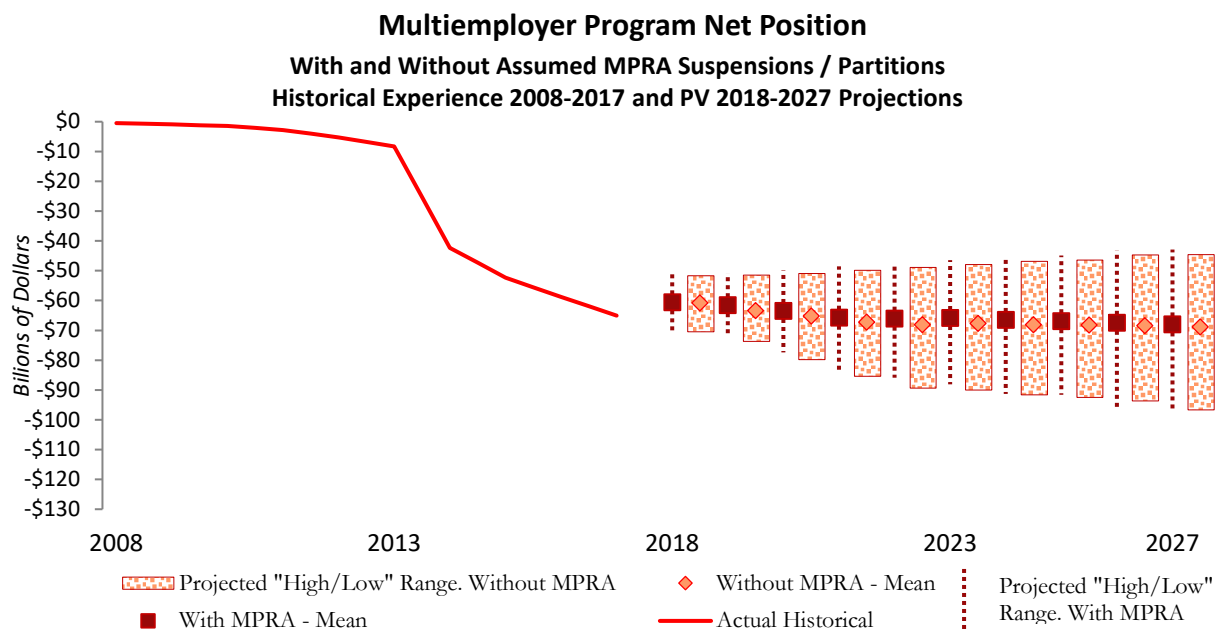
While the mean projected deficit is not projected to materially increase when expressed as a present value discounted back to September 30, 2017, it is projected to significantly increase in nominal terms (expressed in future dollars) to \$90.6 billion.

Assuming plans use suspension and partition, the 10-year projected deficit increased from a mean present value of \$57.8 billion for 2026 to a mean present value of \$68.0 billion for 2027. In nominal terms, the mean deficit is projected to grow to \$89.5 billion.

The projected 2027 mean values reflect changes in assumptions and the projected mean values assuming plans use suspension and partition also reflect differences in the modeling of suspension and partition. The assumption changes and their impact are discussed in the section “Reconciling ME-PIMS Results from 2016 to 2017” beginning on Page 21.

Figure 4 compares the history of net positions reported by PBGC in its Annual Reports for the past decade (the solid line ending in FY 2017) to a range of projected net positions for the next ten years (FY 2018 through 2027). For ease of comparison, the projected values assumed with and without future suspensions and partitions are shown alongside each other. The shaded boxes indicate the 15<sup>th</sup> to 85<sup>th</sup> percentile range and the diamonds represents mean values assuming no future suspensions and partitions. The dotted lines show 15<sup>th</sup> to 85<sup>th</sup> percentile range and the squares are mean values assuming future suspensions and partitions. The similarity in the projected net deficit reflects that, over the long term, suspension (and financial assistance through partition) will have modest impact on PBGC’s net deficit, regardless of the degree to which they may be beneficial to plan participants.

**Figure 4 -- Projected Present Value of Net Position**

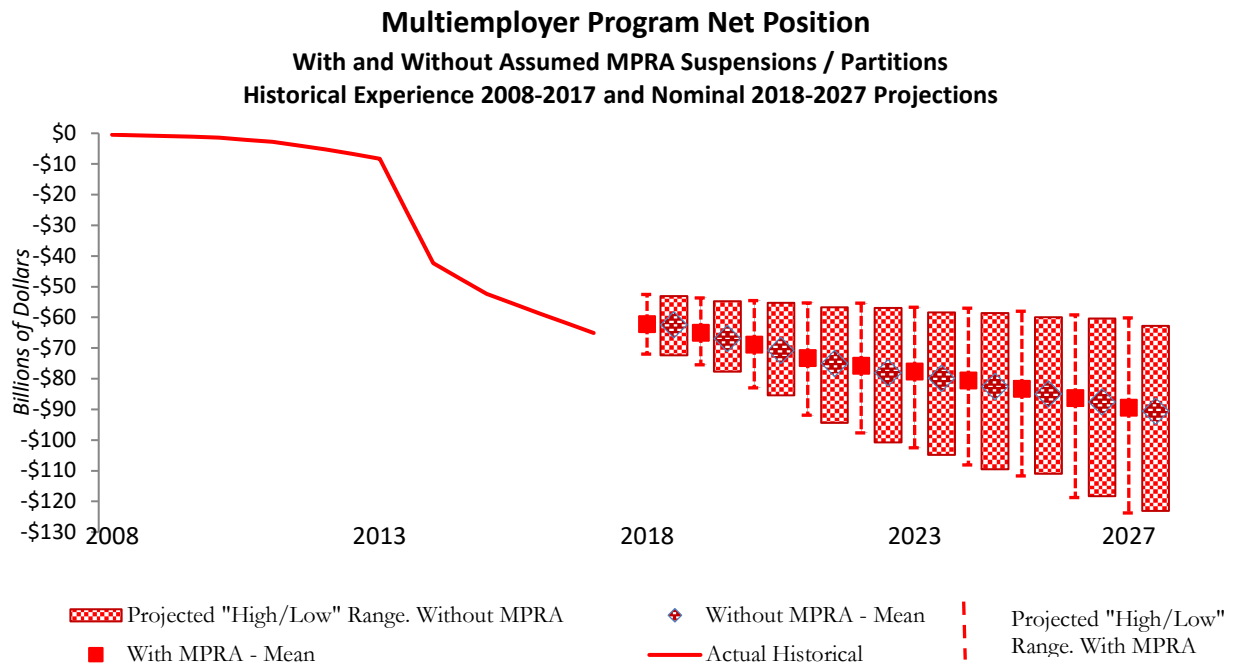


The projections show the present values of PBGC’s deficit (i.e., negative net position), assuming that PBGC maintained its financial assistance obligations at current guarantee levels, even if assets and premiums are insufficient to provide the guarantees. The resulting deficit is the present value of future financial assistance as of that year, less projected assets, plus any unfunded amounts for prior years carried

forward (with interest).<sup>14</sup> in order to continue to provide the current schedule of guarantees and financial assistance in years prior to the projection date.

In Figure 4, the discounted mean future net position is projected to remain relatively close to the Multiemployer Program’s current net position in present value terms. Figure 5 shows a different presentation of the information in Figure 4, converting the projections of future net position to nominal (future) dollars at each point presented.

**Figure 5 -- Future Assumed Suspensions and Partitions - Nominal Projected Net Position**



For simplicity, our model of elections assumes that “Critical and Declining” plans will make and successfully apply for MPRA relief that is effective in 2019.<sup>15</sup> PBGC will continue to review the assumptions around election timing and percentage of plans electing as experience under MPRA emerges.

**Sources of Uncertainty: Multiemployer Program**

Post-MPRA, there are three major sources of uncertainty in the multiemployer system: (1) Probability of new claims; (2) Variability in the timing and amount of financial assistance payments; and (3) Extent to

<sup>14</sup> Unfunded amounts carried forward with interest are effectively treated as if PBGC could borrow them. This enables the completion of the present value calculation so that the total liability can be displayed, but is not intended to imply that PBGC has borrowing authority.

<sup>15</sup>For modeling purposes, assumptions regarding election of suspension and partition incorporate the likelihood that sponsors will apply, will comply with statutory and regulatory requirements, and that the suspensions will not be overturned by participant vote. For additional information see the discussion under Assumed Utilization of MPRA Suspension, Partition and Facilitated Mergers.

which plans will use suspensions and partitions under MPRA. These sources of uncertainty are discussed in detail in the following sections.

### Projected Net New Claims

Projected new claims arise primarily, but not solely, from plans that are currently in poor financial condition. Uncertainty as to the probability and timing of future financial assistance payments reflect both the volatility of plan investment returns and the timing of potential mass withdrawal from the plan by contributing employers. This variability in plan earnings, contributions, and benefit accruals makes the date of plan insolvency and the amount of financial assistance uncertain.

The following tables show the mean present value of net new claims and the mean present value of the financial position of PBGC's Multiemployer Program in 2027 (discounted to 2017 present values), assuming plans utilize future MPRA suspensions and partitions. Alongside those values, the tables display the "low" and "high" values at the 15<sup>th</sup> and 85<sup>th</sup> percentiles. For each of these tables, because higher new claims mean greater financial losses to the PBGC, the order of the columns has been reversed for the second row of projections to better show the relationship between high new claims and a deterioration of PBGC's financial position. In addition to the present value of the liabilities less assets for FY 2027, which comprise the financial position, the chart also notes when the fund is insolvent as of that date (see Figure 1 for the range of solvency outcomes in other years).

Reflecting Assumed MPRA Suspensions / Partitions	2017 Present Value (PV) <i>(Dollars in billions at year end)</i>		
	"Low" (15 <sup>th</sup> percentile)	Mean	"High" (85 <sup>th</sup> percentile)
<b>PV PBGC ME Net New Claims FY 2018 – 2027</b>	\$7	<b>\$28</b>	\$54
	"High" (85 <sup>th</sup> percentile)		"Low" (15 <sup>th</sup> percentile)
<b>PV FY 2027 PBGC ME Financial Position</b> <i>(Deficit)/ Surplus</i>	<b>-\$43</b> Insolvent	<b>-\$68<sup>16</sup></b> Insolvent	<b>-\$97</b> Insolvent

The Net New Claims essentially reflect liabilities recorded when a plan is booked on PBGC's financial statements offset by the value removed from the books in a subsequent year, should a plan's financial condition materially improve.<sup>17</sup> The PV FY 2027 Financial Position measures future obligations as of 2027, including net new claims as well as final adjustments for benefit payments, asset earnings, and projected 2027 assumptions, and then discounts to a 2017 present value. The number shown includes as part of the deficit any shortage of funds due to providing financial assistance at the currently guaranteed level even after the multiemployer fund runs out of money.

<sup>16</sup> The mean present value discounted to 2017 is a \$68 billion deficit. The mean discounted present value is the average across all simulation paths; discount rates vary among different simulation paths. The mean projected 2027 value is a \$90 billion deficit in nominal terms.

<sup>17</sup> This is the present value of net PBGC obligations for plans projected to be booked during the next 10 years, offset by the reversal of liabilities for plans "unbooked" over the 10-year projection period. The liability "unbooked" is the value in the year of removal; it reflects how the liability has evolved over time along a particular economic path and is not the same liability at which the plan was initially booked. Decreases in liability; during the years when a plan remains "booked;" are not captured in the "unbooking" liability.



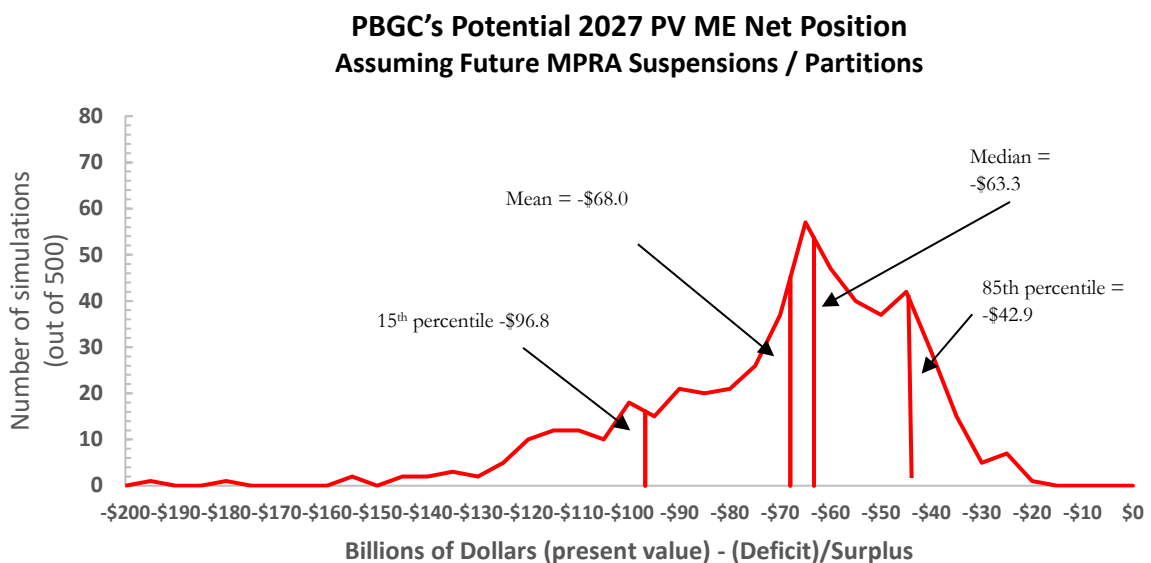
The median present value of net new claims totaled over the next 10 years (assuming future MPRA suspensions and partitions) is about \$22 billion; that is, half of the simulations show a 10-year total of claims above \$22 billion and half below. The mean present value of net new claims (that is, the average level of claims) is about \$28 billion over the next 10 years. This is approximately 17 percent higher than last year's projections.

The middle 70 percent of the outcomes, shown in the preceding table, for the present value of the Multiemployer Program's projected financial position is a range of \$54 billion, slightly higher than the FY 2016 results.

The following graphs illustrate the range of projected outcomes for the financial position of PBGC's Multiemployer Program 10 years from now, reflecting the use of the MPRA suspensions and partitions. For each value of PBGC's projected net position along the horizontal axis, the height of the line shows the frequency of that net position (out of the 500 simulations).

