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To: Ted Goldman

From: Steven Boyce
Mark Baba

Subject: Single-Employer and Multiemployer Program Sensitivity Analysis

Executive Summary

This report summarizes PRAD's sensitivity analysis of certain PIMS modeling assumptions used in the FY17 Projections Report. Our analysis examines sensitivities of 10-year mean projected values of the Single-Employer Program's and the Multiemployer Program's net position under a market downturn scenario. We also examine mean values of 10-year cumulative claims and premiums with respect to assumptions about the potential for declining participation in single-employer pensions. Specifically, we analyze stress test scenarios examining effects of future occurrences of:

- better funded plans departing the single-employer system through standard terminations
- plans closing to new entrants
- plans freezing to eliminate any future benefit accruals.

As can be seen in Table 1, all of the test scenarios for declining future single-employer participation result in lower projections of PBGC's mean net position. Each of these scenarios result in lower values of projected future claims, and also result in reductions in projected premium revenue that exceed the reductions in claims.

We also present analysis of a financial market stress test for both ME-PIMS and SE-PIMS. This analysis projects a repeat of 1999-2008 financial market patterns to illustrate the sensitivity of the projections to market downturns. For each of the models, the financial market stress test results in a mean projected net position worse than ninety five percent of the outcomes from the associated baseline projection. The results for both models are shown in Table 2.

Declining Participation Tests

SE-PIMS currently captures plan freezes and/or closures to new entrants that are already in effect as of the model's data starting point. It does not, however, model any future plan freezes or closures and, other than plan terminations triggered by randomly simulated bankruptcy events, does not model any future voluntary plan terminations. The following scenarios test the sensitivity of mean projections of PBGC outcomes to different assumptions about possible future terminations, closures and freezes.

Standard terminations of pension plans can occur only when their sponsors have fully secured all vested benefits of the plans' participants, either through purchases of annuity contracts from insurance providers and/or lump sum payouts to participants. Thus, the better funded the plan, the better the financial feasibility for the sponsor of implementing a standard termination.

The analysis compared four scenarios to the baseline PIMS results as follows:

- **Standard termination in 2020 for all plans at least 100% funded.** For the first test scenario, we assume that any plan at least 100% funded, on an annuity purchase basis, as of the beginning of 2020 is immediately terminated. As shown in table 1, the result of this assumption is a $1.4 billion decrease in the mean present value net position for 2027.

  The plans that terminate under this assumption, being fully funded, present no insurance exposure to PBGC at the time of their terminations. Nor would they be a source of a variable rate premium revenue loss (assessed only on plan underfunding) at the time of termination.

  However, given the random simulation of future financial market returns and liability valuation rates, there are paths in the simulations where some plan underfunding and insurance exposure would develop in the following years of the projection if the plans remained ongoing.

  The assumption of standard terminations results in $0.1 billion decreases in the mean present values of both claim and variable rate premiums. The largest effect of the terminations on the revenues of PBGC is with the mean present value of the flat rate premium projection (assessed on the number of plan participants) which declines by $1.5 billion, or 7.8%.

- **Standard termination in 2020 for all plans at least 85% funded.** The next test scenario expands on the number of standard terminations from the first test by assuming all plans at least 85% funded at the beginning of 2020 (on an annuity purchase basis) will immediately implement standard terminations, with sponsors contributing additional funds, if needed, to meet the full funding requirement for a standard termination.

  With more plans being affected, and because plans having some underfunding and insurance exposure are included, the effects on claims and premiums are larger than the first scenario. The mean present value of projected claims falls by $1.3 billion, variable rate premiums fall by $0.7 billion and flat rate premiums by $4.7 billion. The mean present value of the 2027 net position falls by $3.7 billion.

- **Participant decline, all plans close to new entrants in 2020.** The third test assumes that all plans that are not already closed to new entrants become closed as of 2020. Plans that close to new entrants will necessarily have decreasing numbers of total participants as time progresses, resulting in smaller flat rate premium collections. There will be no immediate decreases in plan liability values, but future years' values of liabilities will be smaller as fewer and fewer active participants remain to accrue new benefits. With smaller liability values, there is reduced potential for growth in PBGC exposure, and in plan underfunding, that would arise under adverse conditions projected in some simulation paths.

  As shown in Table 1, this assumption results in a mean present value decrease in the 2027 net position of $1.5 billion. The present value of claims falls by $0.1 billon and the present value of variable rate premiums falls by a slightly larger amount, $0.4 billion. The largest revenue decrease is with the flat rate premium which falls by $1.2 billion.

- **All plans freeze benefits accruals in 2020.** The fourth test assumes that all plans not already frozen will completely freeze all benefit accruals as of 2020. This has a similar effect on participant numbers as the closure to new entrants (the third test) and has no immediate effects on the value of plan liabilities at the time the freezes initiate. However, future years' values of liabilities will be lower after removing the continued benefit accruals assumptions for existing participants. As shown in Table 1, this assumption results in a mean present value of the 2027 net position $0.8 billion lower than the baseline projection. The mean present value of projected claims falls by $3.2 billion, while the mean present value of variable rate premiums falls by $2.4 billion. Flat rate premiums fall by $1.2 billion.

Table 1: Declining Participation Stress Tests – Single Employer Program

Dollars in Billions	Mean Present Value of 2027 Net Position	Mean Present Value of Claims 2018-2027	Mean