Vertical lines on the graph below show the present value of PBGC's projected 2027 net position at the 15<sup>th</sup> and 85<sup>th</sup> percentiles and the mean and median values of projected net positions. The median result is a deficit with a present value of \$63.3 billion in FY 2027 assuming future suspensions or partitions under MPRA. None of the 500 projections shows a surplus. The most optimistic projection shows a deficit of \$17 billion in present value. Many projections show very severe deficits, with the largest projected at a present value of \$191 billion.

**Figure 6-- Wide Range of Future Outcomes, But All Are Deficits**



### ***PV Financial Assistance Payments***

In addition to new claims, ME-PIMS simulates financial assistance payments from PBGC to insolvent multiemployer plans to pay retiree benefits and maintain the plans. PBGC generally provides financial assistance only after a plan becomes insolvent. Thus, financial assistance payments projected over the next 10 years are generally due to previous claims (i.e., plans already booked as losses).

Over the period from FY 2018 to FY 2027, financial assistance payments are projected to exceed the PBGC's resources, both with and without the use of MPRA suspension and partition. Assets in the Multiemployer Program at FY 2017 year end are about \$2.3 billion while the present value of projected

premiums over the 10-year period is about \$3.0 billion, totaling about \$5.3 billion. The table below shows the mean, and “high” and “low” values for the present value of projected financial assistance payments, without and with assumed suspensions and partitions under MPRA.

No Future Suspensions/Partitions Under MPRA	2017 Present Value <i>(Dollars in billions at year end)</i>		
	“Low” (15 <sup>th</sup> percentile)	Mean	“High” (85 <sup>th</sup> percentile)
<b>PV PBGC ME Financial Assistance Payments FY 2018-2027</b>	\$8.5	<b>\$10.2</b>	\$12.0
<b>PV Assets Plus Premium FY 2018 - 2027</b>	\$5.0	<b>\$5.3</b>	\$5.5

If plans use the MPRA suspension and partition options, the pattern of financial assistance will change. Plans whose partitions are underwritten by PBGC will receive financial assistance sooner in anticipation that they will need less total financial assistance and be able to survive. Financial assistance payments assuming MPRA election rates are shown in the following chart and discussed below in the section “Assumed Utilization of MPRA Suspension, Partition and Facilitated Merger.”

Reflecting Assumed MPRA Suspensions / Partitions	2017 Present Value <i>(Dollars in billions at year end)</i>		
	“Low” (15 <sup>th</sup> percentile)	Mean	“High” (85 <sup>th</sup> percentile)
<b>PV PBGC ME Financial Assistance Payments FY 2018-2027</b>	\$8.8	<b>\$10.5</b>	\$12.3
<b>PV Assets Plus Premium FY 2018 - 2027</b>	\$5.0	<b>\$5.3</b>	\$5.5

The PV of Financial Assistance Payments for the period FY 2018 to FY 2027 represents the value of near term cash flows. In contrast, the projected net position reflects money still owed even after providing financial assistance for the next 10 years -- it emphasizes the increased demands on PBGC’s resources beyond the projected 10-year “financial assistance” payments shown above.

The projected mean, “high,” and “low” financial assistance payments are higher than in the FY 2016 projection due to the fact that we are one year closer to the projected insolvencies of several large troubled plans. With the passage of time, we have one fewer year of small financial assistance payments at the beginning of the projection and one additional year of very large financial assistance payments at the end of the 10-year projection period. In particular, the PV of projected “low” financial assistance payments more than doubled from last year’s projection due to the greater certainty of the timing of the projected insolvency of the largest troubled plan.

## ASSUMED UTILIZATION OF MPRA SUSPENSION, PARTITION AND FACILITATED MERGER

MPRA gives Critical and Declining plans additional options to address the risk of insolvency, but the use of these options presents difficult choices for plan sponsors and participants. Under MPRA, some plans facing insolvency within the next 20 years may take additional steps to improve long-term solvency, including permanently reducing benefit promises to participants via benefit suspensions. In order to suspend benefits, plans must be in Critical and Declining status and submit an application to the

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Department of the Treasury for approval of the benefit suspensions. The application must meet a number of conditions, including demonstrating that the proposed benefit suspensions will likely allow the plan to remain solvent, demonstrating that benefit reductions have been equitably distributed, providing adequate notice to participants, and allowing a vote by participants on the proposed reductions, among other conditions.

The ME-PIMS model explicitly estimates a plan census and benefit distribution for each plan in its sample. That information is used to determine, at each point along each economic path, (1) whether the plan is in Critical status, (2) if the plan is projected to become insolvent within the ensuing 20-year period<sup>18</sup> and meets the criteria to be Critical and Declining status, (3) the amount of benefits protected under MPRA, and (4) whether the plan would project long-term solvency, either through benefit suspensions alone, or with partition assistance. For Critical and Declining status plans, ME-PIMS then applies assumptions as to whether Boards of Trustees will undertake and successfully complete the requirements of benefit suspension.

The degree to which plans and participants will decide to apply for benefit suspensions as of this date is still, to some extent, unknown due to limited experience. As of May 6, 2018, only 19 plans had applied for benefit suspensions (including 4 for partition). As of the end of 2017, two plans have implemented benefit suspension (including one with a partition). Both have been reflected in the FY 2017 results.

Our assumptions for these future benefit suspensions reflect two primary factors: whether Boards of Trustees will voluntarily undertake to apply for a suspension that is found to comply with the requirements of the law and, to the extent that a plan is not “systemically important,” whether participants will vote to override the suspension. For “systemically important”<sup>19</sup> plans, whose applications are approved by Treasury, the law requires that Treasury override any “no” vote, either by accepting the original suspension proposal or by adjusting the proposed suspensions. In the latter case, the Board of Trustees would have the option not to implement the adjusted suspensions.

### ***Changes in the FY 2017 Model of Suspensions and Partitions***

As of May 6, 2018, four suspensions have been approved. Besides the formal applications received for 19 plans, additional plans have used PBGC’s and Treasury’s informal consultation process to evaluate the ability of the plan to potentially implement MPRA tools.

Based on the experience to date under the suspension and partition application process we have made changes to our model of suspension and partition. The primary changes are:

- For plans that implemented partition, the partitioned benefit payments stream is based on the benefit stream used in the MPRA application to minimize distortion due to the unavailability of census information in PIMS.
- To better estimate the MPRA benefit suspensions impact, PIMS is modified to allow plans to “re-test” suspended benefit amounts every fifth year. Suspension percentages will be increased or decreased depending on the plan’s financial experience leading up to the re-test

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<sup>18</sup> Under MPRA plans in Critical status must perform either a 15- or 20-year projection to determine whether they will become insolvent and thus “Critical and Declining.” The 20-year test applies if the plan is less than 80% funded or has a ratio of inactive to active participants of more than 2 to 1; it is rare for a plan to be in Critical status if one of these conditions does not apply.

<sup>19</sup> A plan is “systematically important” if, absent the suspensions, it would be projected to need more than \$1 billion in financial assistance from the PBGC.

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year. In addition, to better reflect conservatism, PIMS is designed to only implement half of the change in suspension percent reduction. Plans under partition are assumed to remain the same throughout the projections. In the FY 2016 model, plans with suspended benefits were assumed to remain with the same suspension throughout the projections period.

For the FY 2017 projection, we have assumed that the average date at which benefit suspensions will first be applicable is FY 2019, one year later than incorporated into our prior set of assumptions. Otherwise, we continue the use of the rates of suspension and partition that we illustrated in our FY 2016 Projections Report.

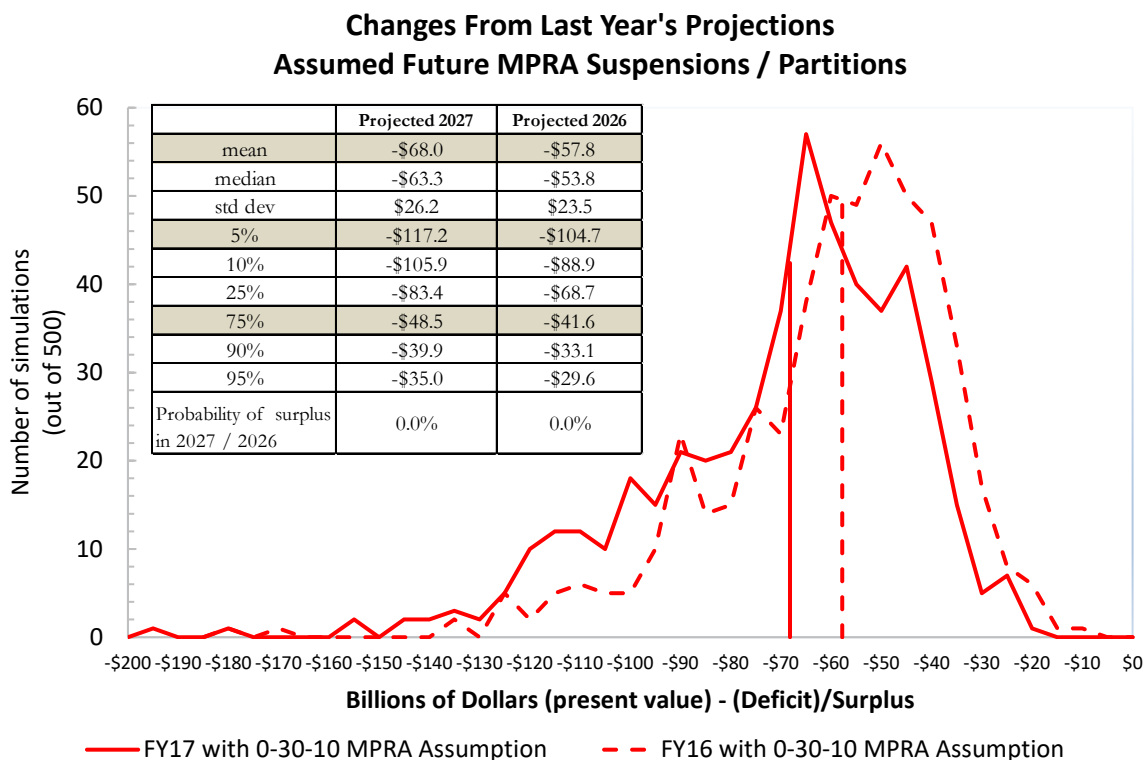
In combination, reflecting the emerging experience under the program, this report continues to assume a zero percent likelihood that the largest Critical and Declining plan will suspend benefits, 30 percent for other plans using suspension alone, and 10 percent using suspension and partition. We expect to continue to evaluate our assumptions of future suspensions and partitions as more plans have an opportunity to consider whether or not to apply.

## VARIABILITY IN PROJECTED FINANCIAL POSITION, MULTIEMPLOYER PROGRAM

Overall, the distribution of outcomes in the FY 2017 projection are worse than the distribution shown in last year's projection. The mean, median, and distribution of the FY 2027 net position are more negative than the FY 2026 projections we reported last year. The mean discounted present value projected result for FY 2027, assuming future suspensions or partitions, is a \$68.0 billion deficit, and the median outcome in FY 2027 (discounted to a 2017 present value) is a \$63.3 billion deficit.

Assuming no future suspensions and partitions, the mean present value of the FY 2027 deficit is \$68.9 billion. There are no projected positive net position outcomes in either scenario.

**Figure 7 – Range of Multiemployer Outcomes with Suspensions**



## RECONCILING ME-PIMS RESULTS FROM 2016 TO 2017

Figure 8 displays a detailed reconciliation (in dollars, as well as percentages) of the changes from 2016 to 2017. A discussion of each item follows the table. Decreases in the projected deficit amounts are shown in parentheses on the chart.

The magnitude of the dollar amounts shown in the table change significantly based on the order in which they are calculated, but they would still add up to the final value of \$68.9 billion under any order. Because the projected assets are small compared to the liabilities, the percentages displayed would change less significantly, regardless of the order of measurement.

Figure 8 -- Reconciliation of Changes in ME-PIMS Results

Reconciliation of Changes in ME-PIMS Results, 2016 to 2017 Results (No Future Suspensions / Partitions under MPRA)			
Description of Change	Value of Change (\$ billions)	Net Deficit (\$ billions)	% Change
<b>Initial Position for Mean PV of 10-Year Projected Net Deficit from 2016 Projections Report</b>		\$58.6	
1. Changes to ME-PIMS Model	4.7	63.3	+8.0%
2. Changes due to Passage of Time from FY 2016 to FY 2017	1.4	64.7	+2.2%
3. Changes due to New Plan Data	2.1	66.8	+3.2%
4. Changes in Economy and Economic Assumptions from FY 2016 to FY 2017	-3.7	63.1	-5.5%
5. Change in Contribution Cap Assumption	5.8	68.9	+9.2%
<b>Year 2027 Mean PV of Projected Net Deficit based on 2017 ME- PIMS Model – No Future Suspensions or Partitions</b>		\$68.9	
(Reflecting Future Suspensions / Partitions under MPRA)			
6. Reflecting Suspensions and Partitions	-0.9	68.0	-1.3%
<b>Year 2027 Mean PV of Projected Net Deficit based on 2017 ME- PIMS Model – Reflecting Future Suspensions or Partitions</b>		\$68.0	

**Changes to the Model:** This report reflects several modifications to the coding (1) to incorporate Critical and Declining status plans as ERM plans, (2) to correct the estimation of withdrawal payments under the booking routine, (3) to correct random number routine, (4) to implement the MPRA “re-test” process, and (4) to enhance performance and make a series of modest program enhancements. These changes increase the mean projected liabilities by \$4.7 billion.

**Expected Change Due to Passage of Time:** The 2016 report projected the PBGC net position in 2026 and presented the results valued in 2016 dollars. To compare with the 2017 report, which projects to 2027 with values reported in 2017 dollars, the 2016 projection is rolled forward to project one additional year with one less year of present value discounting. The effect of the roll forward is an increase in the projected net deficit of \$1.4 billion.

**Data Changes:** Changes in the starting data between FY 2016 and FY 2017 include an increase in the number of plans in the sample in ME-PIMS, reflects new assets allocation for the largest troubled plan

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and incorporates new plan data that plans provide on Form 5500.<sup>20</sup> These changes increase the present value of the deficit by \$2.1 billion.

**Economy and Economic Assumptions:** Between fiscal years 2016 and 2017, there were changes in the assumptions regarding the underlying economy (e.g., source of imputed asset earnings for the years immediately before the valuation for which actual data are not yet available) upon which all the ME-PIMS projections are based. Reflecting these changes decreases the present value of the projected deficit by \$3.7 billion. This is primarily due to projected stronger investment returns offset by decreases in the projected discount rates.

**Change in Contribution Cap Assumptions:** This year's model reflects an update to the contribution cap assumption. This change converts the procedures of capping future cash contributions from multiples of the 2008 total cash contributions to capping the contribution rates instead. This change better reflects the assumption of the decline in active plan participation. This change is based on preliminary results of analysis by PBGC's Policy Research and Analysis Department (PRAD), who are responsible for PIMS development and modeling. Further changes may be made to the FY 2018 model upon completion of the study. This change increases mean projected liabilities by \$5.8 billion.

**Assumptions Regarding Determination of Suspension and Partition:** Based on emerging experience, this report continues with the FY 2016 assumptions. Reflecting future suspensions and partitions decreases the mean present value of the projected deficit by \$0.9 billion, but has only a small effect on projected solvency.

## SENSITIVITY OF CHANGES TO THE MODEL

### *Discount Rate*

Similar to the FY 2016 Projections Report, PBGC includes tests of the sensitivity to increases and decreases in the PIMS discount rate for valuing PBGC obligations. Using the FY 2017 MPRA suspension and partition election assumptions, discount rates 50 basis points higher than in the base projection would improve the mean present value of the 2027 multiemployer net position of \$68.0 billion by \$4.1 billion to \$63.9 billion and discount rates 50 basis points lower would worsen the mean present value of the deficit by \$5.0 billion to \$73.0 billion. Neither scenario shows any chance of a surplus in 2027.

### *Future Wage Index*

PBGC's primary assumption on future wage growth is based on the intermediate assumption of the Social Security Administration projection assumptions. As a sensitivity measure, PBGC did an alternative set of modeling using the Social Security Trustees' low-cost assumption for the future wage index. Using this alternate set of economic assumptions and the FY 2017 MPRA suspension and partition election assumptions, the mean present value of the 2027 multiemployer deficit increases by \$3.9 billion to \$71.9 billion. This scenario still shows no chance of a surplus in 2027.

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<sup>20</sup> Information about Form 5500 and its attachments is available at <https://www.dol.gov/agencies/ebsa/key-topics/reporting-and-filing/form-5500>.



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## SINGLE-EMPLOYER PROGRAM

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### SINGLE-EMPLOYER PROGRAM OVERVIEW

In 2017, PBGC’s Single-Employer Program covered about 28 million participants in over 22,000 plans. PBGC’s simulations show that significant improvement in the Single-Employer Program’s projected net position is likely over the 10-year time horizon. This is a similar pattern to that reported last year, even after adjusting for some refinements to SE-PIMS. Among the changes made to the modeling system were reflecting more up-to-date mortality assumptions (for funding requirements, census experience and for determining PBGC liabilities), more accurately modeling career average formulas, refining the calibration of flat-rate premiums by having separate factors for plans open to new entrants vs. those frozen to new entrants, improving the efficiency of the random number generator and several minor system corrections.

The 2016 Projections Report projected a mean present value surplus of \$9.6 billion for 2026. The 2017 Projections Report shows an improving prospect with a projected 2027 mean present value surplus of \$20.1 billion. The report continues to show a wide range of variability in the potential outcomes for the projected surplus or deficit. However, like last year’s projection, none of the simulations project that the program will run out of money within the next 10 years.

### WILL PBGC HAVE FUNDS TO PAY SINGLE-EMPLOYER GUARANTEES?

As discussed in the section “Financial Obligations” beginning on Page 5, PBGC’s financial statements in its Annual Report present liabilities that extend for the lifetime of pension plan participants and their beneficiaries. These liabilities primarily represent obligations for plans that have already terminated plus probable future claims. PBGC’s liabilities are then compared to the assets currently held to determine the net position. In general, the Annual Report does not look ahead to see how liabilities and assets will change as new claims arise, new premiums are earned, asset returns are realized, etc.

The paths simulated in SE-PIMS, by contrast, start with PBGC’s existing assets and obligations (liabilities) as of Fiscal Year 2017 and then also project:

- Future premium income,
- Future PBGC claims, which increase PBGC’s benefit obligations but also include assets recovered from terminated plans and from their sponsors, and



- Future investment income or losses on PBGC assets, based on PBGC's investment policy and asset allocations.

In the 5,000 paths simulated in SE-PIMS, there are none in which PBGC's Single-Employer Program assets are completely exhausted within the 10-year projection period.

## SUMMARY PROJECTIONS

### Net Position

The FY 2017 Single-Employer Program financial statement assets of \$106.2 billion and liabilities of \$117.1 billion result in a net deficit of \$10.9 billion. The following chart shows PBGC's actual net financial position from fiscal years 2008 to 2017, and the present value of the range of projections for the next 10 years. The mean projected net position for each future year is shown as a large square. The dotted vertical bars for each future year show the range of results between the 15<sup>th</sup> and 85<sup>th</sup> percentiles for that future year. Since each year's position affects the following year's position, the uncertainty of PBGC's financial position grows every year through FY 2027, as reflected in the progressively longer vertical bars. This year's mean projected present value surplus is \$20.1 billion in FY 2027, an increase of \$10.5 billion from the comparable numbers in our prior report. If instead, we express it in nominal terms, the mean projected surplus in FY2027 would be \$26.4 billion.

Figure 9 – Single-Employer Program Net Position Projected in Present Value

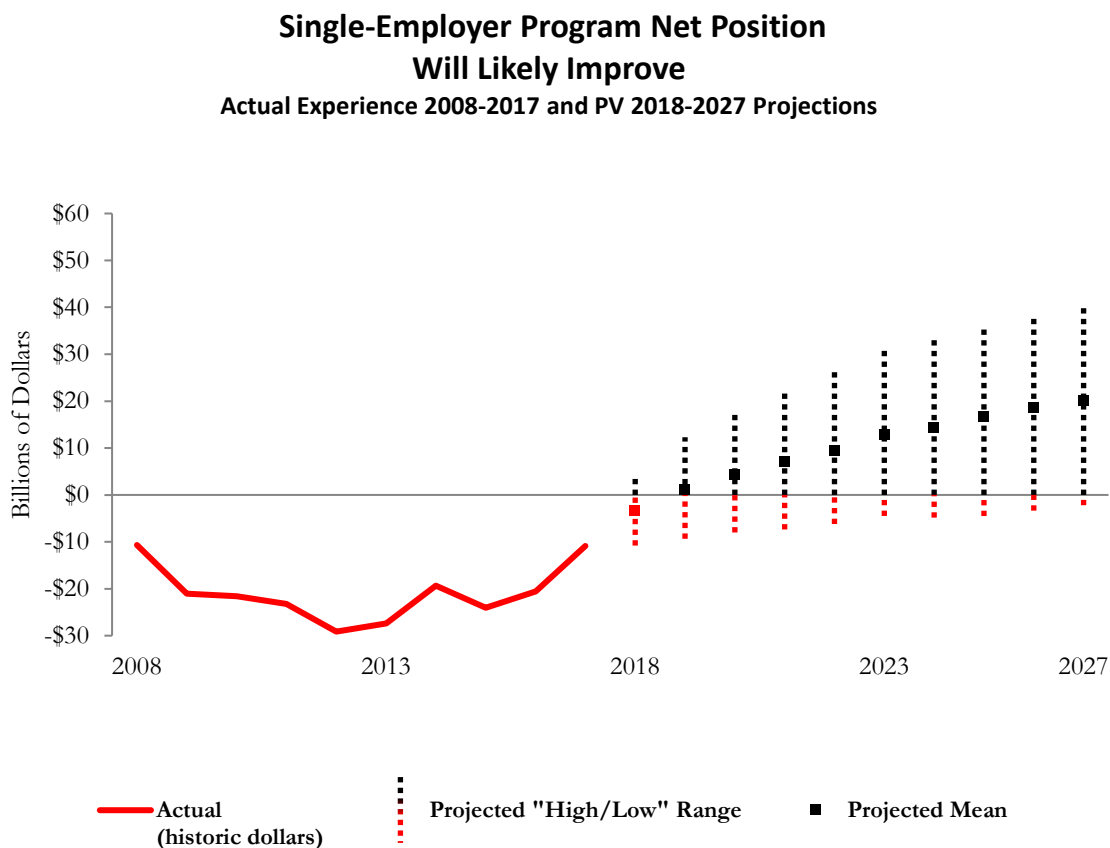
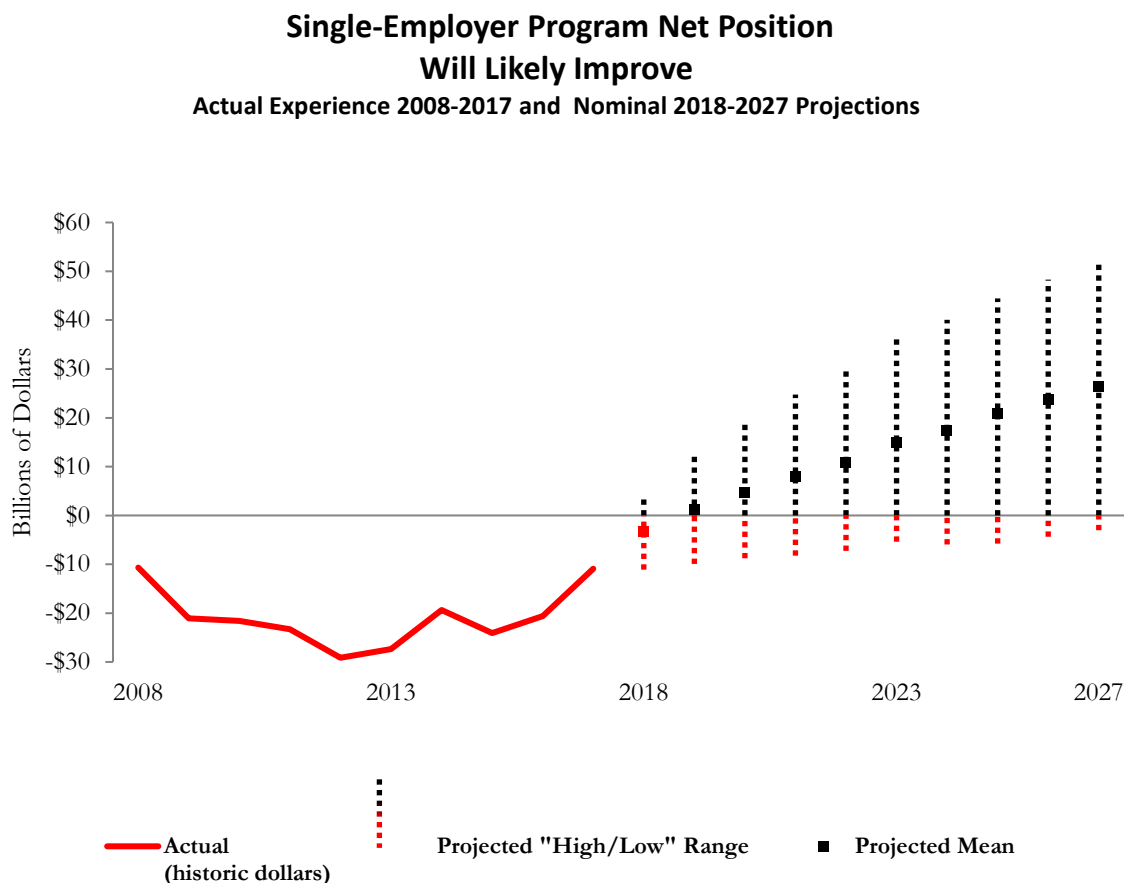


Figure 10 shows a different presentation of the information in Figure 9, converting the projections of future net position to nominal (future) dollars at each point presented. Thus the net position shown for

the year 2020 represents the projected liabilities and assets in 2020 dollars, rather than the present value of those projected liabilities and assets in 2020 discounted to a September 30, 2017 present value.

**Figure 10 – Single-Employer Net Position Projected in Nominal Dollars**



Because PBGC’s obligations are paid out over the remaining lifetimes of people receiving pensions, a deficit means PBGC will have less money than it will need over a period of decades. Without changes, at some point there is a risk that a program in a deficit position will run out of money (i.e., it will have paid out all its assets and still owe benefits). However, a majority of our simulations show that future premiums net of claims may be sufficient to eliminate the deficit over time. Whether or not the deficit is eliminated over time, from a year-over-year cash flow basis the program appears highly likely to be able to operate over the near term. Out of 5,000 simulations, none project that PBGC’s Single-Employer Program will run out of money within the next 10 years.

The improvements to PBGC’s net position over the 10-year period are due to a general trend of improving plan solvency and projected PBGC premiums exceeding projected claims.

**Sources of Uncertainty: Single-Employer Program**

The uncertainty in the future of PBGC’s Single-Employer Program arises from questions we cannot now answer. These include not knowing which plans will fail, how much PBGC will owe participants as a result of these failures, how much PBGC will still owe people by FY 2027 (in outstanding benefits that remain beyond the 10-year projection period), what returns PBGC will realize on its assets, and how much PBGC will receive in premiums.

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### ***Which Plans Will Fail?***

The primary drivers of PBGC's projections are the financial health of the companies that sponsor pension plans and the amount of underfunding in those plans. If many companies with large, underfunded pension plans enter bankruptcy and are permitted to terminate their underfunded plans, new claims are created against PBGC, increasing future PBGC obligations. These new claims will also be reflected in PBGC's projected net position.

### ***How Much Will PBGC Owe Participants?***

***Benefit payments and new claims.*** "Benefit payments" for a given year means the amount PBGC is projected to pay to retirees during that year (discounted to a 2017 present value), regardless of when their plans failed. "New claims," on the other hand, represents the total present value of the projected costs over time to PBGC of plans that fail during the projection period. A new claim is the difference between the present value of all the money PBGC will have to pay for a plan that is projected to fail and the assets of that plan, including any recovery from plan sponsors. Note that the valuation reflects the benefits payable beyond the 10-year projection period for all failed plans; payments continue until all participants covered by the plan no longer receive benefits.

The present value of projected net new claims (illustrated in the following chart) represents the amount of money PBGC will owe for participants' benefits because their plans fail during the 10-year projection period, less the assets recovered from failed plans and recoveries from the companies that sponsor them. In this chart, as in similar charts above, the solid line represents historical values, while the dotted lines represent the ranges of outcomes in future years.<sup>21</sup> The outcomes are between the 15<sup>th</sup> and 85<sup>th</sup> percentiles. Since PBGC trustees the assets of failed plans, new claims bring in both new assets and new liabilities. Because PBGC would generally not take over a plan that could pay all benefits due, each plan adds liabilities to PBGC that are larger than the assets that PBGC inherits from it.

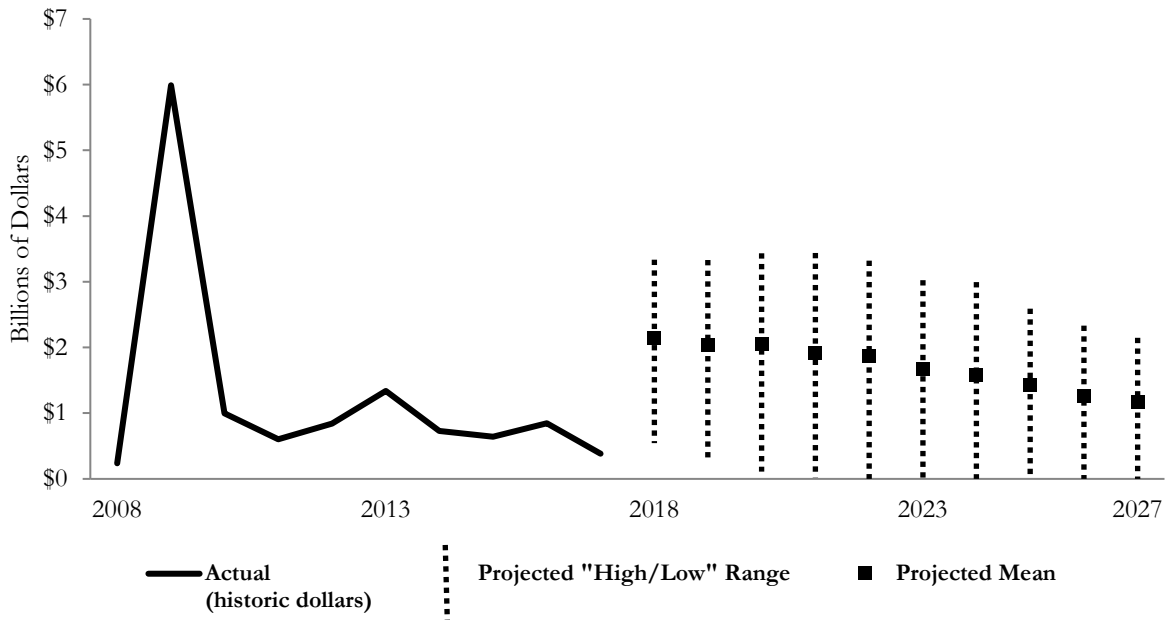
The projections displayed for net new claims are for each year's results, so patterns in the amount of variability reflect long-term trends rather than cumulative effects.

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<sup>21</sup> The chart does not include claims for plans currently booked by PBGC but not yet terminated ("Probables" plans). Since these plans have not yet terminated, their claims are not included in the historic claims and they are excluded from the projections of future claims (since they are reflected in the balance sheet values that are projected forward in PIMS).

Figure 11 – Single-Employer Net New Claims

**Single-Employer Program Net New Claims,  
Actual Experience 2008-2017 and 2018-2027 Projections**



The following table shows a range of projections for present value of the new claims and benefit payments for the next 10 years. The table shows the mean and the “high” and “low” values covering 70 percent of outcomes.<sup>22</sup> The projection of benefit payment amounts are present values of the benefit payments projected to occur over the next 10 years, while the projected new claims amounts are the present values of all new claims that are booked in the next 10 years.

	2017 Present Value (PV) <i>(Dollars in billions at year end)</i>		
	“Low” (15 <sup>th</sup> percentile)	Mean	“High” (85 <sup>th</sup> percentile)
<b>PV PBGC SE Benefit Payments FY 2018-27</b>	\$67	<b>\$76</b>	\$85
<b>PV PBGC SE Net New Claims FY 2018-27</b>	\$4	<b>\$17</b>	\$31

More uncertainty exists about future new claims than about future benefit payments. Since benefit payments include continuing payments to people whose plans already have failed, PBGC already knows how much it expects to pay those people over the next 10 years. Furthermore, while projected benefit payments in this table are only for the 10-year projection period, projected new claims include obligations for benefit payments far into the future. Under the model, the median present value of new claims over the next 10 years is approximately \$13.6 billion. The mean present value of claims is higher, about \$17.1

<sup>22</sup> In the tables, “high” and “low” projections for different measurements — such as “Benefit Payments” or “New Claims” — simply order all results through that lens. So, amounts within a single column cannot be combined. Where there are relationships among the values presented, they are noted in the text that accompanies the tables.

billion over the next 10 years. The mean is higher than the median because there is a chance under some simulations that claims could reach very high levels.

### **How Much Will PBGC Still Owe in Fiscal Year 2027?**

Interest rates affect the present values associated with PBGC’s benefit obligations. The Single-Employer Program’s obligations are mainly benefit payments to the retirees who depend on PBGC. At any given point in time, PBGC uses interest rates to determine the market value of those obligations in the future. Changes in this interest rate have a big effect on the calculations. Variation in the rates accounts for a great deal of the variation in the value associated with the benefits owed. Within the 70 percent of outcomes presented, the Single-Employer Program’s present value of projected liabilities in FY 2027 varies by \$66 billion (discounted to a 2017 present value), as shown in the following table.

	2017 Present Value <i>(Dollars in billions at year end)</i>		
	“High” (85 <sup>th</sup> percentile)	<b>Mean</b>	“Low” (15 <sup>th</sup> percentile)
<b>PV PBGC SE Liabilities in FY 2027</b>	\$123	<b>\$89</b> <sup>23</sup>	\$57

### **What Investment Returns Will PBGC Realize?**

In contrast to its role with multiemployer plans, PBGC becomes the statutory trustee of the assets of terminated single-employer plans. Because PBGC assumes the assets of these plans when they fail, the Single-Employer Program has a significant pool of assets. The rate of return on these assets is a significant source of uncertainty for the Single-Employer Program.

As shown in Figure 12, investment income varies a great deal by year. However, the amount of variation does not grow cumulatively, because each year’s projection is only for that year’s investment income, not the accumulated total of all investment gains and losses. The dotted vertical bars represent the range of outcomes in each year that lie between the 15<sup>th</sup> and the 85<sup>th</sup> percentiles. The vertical bars in the chart remain similar in size.

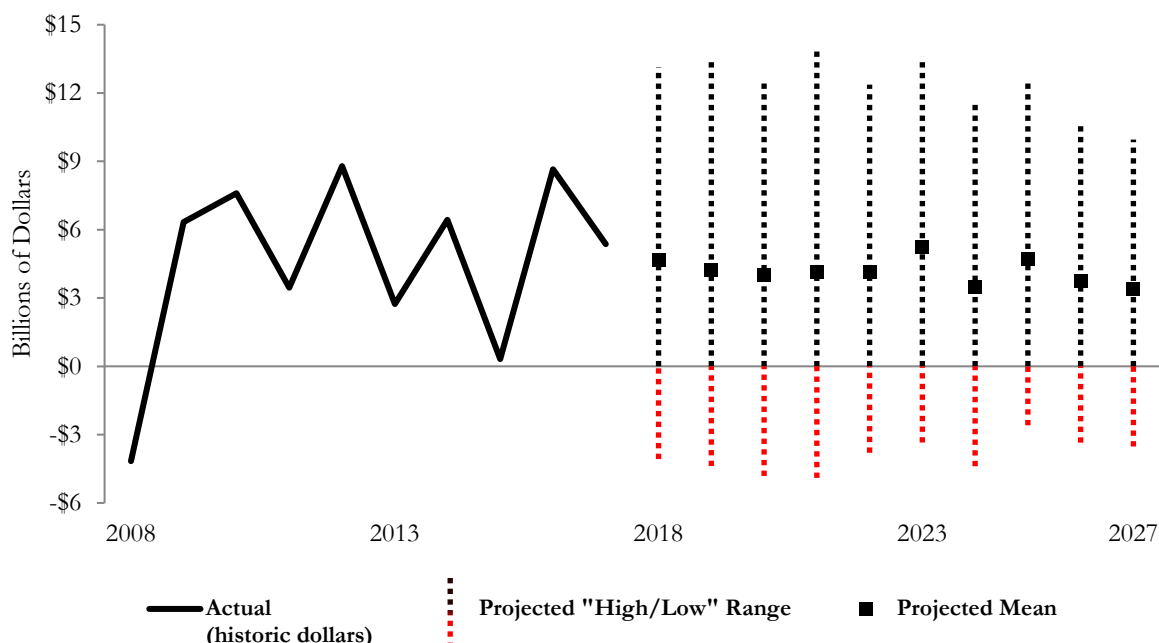
For FY 2018 (the first year of the projection) the projected result ranges from a \$13.1 billion gain to a \$4.1 billion loss, expressed as present values discounted to 2017.

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<sup>23</sup> The mean present value discounted to 2027 is \$89 billion. The mean projected 2027 value is \$117 billion in nominal terms.

Figure 12 – Single-Employer Program Investment Income

**Single-Employer Program Investment Income,  
Actual Experience 2008-2017 and 2018-2027 Projections**



For these projections, PIMS assumed PBGC would invest 70 percent of assets in fixed income investments such as treasuries and corporate bonds and 30 percent of assets in equities, consistent with PBGC’s investment policy.<sup>24</sup>

The following table summarizes projections for the total base of assets in the Single-Employer Program by 2027, as well as for the amount PBGC will earn in investment income through FY 2027.

	2017 Present Value <i>(Dollars in billions at year end)</i>		
	“Low” (15 <sup>th</sup> percentile)	<b>Mean</b>	“High” (85 <sup>th</sup> percentile)
<b>PV PBGC SE Assets in FY 2027</b>	\$80	<b>\$109<sup>25</sup></b>	\$139
<b>PV PBGC SE Investment Income FY 2018-27</b>	\$17	<b>\$42</b>	\$64

Within the results shown in the table (15<sup>th</sup> percentile to 85<sup>th</sup> percentile), there is a range of \$47 billion projected in the investment returns that PBGC will realize and a \$59 billion range in the total amount of PBGC’s projected assets.

<sup>24</sup> At any point at which PBGC’s assets are projected to exceed 130% of its projected liabilities, the investment policy is assumed to change to 100% fixed income securities.

<sup>25</sup> The mean present value discounted to 2017 is \$109 billion. The mean projected 2027 value is \$144 billion in nominal terms.

New claims also increase assets because when plans fail, PBGC inherits their assets as well as their future responsibilities. Thus a plan termination adds to the money PBGC has on hand, and adds even more to the amount PBGC owes. In many simulations with rising assets, new claims also increase.

### How Much Premium Income Will PBGC Receive?

One other factor that reduces PBGC’s deficit is premiums set by Congress. The projected amount of premiums that PBGC will receive under current law is shown in the table below:

	2017 Present Value (Dollars in billions at year end)		
	“Low” (15 <sup>th</sup> percentile)	Mean	“High” (85 <sup>th</sup> percentile)
<b>PV PBGC SE Premiums FY 2018-27</b>	\$26	<b>\$37</b>	\$49

The present value of premiums figures shown above are lower than the corresponding values last year. For example, the mean present value of premiums decreased by 15.5 percent, and the 15<sup>th</sup> and 85<sup>th</sup> percentiles decreased by 15.1 percent and 14.2 percent respectively. This change is primarily a result of generally decreasing Variable Rate Premium income over time – SE-PIMS is one year further into that trend and one year of relatively high Variable Rate Premiums has passed.

### VARIABILITY IN PROJECTED FINANCIAL POSITION, SINGLE-EMPLOYER PROGRAM

SE-PIMS projects PBGC’s potential financial position by combining simulated claims (including amounts PBGC recovers from failed plans and their sponsors) with simulated premiums, investment returns and other factors, recognizing PBGC’s 2017 financial position as the starting point.

The financial position of the Single-Employer Program as of September 30, 2017, was a deficit of \$10.9 billion. In a majority of simulations, the FY 2017 projections show an improvement; the median present value of the projected position in 2027 is a \$24.1 billion surplus. The mean present value of the projected position in 2027 is a slightly lower \$20.1 billion surplus. The table below shows the mean position, along with the values at the 15<sup>th</sup> and 85<sup>th</sup> percentiles.

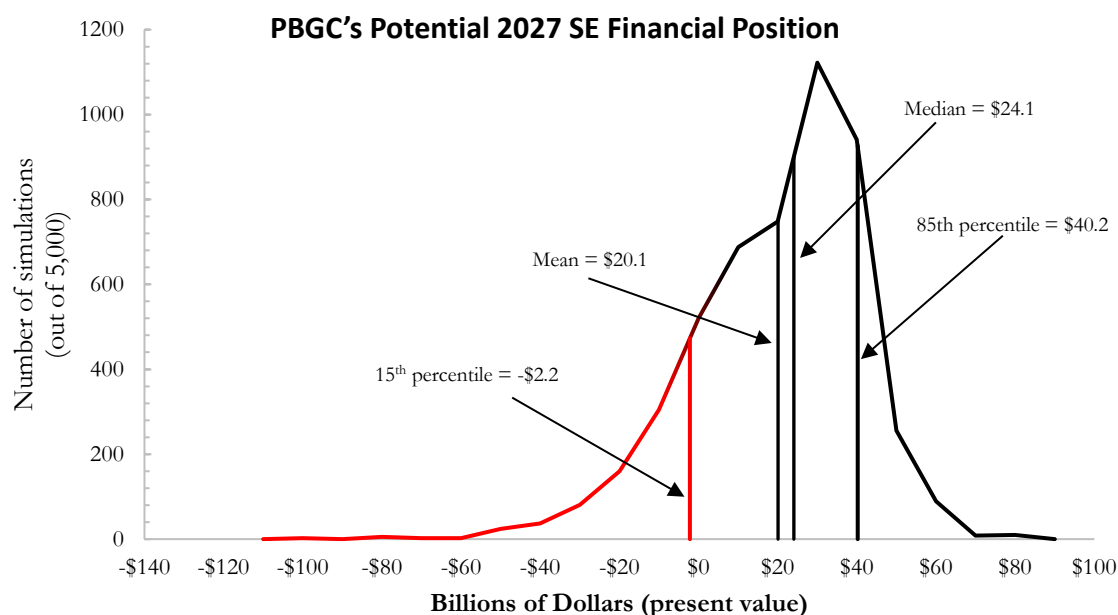
	2017 Present Value (Dollars in billions at year end)		
	“Low” (15 <sup>th</sup> percentile)	Mean	“High” (85 <sup>th</sup> percentile)
<b>PV FY 2027 PBGC SE Financial Position</b> <i>(deficit)/ surplus</i>	<b>-\$2</b>	<b>\$20<sup>26</sup></b>	\$40

**Full distribution of results by financial position.** Figure 13 shows the full range of outcomes that SE-PIMS projects for PBGC’s single-employer financial position over the next 10 years. For each value of PBGC’s projected net position along the horizontal axis, the height of the line shows how many paths (out of 5,000) have that net position as a result. The higher the curve, the more simulations fall at that point in the distribution. The further to the right any point on the curve is, the better the financial position

<sup>26</sup> The mean present value discounted to 2017 is a \$20 billion surplus. The mean projected 2027 value is a \$26 billion surplus in nominal terms.

associated with that point. The further to the right the graph’s “hump,” the more paths have positive outcomes, and the less spread-out the graph is side-to-side, the more the simulations agree on outcomes.

**Figure 13 – PBGC's Potential 2027 SE Financial Position**



Vertical lines on the graph show the present value of PBGC’s projected 2027 net position at the 15<sup>th</sup> and 85<sup>th</sup> percentiles, and the mean and median values of projected net positions. The median (as mentioned above) is a \$24.1 billion surplus in FY 2027, while the mean is a \$20.1 billion surplus.

## RECONCILING SE-PIMS RESULTS FROM 2016 TO 2017

**Comparison of financial position with last year’s results.** Figure 14 compares the 2016 projections of PBGC’s 2026 financial position with this year’s projections of the 2027 financial position. The distribution has moved to the right (the mean and median values have both increased), while the width of the curve has changed only slightly. This means that the average results have improved, but there is little change in the variance around these averages. The mean projected position has improved by about \$10.5 billion, from a surplus of \$9.6 billion to a surplus of \$20.1 billion. The median projected position has similar improvement.



**Figure 14 – SE Financial Position: Comparison to Prior Year**

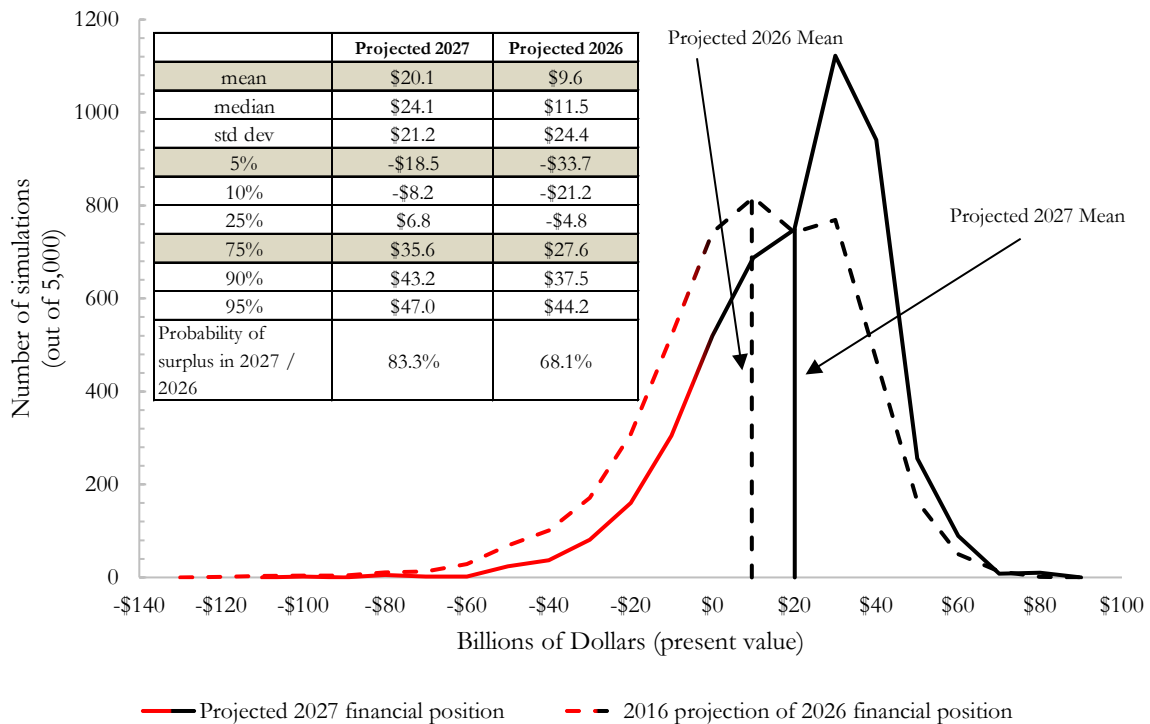


Figure 15 explores the effects of each of the changes in our model and data on the projected 2026 net deficit. It is important to note that the order of the changes affects the values. If the impact of the changes were measured in a different order, it is likely that the values for each of the changes would be different, although the final deficit number would remain the same. While the magnitude of changes appears large in relationship to the projected 2026 surplus, this is largely because the projected surplus is a smaller order of magnitude than the liability, and thus relatively small changes in modeled liability appear to have very large effects. These changes are small, however, in comparison with either projected liabilities or the range of potential deficits.

**Figure 15– Reconciliation of Changes in SE-PIMS Results**

Reconciliation of Changes in SE-PIMS Results, 2016 to 2017 Results		
Description of Change	Value of Change (\$ billions)	Net Position (\$billions)
<b>Initial Position for Mean PV of 10-Year Projected Net Position from 2016 Projections Report</b>		\$9.6
Changes to the SE Model	\$0.6	\$10.2
Changes due to Passage of Time	\$2.6	\$12.8
Changes due to Updated Plan and Sponsor data	\$3.0	\$15.8
Changes to Economy, Economic Assumptions and PBGC data	\$4.3	\$20.1
<b>Year 2027 Mean PV of Projected Net Position based on 2017 SE-PIMS Model</b>		\$20.1

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**Changes to the SE Model:** The most significant change to the SE model is a refinement to calculations for modeling pension plans with career average benefit formulas. This change increases the mean projected surplus by \$0.6 billion.

**Changes due to Passage of Time:** The 2016 report projected the PBGC net position in 2026 and presented the results valued in 2016 dollars. To compare with the 2017 report, which projects to 2027 with values reported in 2017 dollars, the 2016 projection is rolled forward to project one additional year with one less year of present value discounting. The effect of the roll forward is an increase in the projected net position of \$2.6 billion.

**Updated Plan and Sponsor data:** Updated data on covered single-employer plans result in an improved projected surplus. Additionally, updated data on the financial status of corporate sponsors of single-employer plans resulted in generally lower modeled bankruptcy rules, leading to a lower projected incidence of future claims. The combined effect of these changes is a net increase in the present value of the projected net position of \$3.0 billion.

**Changes to Economy, Economic Assumptions and PBGC data:** Market investment returns over the period since the FY16 modeling assumptions surpassed the average returns projected for that period with the FY 2016 model. This contributed to the nearly \$9.7 billion improvement in PBGC's net position between the FY 2016 and FY 2017 Annual Reports. Additionally, the same investment returns result in projected improvements in the funding of insured pension plans, resulting in lower projections of claims and also lower projections of variable rate premium revenue. The net effect of these changes is a \$4.3 billion increase in the projected net position.

In total, the present value of the Single-Employer Program mean projected net position increased from a \$9.6 billion surplus to a \$20.1 billion surplus.

## RECENT SINGLE-EMPLOYER PLAN TRENDS

Our projections do not assume that plans are terminated voluntarily by healthy companies, only by companies in distress. However, some healthy companies do close their pension plans by purchasing annuities and undertaking a standard termination. In these cases, PBGC's current obligations are not affected, but those companies cease paying premiums altogether. PBGC is analyzing the effect of these actions and will attempt to incorporate them in future reports.

PIMS historically did not model the potential for plans to discharge any significant part of their obligations by purchasing annuities through insurance companies and/or paying lump sums. We have begun to implement modeling of lump sum calculations in limited circumstances (PIMS reflects lump sum payment of benefits to workers leaving active employment from a cash balance plan that is at least 80 percent funded). However, the use of annuity buyouts and lump sums by companies seeking to transfer risk for significant portions of their liabilities is not currently modeled as a continuing or expanding trend in the future. In addition to reducing premium receipts, these transactions might affect future exposure to claims in some circumstances. PBGC is now gathering data on these transactions as part of the premium filing and intends to continue investigating this trend.

## SENSITIVITY OF CHANGES TO THE MODEL'S DISCOUNT RATE

PIMS benefits from comments of readers, other users and a peer review of the program. One suggestion made in prior peer reviews was to enhance the disclosure of the sensitivity of results to changes in

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assumptions and other aspects of the Model. PBGC has begun to do this, focusing first on the modeled discount rate. Over time, PBGC plans to expand this analysis to other significant areas of PIMS.

As discussed above, PBGC has added tests of the sensitivity to increases and decreases in the PIMS discount rate for valuing PBGC obligations. If market prices for annuities were based on discount rates 50 basis points higher than in the base projection, this would improve the mean present value of the 2027 single-employer net position by \$3.9 billion and improve the likelihood of a surplus in 2027 from 83.3 percent to 88.7 percent. Discount rates 50 basis points lower would decrease the mean present value of the surplus by \$4.5 billion and reduce the likelihood of a surplus in 2027 to 75.4 percent.

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## STATEMENT OF ACTUARIAL OPINION

I, the undersigned, certify that this actuarial evaluation has been prepared in accordance with generally accepted actuarial principles and practices and, subject to the disclaimers herein, to the best of my knowledge, fairly reflects the possible distribution of projected outcomes relative to the operations and status of the Corporation's Single-Employer and Multiemployer Programs as of September 30, 2017.

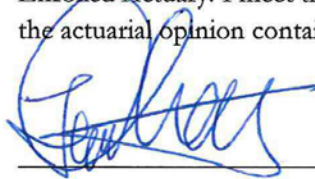
In preparing this evaluation, I have relied upon information provided to me regarding plan and participant data, plan sponsor financial information, historic asset yield and bankruptcy information and other matters. I have checked this information for reasonableness as appropriate based on the purpose of the evaluation; the responsibility for the source information obtained from Forms 5500 and elsewhere rests with the preparers of these data.

Subject to the disclaimers herein, in my opinion,

- (1) The techniques and methodology used are generally acceptable within the actuarial profession.
- (2) The assumptions used are appropriate for the purposes of this report.
- (3) The resulting evaluation represents a reasonable estimate of the possible distribution of projected outcomes relative to the operations and status of these programs.

The undersigned is available to discuss the material in this report.

I, Jensen Chan, am the Acting Director of PBGC's Policy, Research, and Analysis Department (PRAD). I am a Member of the American Academy of Actuaries, a Fellow of the Society of Actuaries and an Enrolled Actuary. I meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained in this report.



5/31/2018

Jensen Chan

Date

*Acting Director, Policy, Research and Analysis Department, PBGC*

*Member, American Academy of Actuaries*

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## OVERVIEW OF PIMS

The analysis contained in this report utilizes ME-PIMS and SE-PIMS. PIMS Models are primarily models of pension plans, rather than of plan participants. They use data reported by a sample of pension plans to model the future funded status of the universe of private sector multiemployer and single-employer pension plans. Both Models project long-term financial outcomes by running many simulations, each modeling year-by-year changes over 20 years into the future. Each simulation starts with known facts about the economy, the universe of PBGC-insured plans, and PBGC’s financial position. The program then introduces random year-by-year changes (within certain bounds) to simulate economic fluctuations, producing 500 simulations for alternate economic paths through time. Within a simulation, each plan’s outcomes from one year form the following year’s starting-point for that plan, and so on. The Models recognize that all single-employer plan sponsors have some chance of bankruptcy, that all multiemployer plans have some chance of insolvency, and that these probabilities change over time depending on a variety of factors.

Neither SE-PIMS nor ME-PIMS is a predictive model. Although ME-PIMS mathematically models the likelihood of mass withdrawal from a given plan or plan insolvency prior to mass withdrawal, it does not anticipate withdrawal by individual employers. It does, however, reflect anticipated employer behavior in limiting contributions to multiemployer plans. SE-PIMS does not attempt to anticipate companies’ more general behavioral responses to changed circumstances, such as, whether or not to continue to sponsor defined benefit plans.

### ***Future Outcomes Are Expressed in Present Value Terms***

This report generally expresses future outcomes in present value terms (i.e., discounted back to 2017); unless the numbers are explicitly noted as expressed in nominal terms, values shown should be assumed to be discounted present values. Each simulation’s outcomes are discounted based on the 30-year Treasury bond yields projected for that simulation, regardless of whether the underlying simulated cash flows are generated from holdings of equities, corporate bonds, or U.S. Treasury bonds.

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In the projections of net position, one important factor is the determination of the amount of money PBGC owes to provide benefits or assistance in today's present values. Changes in interest rates have a large effect on this calculation — the higher the interest rate used to calculate future obligations (liabilities), the lower the present value of the obligations reported. ME-PIMS and SE-PIMS model uncertainty in future changes to these interest rates.

### ***How Projections Compare to Financial Statement Liabilities***

The long-term projections, presented here, are different from the exposure reported in PBGC's financial statements. There, PBGC classifies some plans as "probable for financial assistance" (multiemployer) or "probable to terminate" (single-employer) and records them as losses on its financial statements. PBGC describes others as "reasonably possible" losses and discloses the estimated exposure due to these plans in Section VI of the PBGC Financial Statements, "Single-Employer and Multiemployer Program Exposure," but does not book them as losses. These estimates are based on plans that PBGC insures and considers reasonably possible to require financial assistance or to terminate, compared with all the plans that PBGC insures (the universe modeled in ME-PIMS and SE-PIMS).

PIMS treats the financial statement liabilities as initial inputs to the Model, estimating how they may vary in the future and adding in the effects of projected new claims, benefit payments and asset returns.

## **ME-PIMS**

### ***ME-PIMS – Overview***

Each year in the course of preparing its financial statements, PBGC analyzes insured large (over 35,000 participants) and medium (between 2,500 and 35,000 participants) multiemployer plans to identify those ongoing plans that might become claims against the insurance program.<sup>27</sup> In determining whether a plan should be classified as a probable risk of requiring financial assistance in the future and recorded in PBGC's financial statements as a balance sheet liability, PBGC evaluates whether the plan can be expected to become insolvent within the following 10 years, often taking into account detailed available plan, industry, and employer data. Each plan is determined to either be "booked" as a liability for the financial statements for a given year or not to be included in the accrued liabilities at all.

To project future claims against the Multiemployer Program that are not already booked in the current financial statements, ME-PIMS models a similar process for each plan in each future year for each simulation. In each projection year and for the particular economic path being simulated, ME-PIMS projects a plan's funded status, cash flow, asset base, and growth or decline in the contribution base, to determine whether that plan is projected to become insolvent within a specified time horizon (generally the next 10 years). In each projection year, the plans that are projected as future insolvencies within that time horizon become ME-PIMS liabilities that year for the particular simulated path. Thus a plan may be "booked" in ME-PIMS in some years and some simulations and not in others.

There is typically a long time lag between PBGC's booking of a multiemployer plan and the start of PBGC's financial assistance payments. Payments begin only after the plan has depleted its assets. In ME-PIMS' simulation of the Multiemployer Program, a plan can be booked as a probable claim in one year of

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<sup>27</sup> Generally, all multiemployer plans currently receiving financial assistance from PBGC as well as those that have terminated are included in PBGC's financial statements, along with ongoing probable insolvencies. Since FY 2015, the liabilities of the small plans that have not yet terminated are represented in the aggregate in the financial statements by a small plan bulk reserve.

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a projection, and then, if economic conditions are projected to improve sufficiently, it can become unbooked (in the Model) in a later year. Because PBGC's accounting procedures for financial statements reflect considerations not included in the ME-PIMS modeling analysis, and because the financial condition of plans can vary from year to year, the ME-PIMS projections of PBGC's net position may deviate from PBGC's financial statements in subsequent years.

No single underfunding number or range of numbers is sufficient to evaluate PBGC's exposure and expected claims over the next 10 years. Claims are sensitive to changes in interest rates and investment returns, overall economic conditions, contributions, changes in benefits, the performance of some particular industries, and bankruptcies. In the Multiemployer Program, a large number of claims from the actual and projected insolvencies of small and medium-sized plans, and a small number of claims from large plans, have characterized the PBGC's historical claims experience and are likely to affect potential future claims experience as well.

ME-PIMS portrays future underfunding, under current law funding rules, as a function of a variety of economic parameters. The Model anticipates that individual plans have various probabilities of positive and negative experience, and that these probabilities can change significantly over time. The Model also recognizes the uncertainty in key economic parameters (particularly interest rates and market returns). The Model simulates the flows of claims that could develop under hundreds of combinations of economic parameters and extrapolations of plans' respective 10-year historical patterns.

A multiemployer plan can go through a "mass withdrawal," which happens when all employers stop participating in a plan at the same time. For each plan in each of the projection years, ME-PIMS calculates a probability of mass withdrawal based on the factors listed in the "Assumptions" section. When determining whether a multiemployer plan undergoes a mass withdrawal in a given year/scenario, a random number is drawn and compared with the plan's probability threshold for mass withdrawal — the result determines whether or not a mass withdrawal is included in that year of the simulation<sup>28</sup>.

### **ME-PIMS — Data**

ME-PIMS has a detailed database of actual plans (including previously booked plans). These plans represent more than half of PBGC's insurance exposure in the multiemployer defined benefit system, measured from the latest Form 5500 filings available as of the preceding spring (generally information for plan years that commenced during 2015 and ended either as of December 31, 2015 or during 2016). The database includes:

- summary statistics on plan demographics,
- plan benefit structure,
- asset values,
- liabilities,
- actuarial assumptions, and
- historical contribution levels and demographic trends (over the 10 prior years) to assist in modeling plan trends.

The ME-PIMS database also contains other pension plan information obtained from Schedules MB of Form 5500. For booked plans PBGC collected additional data beyond the general information available

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<sup>28</sup> For example, assume the mass withdrawal probability for a plan is 5% and that the random numbers are drawn from an urn of balls numbered from 1 to 100. If the ball drawn is numbered 5 or less then the plan experiences a mass withdrawal. If the random number is greater than 5, the plan does not experience a mass withdrawal.



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on the Form 5500 and used it in the Model. The additional data is subject to confidential treatment requests under 29 CFR 4901.24.

### ***ME-PIMS — General Methodology***

ME-PIMS projects PBGC's potential financial position by combining simulated claims with simulated paths for premiums, expenses, PBGC's investment returns, and changes in PBGC liability; that is, the present value of benefits and expenses payable pursuant to claims recognized by the PBGC. The probability of any particular outcome is estimated by dividing the number of simulations with that outcome by 500, the number of multiemployer simulations.

Because multiemployer liabilities are booked by PBGC several years before a plan becomes insolvent, a plan's financial condition can improve after it is first booked, reducing PBGC's liability for that plan (i.e., the value of its claim) by delaying its projected date of insolvency and/or reducing the flow of assistance anticipated after insolvency. In some cases, insolvency is delayed beyond the 10-year threshold required for recognition, causing the plan to become "un-booked" and reducing its claim value to zero. Conversely, a plan's condition can deteriorate further following the initial recognition.

ME-PIMS reflects un-bookings as negative claims, which are taken into account in the mean and median claim amounts (i.e., the above amounts represent the value of booked minus un-booked future claims). However, financial improvements during the projection period that are insufficient to cause claims to be un-booked are not reflected in the un-booked ME-PIMS claims values. As a result, the change in net position over the projection period may fall short of the amount that would actually be determined when reflecting the present values of simulated premiums, financial assistance, expenses, and investment returns over that period.

ME-PIMS primarily models the plan's financial status rather than that of the plan's contributing employers.

In the Multiemployer Program, there is little distinction between claims due to insolvency and probable liabilities, unlike the Single-Employer Program. In the Single-Employer Program, a probable liability is generated on PBGC's books when the condition of the sponsoring employer justifies such a classification. In the Multiemployer Program, a probable liability is generated when certain plan metrics are sufficiently problematic, a mass withdrawal is triggered, or cash-flow insolvency is projected within 10 years.

### ***ME-PIMS — Sampling***

In ME-PIMS, a sample of actual plans (both booked and non-booked) represents the universe of multiemployer plans. ME-PIMS simulates contributions and underfunding for the sample plans chosen for the ME-PIMS analysis. It extrapolates or scales the results generated by this sample of plans to the universe of all multiemployer plans by multiplying each sampled plan by a weighting factor. To avoid the risk that a particular sampled plan is anomalous and will materially distort the overall results, PIMS includes almost all the largest plans in its sample, and decreasing proportions of smaller plans, where sampling anomalies would have a smaller impact. Thus, the largest plans typically have the smallest weighting factors.

ME-PIMS starts with PBGC's multiemployer net position from the financial statements (a \$65.1 billion deficit in the case of FY 2017) for currently insolvent and probable plans. The starting net position is modeled using a sample of 41 insolvent plans, 27 terminated probable plans, and 59 (including 20 small booked plans) ongoing probable plans. This is a change from 34, 27, and 54 plans, respectively, used in FY 2016. In addition, ME-PIMS starts with data on the funded status of 194 non-booked plans



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(compared to 183 in 2016) that are weighted to represent the universe of PBGC-covered plans that are not current or probable claims for PBGC.

The ongoing non-booked PIMS sample is divided into tiers, by plan size (based on vested current liabilities). In each tier of the sample plans, the individual plans are weighted by the factor for that tier, where the factor is the total vested liability for *all* multiemployer plans in that tier divided by the total vested liability for the *sample* plans in that tier. If a plan is projected to present a claim in ME-PIMS, the claim to the Multiemployer Program is the claim for that plan multiplied by the factor for that plan's tier.

The size of the sample was increased for the FY 2014 and subsequent Projections Report to accommodate (1) the change in procedures to determine which plans are to be included in the financial statements (i.e., which plans are to be booked), as implemented by the Multiemployer Working Group (MWG) for the fiscal year ended September 30, 2014, and (2) the passage of MPRA, which makes available suspension and partition options for certain "Critical and Declining" plans. To accommodate the new booking procedures, the PIMS sample of ongoing non-booked plans was divided into three categories: small (under 2,500 participants), medium (between 2,500 and 35,000 participants) and large (over 35,000 participants) plans. To accommodate the modeling of MPRA, each of these groups was further divided in "MPRA" and "others" yielding a total of six categories. A new process has been incorporated into the FY 2017 data processing; MPRA plans estimated from the external model were replaced with actual Critical and Declining plans.

The list of plans in the MPRA group for each size category is determined based on PRAD's research of Critical and Declining (C&D) status plans. PRAD compiled this list of plans based on 1) plans that filed a C&D notice, 2) plans indicated as C&D status on the Schedule MB and 3) other information available to PRAD. As with prior years, this group of MPRA plans are further divided into large, medium and small size for weighting purpose. Lastly, in anticipation of C&D status to apply for MPRA tools, additional C&D status plans were added to the FY 2017 inventory. There are 25 sample plans total in the three MPRA groups; the weights are 1.00 for all size groups. There are 9 tiers of plans in the "others" groups, 2 for the large plans, 4 for the medium plans and 3 for the small plans. The weights for the tiers range from 1.09 to 15.58 for the tier representing the smallest plans.

Under the booking procedures (implemented in FY 2014) for the financial statements, ongoing small plans are no longer included explicitly in the financial statement calculations, but are replaced by a bulk "small plan reserve."<sup>29</sup> ME-PIMS does not precisely duplicate the bulk reserve methodology but further divides the "other" small plans into two groups. The first group consists of the small plans that are assumed to be booked in the first valuation year (year 0), as determined by an initial ME-PIMS run. The weight for these plans, 0.870 in FY 2017, is determined by the ratio of the ME-PIMS PV of assistance for these plans to the bulk reserve. The increase in weight, from 0.755 in FY 2016 to 0.870 in FY 2017, is due to exclusion of several small MPRA plans from the inventory.

### **ME-PIMS — Plan Sponsor Behavior**

Generally, the Model assumes that plans in Critical status will increase contributions and make other plan changes. These assumptions differ for Critical status plans that have "exhausted all reasonable measures" (ERM). All C&D status plans are assumed to be ERM for FY 2017.

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<sup>29</sup> The revised methodology is discussed on Page 83 of PBGC's 2014 Annual Report, available at <https://www.pbgc.gov/Documents/2014-Annual-Report.pdf>.

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The Model also reflects potential adoption of suspension of benefits and partition by plan sponsors of Critical and Declining plans, based on the financial status of each sample plan along each modeled economic path. Plans that are Critical and Declining along a particular path are assumed to make a one-time decision whether or not to apply for suspensions and partitions based on the assumptions regarding partition and suspension probabilities.

To determine whether a plan will need suspension or partition assistance along a particular economic path, ME-PIMS uses the imputed plan census to calculate benefits at the maximum suspension level (110% of PBGC's guarantee, with additional protections for aged and disabled participants).<sup>30</sup> If the suspension reduction is sufficient to achieve long-term solvency, the plan election will be for suspension-only or no changes (depending on a random-number draw). If the suspension is inadequate, the plan is further processed to determine whether an election for suspension plus partition will be modeled.

For a suspension-only candidate plan, the maximum suspensions are adjusted using aggregate cash flows to calculate the benefit levels just high enough to achieve long-term solvency over the 30 years of the projection period. The requirement for longer-term solvency is modeled on a simplified basis by requiring a funding ratio of at least 20% at the end of 30 years. In the FY 2017 model, a suspension "re-test" was added. Suspended plans will be re-tested every 5 years to determine if the suspension percentage can be modified. The model will increase suspension percentage if a plan is projected to be insolvent due to financial deterioration. Should the financial condition of a plan improve, the model will allow a maximum of 50% of the change in the suspension percentage to be implemented. For this new suspension, a more conservative asset return of 5.5% is used. These conditions are added to minimize plans going in and out of suspensions during the projections.

For a suspension plus partition candidate plan, the benefits are reduced to the maximum suspension level and the amount of partition assistance required is determined so as to maintain solvency. If the present value of partition assistance required is less than the present value of future assistance by more than a de minimis amount, assuming no partition occurs, the plan is assumed to pass MPRA's expected long-term loss test (see ERISA §4233(b)(3)(A)). Should the plan meet these requirements, it is then modeled as electing between suspension and partition or no changes. Plans projected to have partition will remain in the partition status throughout the projections.

ME-PIMS does not separately model other forms of financial assistance such as facilitated merger assistance. Since they are subject to similar limits on plans except the requirement for maximum suspensions, we model them as part of the potential partition universe. Given MPRA's impairment tests (see ERISA §4233(b)(4) and §4231(e)(2)(c)), the effect on PBGC outcomes is likely similar whether financial assistance is provided through facilitated merger or partition.

The 2017 version of ME-PIMS includes new modeling around the anticipation of actual implementation of benefits suspensions and partitions for individual plans. These changes also delay the assumed date of benefit suspensions by one year (from FY 2018 to FY 2019).

### ***ME-PIMS — Imputing the Inactive Census***

ME-PIMS generally operates on the basis of plan data, using aggregate information as reported on the Form 5500; it imputes individual participant census information in order to estimate changes in plan liabilities due to demographic changes over time. The active participant census is readily developed from

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<sup>30</sup> This calculation uses imputed census data. A percentage of the population is assumed to be disabled.

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the active age/service scatter attachment to the plan's Form 5500. The inactive census is imputed on a basis that varies by age, service, form of benefit (modeling life annuities and joint and survivor annuities), gender, and benefit amount. The imputed inactive census is based on actual inactive data received from several plans. The actual inactive data provide a master template for the assumed distributions by age, service, gender and form of payment to generate each plan's initial inactive census.

ME-PIMS then applies the individual plan's current accrual rate (with adjustment for inflation) to this initial inactive census, which is then further scaled to the Form 5500 in-pay benefits and the starting current liabilities of the plan.

The Model also incorporates the ability to input plan specific census information where available.

### **ME-PIMS — Assumptions**

The following variables are stochastically projected:

**Interest Rates, Stock Returns, and Related Variables.** (e.g., inflation, wage growth, and multiplier increases in flat-dollar plans). These variables are determined by the underlying means, standard deviations and correlation matrix established for the ME-PIMS projection.

- Stock returns are modeled as independent from one period to the next. To determine a simulated sequence of stock returns, the Model randomly draws returns from a distribution that reflects historical experience going back to 1926.
- Interest rates are modeled as correlated over time. With the Model, the Treasury yield for a given period is expected to be equal to the yield for the prior period, plus or minus some random amount.
- The random draws affecting the bond yields and stock returns are correlated according to an estimate derived from the period 1973 to 2007. Stock returns are more likely to be high when the Treasury yield is falling and vice versa. Credit spreads on investment-grade corporate bonds are modeled to regress toward their historic mean values.

**Asset Returns.** Plan asset returns are based on an internal study of historic asset returns among large plans. Using the financial rates directly modeled in PIMS (stock market returns, long-term Treasury bond returns and yields), the study estimated mixtures of those rates to best fit the historic returns of plans in the study. PIMS projects annual plan returns using the following weighting based on the average of the estimated rate mixtures: 48 percent stock market returns, 23 percent long-term Treasury bond returns, and 30 percent long-term Treasury bond yield, with a -2.5 basis points additive return adjustment (percentages are rounded). Future plans for PIMS may include modeling of additional asset class returns allowing PIMS to use the investment allocation information trustees now report as part of the annual Form 5500 filings.

**Plan Demographics.** Starting with the plan's active employee population data from the Form 5500 (grouped by age and service bands), the distribution of active participants for each plan in the future varies according to that plan's actuarial assumptions regarding retirement, disability, and termination of employment. Age and service also vary over time due to hiring assumptions that are determined separately in each scenario of the projection. Hiring patterns vary with stochastic projections; the general assumption is that a plan's historical hiring distribution continues and hiring occurs (or not) to bring the size of the active population up to the size indicated by the continued trend as needed after plan decrements (retirement, termination of employment, disability) take place. ME-PIMS does not currently assume industry-specific employment trends.

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ME-PIMS models net annual changes in employment levels reflecting the path of economic variables in a particular simulated path over time, resulting in a mean net decrease in the active multiemployer population of 1.3 percent per year across all simulated paths.

**Benefit-level and Employer-contribution Increases.** These vary annually during the projection period with some correlation to modeled economic conditions in each future year.

**Probability of Mass Withdrawal.** We generate the probability of mass withdrawal under a model that uses each plan's:

- plan size,
- ratio of active to inactive population,
- ratio of assets to benefit payments and expenses,
- ratio of the accumulated credit balance in the funding standard account to employer contributions,
- ratio of market value of assets to vested actuarial liabilities, and
- ratio of current year to previous year contribution amount.

The current report continues to reflect the above factors, but reduces the assumed incidence of mass withdrawal by 75% based on a study <https://www.pbgc.gov/sites/default/files/me-pims-masswithdrawalassumptions.pdf> of post-PPA experience.

The following non-stochastic assumptions are also used in ME-PIMS projections:

**Mortality.** For purposes of determining sample plans' year by year mortality experience during the projection period: the blended RP-2014 annuitant and non-annuitant mortality tables, projected with MP-2016 to the specified projection year on a static basis. For purposes of determining the present value of PBGC assistance: the blended RP-2014 Healthy male mortality table times 1.09 and the Healthy female mortality table times 0.99, projected to 2032 using the MP-2016 scale for FY 2017. For projections of future fiscal years, the static projection is updated by one additional year, using the MP-2016 scale, for each year beyond FY 2017. PBGC has replaced the static projection with generational projections starting in the FY 2017 Annual Report. PRAD anticipates incorporating this change into the FY 2018 model.

**Contribution Level/Credit Balances.** The credit balance is increased each year by the valuation interest rate and decreased by the amount by which modeled contributions are less than the minimum required. ME-PIMS modeling of employer contributions reflects that most employers make contributions at a level above the minimum required. The FY 2017 model incorporates the preliminary result from PRAD's updated analysis on the contributions level. The 2018 hard dollar contributions cap has been replaced by a multiple of the 2008 per capita contributions rate to better reflect the population decline assumption. The per capita contribution rate is limited to 2 times the 2008 per capita rate before 2015 and to 3 times thereafter.

**Benefit Improvements.** For flat-dollar plans that are not in Critical or Endangered<sup>31</sup> status, benefit multipliers are assumed to increase annually by the rate of increase in average wages. The

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<sup>31</sup> A plan is generally considered to be in "Endangered status" if it is not in "Critical status" and it (1) is less than 80% funded or (2) has an accumulated funding deficiency in the current plan year or is projected to have an accumulated funding deficiency in any of the six subsequent plan years. A plan is in "Seriously Endangered status" if the plan is not in "Critical status" and both (1) and (2) apply. (Internal Revenue Code §432(b)(1))

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majority of multiemployer plans have flat-dollar formulas, though there is a trend towards formulas that are based on a percentage of total contributions attributable to each participant, especially for plans in Critical or Endangered status. ME-PIMS models both flat-dollar and percent-of-contributions benefit formulas. In plans where the benefit formula is not a flat-dollar or percent-of-contributions schedule, a translation of the actual formula is made so that the plan is modeled as a comparable flat-dollar plan.

**Benefit Improvement Restriction.** ME-PIMS assumes that Critical status plans and most Endangered status plans will not adopt future benefit improvements.

**PBGC Premiums.** ME-PIMS models premiums based on the rate under current law with projected rates increasing under the indexing provisions in current law. There is no allowance in premium projections for write-offs of uncollectable premiums and for the fact that a portion of the premium collected is not credited with interest under MPRA.

**PBGC's Assets.** All assets in the Multiemployer Program are, by law, placed in revolving funds. PBGC's policy is to invest revolving fund assets in United States Treasury securities. Asset returns in ME-PIMS are bound by the modeling of Treasury returns in future years.

**Discounting Future Claims.** When ME-PIMS discounts future claims, the discount factor is a single interest factor which models the curve of interest factors described in the 2017 financial statements with an assumed reversion to the relationship of market interest rate and annuity pricing factors observed prior to the 2008 financial crisis. Those factors are based on a survey of private-sector annuity market prices. PRAD anticipates incorporating this change into the FY 2018 model.

**Determining Discounted Future Present Values Shown in Report Tables.** For calculations involving discounting future amounts, the discount rate used is the simulated 30-year Treasury rate generated for the particular year and economic path.

**Behavior of Critical Status Plan Sponsors.** The per-capita contribution in Critical status plans increases at a multiple of the prior observed rate, but the annual rate of increase in per-capita contribution is limited to 12 percent per year (7 percent for those Critical plans assumed to declare ERM). For the FY 2017 model, the contribution cap was modified to better reflect the decline in active participation in the ME universe. The plan contributions are capped by a multiple of the 2008 per capita contribution rate rather than the 2008 actual contributions amount as in the FY 2016 model. In addition, the per capita rate is changed to be counted from 2008 rather than from the valuation date. This new cap assumes that the per capita contribution rates in non-ERM plans will not more than double in the first six years (since 2008), not more than triple thereafter. The limit is 1.5 times the per capita rate pre-PPA base year (2008). Per capita contribution rates will increase with the future wage index once the cap is reached. A floor is set such that the aggregate dollar limit never falls below the prior year's contribution. These increases in contributions are treated as "supplemental" and do not affect the benefit accrual rate in plans where the benefit is based on a percentage of employer contributions. Non-ERM Critical status plans are assumed to eliminate early retirement subsidies and temporary supplements for active participants.

**Assumptions to Facilitate Suspension and Partition.** This 2017 Projections Report reflects the same assumptions used in the FY 2016 model except where noted below.

- In a partition, the guaranteed portion of benefits for some participants is spun off to a separate, insolvent plan, for which PBGC will provide financial assistance. Our model assumes benefits of terminated vested participants are assumed to be partitioned first;

- The assumed average return on plan assets used in MPRA solvency tests is 6.5%.
- The assumed threshold for partition based on a reduction in PBGC's long-run loss is 1%.
- Changes from prior year
  - Plans that have gone through a suspension will be re-tested for the suspension every 5 years. Deterioration in financial conditions will allow plans to further suspend benefits up to a limit of 110% of the PBGC guarantee. In addition, plans will be allowed to test for partition in the future if needed. For improvement in financial conditions, plans are allowed to slowly phase-in the reduction in suspension to allow for a smoothed change and to prevent flip flopping between suspended and not suspended during the projections. To be conservative, a lower asset return of 5.5% is used to test for suspension percentage changes.

**Plan Demographics to Facilitate Cash Flow Modeling.** To determine the cash flows in multiemployer plans, ME-PIMS utilizes a number of assumptions (same assumptions as FY 2016):

- Proportion of active population assumed to be male: 70%,
- Proportion of retirees (in ongoing plans) assumed to be male: 80%,
- Proportion of terminated vested participants (in ongoing plans) assumed to be male: 94%,
- Age difference: females three years younger than their male spouses,
- Proportion of active population assumed to elect joint and survivor form: 60%,
- Proportion of retirees assumed to possess a joint and survivor form: 30%,
- Proportion of terminated vested assumed to elect joint and survivor form: 35%,
- Joint and survivor form: joint and 50% survivor benefit,
- Proportion of participants assumed married for pre-retirement death benefit: 80%, and
- Conversion factors based on PBGC rates for the joint and 50% survivor benefit: 0.8730 for male participants; 0.9135 for female participants.

The 2017 version of ME-PIMS uses the same assumptions<sup>32</sup> as used in the 2016 version of the Model except as detailed below:

**Mortality Table used to Determine the Present Value of PBGC Assistance:** the Blended RP-2014 Healthy male mortality table times 1.09 and Healthy female mortality table times 0.99, projected to 2032 using the MP-2016 scale. We used this approximate table to match the generationally projected mortality tables used for the FY 2017 Annual Report.

**Mortality Table used to Determine Plan Experience:** the Blended RP-2014 annuitant and non-annuitant tables projected to this year's valuation dates using the MP-2016 scale. We updated the

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<sup>32</sup> This list excludes changes that arise merely from changes in economic conditions or from annual updates, for example changes in interest rates, asset returns, and one additional year of mortality improvement.



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anticipated experience for plans to reflect emerging long-term mortality experience in general, as reported by the Society of Actuaries.

### ***Possible Future Refinements to the ME-PIMS Model***

PBGC expects to continue to modify and improve ME-PIMS in the future. Areas under study include incorporating additional modeling of plans' actual responses to PPA, including further updates in the areas of projected mass withdrawals, employer contributions changes and employer benefit and funding decisions, and responses to MPRA in the area of suspension of benefits and partition.

A plan becomes insolvent when it does not have enough assets to pay benefits as they become due. A single-employer plan has one sponsor for which financial information is often available and whose financial condition can be assessed and modeled. By contrast, among multiemployer plans, even the identity of some individual employers that participate in particular multiemployer plans has only recently become available. Others remain unknown<sup>33</sup>. PBGC expects to continue to explore improvements to the model of plan insolvency that might reflect other plan or industry characteristics.

PIMS currently models future mortality improvement using age-varying static mortality projections. Future improvements to the system may incorporate generational mortality tables and the capability of utilizing a yield curve for discounting.

## **SE-PIMS**

### ***SE-PIMS — Overview***

No single underfunding number or range of numbers is sufficient to evaluate PBGC's exposure and expected claims over the next 10 years. Claims are sensitive to changes in interest rates and investment returns, overall economic conditions, contributions, changes in benefits, the performance of some particular industries and bankruptcies.

Large claims from a small number of terminations characterize PBGC's claims experience throughout its history and are likely to affect PBGC's potential future claims experience as well.

SE-PIMS starts with data on PBGC's single-employer position and data on the funded status of more than 460 plans that are weighted to represent the universe of PBGC-covered plans. The Model produces results under 5,000 different simulations (500 economic paths times 10 bankruptcy simulations). The probability of any particular outcome is estimated by dividing the number of simulations with that outcome by 5,000. The Model uses funding rules as prescribed by current law.

PBGC's expected claims under the Single-Employer Program depend on two factors: the amount of underfunding in the pension plans that PBGC insures (i.e., exposure) and the likelihood that corporate sponsors of these underfunded plans will encounter financial distress that results in bankruptcy and plan termination (i.e., the probability of claims).

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<sup>33</sup> Consistent with ERISA Section 103(f)(2)(B), Form 5500 requires only that multiemployer plans identify employers that contributed more than 5% of the total contributions to the plan during the plan year.

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## ***SE-PIMS — Data***

SE-PIMS has a detailed database of more than 460 actual plans, sponsored by more than 330 firms, which represent about half of PBGC's insurance exposure in the single-employer defined benefit system measured from the 2015 Form 5500 filings which contain information for plan years that commenced during 2015 and ended either as of December 31, 2015 or during 2016 (the most recent year of complete Form 5500 filing data available). SE-PIMS also reflects any available contributions from later years' filings that are available when the initial results are generated. The plans selected for the sample are those with sponsors that have the largest shares of total plan liabilities in the single-employer defined benefit system and where (1) sufficient publicly accessible data is available on the sponsor to use the SE-PIMS bankruptcy probability model, and (2) plan details can be sufficiently captured in the SE-PIMS Model.

The database includes:

- summary statistics on plan demographics,
- plan benefit structure,
- asset values,
- liabilities,
- actuarial assumptions, and
- key financial information about the employer sponsoring the plan.

## ***SE-PIMS — Methodology***

The SE-PIMS sample of more than 330 large plan sponsors is weighted to represent the universe of PBGC-insured, single-employer plans. The weighted representation reflects the values of total liabilities and underfunding, and the distribution of funding levels among plans in the insured universe that were available publicly as of the preceding spring (generally information for plan years that began in 2015).

The weights in SE-PIMS scale the sample of plans to be representative of the entire universe of single-employer plans (generally trying to capture the distribution of plans by size). This is done by creating scaled copies (referred to as "partners") of the sponsors in the SE-PIMS sample. Each partner is projected to sponsor scaled copies of the same plans sponsored by its source sponsor. Partners begin each simulation with the financial conditions copied from their source sponsors but are scaled in the sizes of their balance sheet entries and employment and receive individual projections of their financial conditions and bankruptcy experiences. Because the SE-PIMS sample is drawn from larger than average plans and corporations, each partner is scaled (in plan size and sponsor size) to one-fifth the size of its source.

Partners are allocated to sponsors in SE-PIMS to create a weighted sample that approximates the distribution of plan liabilities by funding status in the insured universe.

For example, the weighted sample's total value of plan liabilities among plans 50 to 60 percent funded is compared to the same total for the insured universe, and similarly for plans 60 to 70 percent funded, 70 to 80 percent funded, etc. Partners are allocated for a best fit to the entire distribution.

SE-PIMS simulates contributions, premiums, and underfunding for these plans using the minimum funding and premium rules, and then extrapolates the results to the universe of single-employer plans.

Funding rules and PBGC premiums under current law are reflected in the modeling. SE-PIMS also uses each employer's financial information as the starting point for assigning probabilities of bankruptcy, from which it projects losses to the insurance program.



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Projections of claims against the insurance program are made stochastically. Claims against the pension insurance program are modeled by simulating the occurrence of bankruptcy for plan sponsors. The Model reflects the relationship that occurred from 1980 to 1998 between the probability of bankruptcy and the firms' contemporaneous financial health variables (equity-to-debt ratio, cash flow, firm equity, and employment), modified as described below. For each period, the Model assigns a random change in each of these variables to each firm, correlated with changes in the economy. The simulated financial health variables determine the probability of bankruptcy for that year.

The Model assumes, with the exception noted below regarding variable-rate premiums, that all plan sponsors contribute the minimum amount each year. The Model runs 500 economic paths (varying interest rates and equity returns) with each plan's sponsor being "cycled" through each economic path 10 times (with varying financial health experiences, bankruptcy probabilities, etc.) for a total of 5,000 different simulations.

SE-PIMS then extrapolates the results of these simulations to the universe of insured single-employer plans.

### ***SE-PIMS — Assumptions***

The following variables are stochastically projected:

**Interest Rates, Stock Returns, and Related Variables.** (e.g., inflation, wage growth, and multiplier increases in flat-dollar plans)<sup>34</sup>. These variables are determined by the underlying means, standard deviations, and correlation matrix established in SE-PIMS.

- Stock returns are modeled as independent from one period to the next. To determine a simulated sequence of stock returns, the model randomly draws returns from a distribution that reflects historical experience going back to 1926.
- Interest rates are modeled as correlated over time. With the Model, the Treasury yield for a given period is expected to be equal to the yield for the prior period, plus or minus some random amount.
- The random draws affecting the bond yields and stock returns are correlated according to an estimate derived from the period 1973-2007. Stock returns are more likely to be high when the Treasury yield is falling and vice versa. Credit spreads on investment-grade corporate bonds are modeled to regress toward their historic mean values.

**Sponsor Financial Health Variables.** (equity-to-debt ratio, cash flow, firm equity, and employment).

**Asset Returns.** Plan asset returns are based on an internal study of historic asset returns among large plans. Using the financial rates directly modeled in PIMS (stock market returns, long-term Treasury bond returns and yields) the study estimated mixtures of those rates to best fit the historic returns of plans in the study. PIMS projects annual plan returns using the following weighting based on the average of the estimated rate mixtures: 48 percent stock market returns, 23 percent long-term Treasury bond returns, and 30 percent long-term Treasury bond yield, with a -2.5 basis points additive return adjustment (percentages are rounded). Future plans for PIMS

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<sup>34</sup> In a flat-dollar plan, the pension benefit is determined by multiplying a fixed amount by the participant's years of service. In a salary-related plan, the benefit is determined by multiplying a percentage of the participant's salary by the years of service.

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may include modeling of additional asset class returns allowing PIMS to use the investment allocation information sponsors now report as part of the annual Form 5500 filings.

**Plan Demographics.** Starting with plans' population data from the Form 5500, the distribution of active participants for a plan varies throughout the forecast, according to that plan's actuarial assumptions regarding retirement, disability, and termination of employment. Age and service also vary over time due to hiring patterns that are determined separately in each simulated path of the projection. Unless the plan is frozen, PIMS assumes a stationary mean active participation level for the plan. The distribution of ages and benefits for retired and terminated vested participants are imputed from a long-term projection of the starting active population and normalized to the actual counts furnished by the Schedules SB. All participants are assumed to be male and are assumed to elect straight life annuities.

**Probability of Bankruptcy.** Sponsors are subjected to an annual stochastic chance of bankruptcy. That probability of bankruptcy is determined by formulas estimated from historical bankruptcies and various measures of companies' financial health over the period 1980 to 1998. The bankruptcy risks generated for PIMS are compared to market indices and the largest outliers have their modeled risk recalibrated to equal the mean of the market estimate of bankruptcy risk for their class of bonds. Bankruptcy probability formulas generally do not vary by industry.<sup>35</sup> A plan presents a loss to participants and/or the pension insurance program if its sponsor is simulated to experience bankruptcy and the plan is less than 80 percent funded for termination liability.

PBGC plans to update its bankruptcy model to look beyond book values of the firms to their market values in determining bankruptcy risk.

The following non-stochastic assumptions are also used in SE-PIMS projections:

**Mortality.** For purposes of determining sample plans' year by year mortality experience during the projection period: the blended RP-2014 annuitant and non-annuitant mortality tables, projected with MP-2016 to the specified projection year on a static basis. For purposes of determining the present value of PBGC assistance: the blended RP-2014 Healthy male mortality table times 1.09 and the Healthy female mortality table times 0.99, projected to 2032 using the MP-2016 scale for FY 2017. For projections of future fiscal years, the static projection is updated by one additional year, using the MP-2016 scale, for each year beyond FY 2017. PBGC has replaced the static projection with generational projections starting in the FY 2017 Annual Report. PRAD anticipates incorporating this change in the FY 2018 model. For purposes of determining statutory minimum funding requirements beginning in 2018, we modeled updates to the table by changing our assumption to the prescribed IRS table and projected on a static basis each year beyond 2018 using scale MP-2016. We assumed that large collectively bargained plans opt to use a substitute mortality table whose rates are assumed to be 9% higher than the standard table (5% higher relative to the RP-2000-based table for valuation years prior to 2018).

**Contribution Level/Credit Balances.** The credit balance is increased each year by the plan's rate of return on assets and decreased by the amount assumed to be used to satisfy the minimum funding requirement. For purposes of modeling future claims, SE-PIMS assumes that employers will contribute the minimum required amount each year as determined using the further

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<sup>35</sup> SE-PIMS makes an exception for the financial and utilities industries, where relatively high degrees of leverage are considered not to signal a risk of bankruptcy. SE-PIMS also increases the bankruptcy probabilities of a few large companies, especially in the retail industry, whose Model probabilities greatly underestimate the risk of bankruptcy as measured by their bond ratings.

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smoothing authority under the Bipartisan Budget Act of 2015 and that any credit balance remaining will be used to the maximum extent permitted until the balance is completely depleted. Updated actual 2015 and 2016 contributions and the associated Minimum Required Contributions are reflected where available as of the data compilation date.

**Benefit Improvements/Benefit Improvement Restriction.** For flat-dollar plans, benefit multipliers are assumed to increase annually by the rate of inflation and productivity growth. For salary-related plans, the benefit formula is assumed to remain constant, but annual salary increases are reflected based on the rate of inflation, productivity growth, and a factor measuring merit and/or seniority. Because SE-PIMS does not model benefit increases that exceed the average wage increase of affected employees, benefit improvement restrictions are not applicable in PIMS.

**Cash Balance Plans.** SE-PIMS assumes that plans will pay the full accrued benefit (the account balance) as a lump sum to all retiring and terminating active participants in any plan that is at least 80% funded.

**Plan Accrual Benefit Restrictions.** Plans with funded percentages below 60% must cease benefit accruals. SE-PIMS reflects this rule, and assumes that once a plan is frozen, it will remain frozen, even if the percentage increases above 60% at some future time.

**Declassification of Credit Balances.** When determining funding percentages for triggering benefit restrictions, SE-PIMS reduces assets by credit balances. Sponsors have the option of declassifying credit balances at any time to raise the funded percentage to the level needed to avoid a benefit restriction. For modeling purposes, SE-PIMS assumes that sponsors will choose to declassify credit balances to the extent necessary to avoid the benefit freeze restriction (60% threshold), but assumes that traditional plan sponsors will not declassify balances to attain the 80% threshold. Because cash balance plans are assumed to pay the full accrued benefit as a lump sum to departing participants, contingent on sufficient funding, these plans are assumed to declassify credit balances to achieve 80% funding.

**PBGC Premiums.** SE-PIMS models premiums based on the rate under current law with projected rates increasing under the fixed increases and indexing provisions in current law. There is no allowance in premium projections for write-offs of uncollectable premiums. Premiums are assumed paid by the employer.

**Variable-Rate Premiums.** PBGC's experience has been that many companies make plan contributions in excess of the minimum, in part to avoid or reduce their variable-rate premium payments. Virtually all of these companies have been at a low risk of bankruptcy, and their plans have not accounted for a material portion of PBGC's claims. By contrast, the relatively small number of plans that result in claims are sponsored by companies that have not made contributions above the required minimum for an extended period prior to the claim. Using the general PIMS projection that companies will make the minimum required contributions would overstate the estimate of PBGC's variable rate premium income. Accordingly, for variable-rate premium projections only (i.e., not for ongoing funding), the SE-PIMS Model reflects an adjustment to plan assets phased in over five years to offset the assumption that plans generally contribute at the minimum. The adjustment to assets also reflects increasing tendencies for sponsors to reduce underfunding through extra contributions as variable premium rates increase. Variable-rate premiums are further scaled to match recent experience. This report reflects a one-year delay in the portion of asset increase related to premium rates in order to better match PBGC's actual experience in variable-rate premium collection as premium rates rise.

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**PBGC's Assets.** Projected returns are based on analysis of historical returns, return volatilities, and correlations between the different asset class returns. At any point at which PBGC's assets are projected to exceed 130% of its projected liabilities, the investment policy is assumed to change to 100% fixed income securities.

**Discounting Future Claims.** When SE-PIMS discounts future amounts, the discount factor is a single interest factor which models the "select" and "ultimate" factors described in the 2017 financial statements with an assumed reversion to the relationship of market interest rate and annuity pricing factors observed prior to the 2008 financial crisis. Those factors are based on a survey of private-sector annuity market prices.

**Determining Discounted Future Present Values Shown in Report Tables.** For calculations involving discounting future amounts, the discount rate used is the simulated 30-year Treasury rate generated for the particular year and economic path.

(For additional information on SE-PIMS and the assumptions used in running the Model, see PBGC's *Pension Insurance Data Book 1998*, Pages 10-17, which also can be viewed on PBGC's website at <http://www.pbgc.gov/documents/1998databook.pdf>.)

The 2017 version of SE-PIMS recognizes the following changes in assumptions from those used in the 2016 version of the Model<sup>36</sup>.

**Mortality Table used to Determine the Amount of Underfunding at Termination:** The Blended RP-2014 Healthy male mortality table times 1.09, projected to 2032 using the MP-2016 scale. We updated this table to match the mortality tables used for the FY 2017 Annual Report.

**Mortality Table used to Determine Minimum Funding and Variable Rate Premium Requirements:** For purposes of determining statutory minimum funding requirements beginning in 2018, we modeled updates to the table by changing our assumption to the prescribed IRS table and projected on a static basis each year beyond 2018 using scale MP-2016. We assumed that large collectively bargained plans opt to use a substitute mortality table whose rates are assumed to be 9% higher than the standard table (5% higher relative to the RP-2000-based table for valuation years prior to 2018).

**Mortality Table used to Determine Plan Experience:** For purposes of determining plan experience, we modeled updates to the table by changing our assumption to the Blended RP-2014 annuitant and non-annuitant tables projected to the valuation date using the MP-2016 scale. We updated the anticipated experience for plans to reflect emerging long-term mortality experience in general, as reported by the Society of Actuaries.

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<sup>36</sup> This list excludes changes that arise merely from changes in economic conditions or from annual updates, for example changes in interest rates and asset returns, or one additional year of mortality improvement.

## SAMPLE STATISTICS FROM FY 2017 RUNS IN ME-PIMS AND SE-PIMS

The following tables show selected output statistics from runs of ME-PIMS and SE-PIMS for this (2017) report. These statistics are specific to the Model runs for this report.

**Table 1**

<b>Arithmetic Means, Standard Deviations and Correlations of Key Financial Market Values FY 2017 Single-Employer and Multiemployer Model Runs (across 2018-2027 for 500 economic paths)</b>			
	<b>Long-Term Treasury Yield</b>	<b>Return on 30-year Treasury Bonds</b>	<b>Stock Market Return</b>
Mean	2.9%	2.7%	8.6%
Standard Deviation	1.0%	8.1%	20.1%
Correlations:			
Long-Term Treasury Yield	1.00	-0.30	-0.01
Return on 30-year Treasury		1.00	0.21
Stock Market Return			1.00

**Table 2**

<b>Arithmetic Means and Standard Deviations of Market Rates Derived From Projected Long-Term Treasury Yields in FY 2017 Single-Employer and Multiemployer Model Runs</b>			
	<b>Long-Term Corporate Rate</b>	<b>Inflation Rate</b>	<b>Wage, Salary and Flat Benefit Growth Rate</b>
Mean	4.0%	2.8%	4.2%
Standard Deviation	1.0%	1.0%	1.0%

**Table 3**

<b>Projected Plan Returns<sup>37</sup> FY 2017 Single-Employer and Multiemployer Model Runs</b>	
Arithmetic Mean	5.5%
Geometric Mean	5.1%
Standard Deviation	10.1%

<sup>37</sup>The geometric rate of return reflects that negative asset returns set plans back more than positive returns help them, by reducing the base of assets. This is particularly important for plans whose benefit payments exceed contributions.

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**Table 4**

<b>Projected Annual Bankruptcy Probabilities<sup>38</sup> FY 2017 Single-Employer Model Runs</b>	
Arithmetic Mean	0.5%
Standard Deviation	1.2%

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**Table 5**

<b>Annual Probability of Plans' Projected Mass Withdrawal FY 2017 Multiemployer Model Runs Assuming MPRA Election Rates</b>	
Arithmetic Mean	0.5%
Standard Deviation	1.6%

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**Table 6**

<b>Annual Rate of Plans' Projected Insolvency FY 2017 Multiemployer Model Runs Assuming MPRA Election Rates</b>	
Arithmetic Mean	0.4%
Standard Deviation	0.1%

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<sup>38</sup> The bankruptcy probability modeling methods and results are more fully described in Boyce, S. and Ippolito, R.A. (2002), The Cost of Pension Insurance. Journal of Risk and Insurance, 69: 121–170. doi: 10.1111/1539- 6975.00012.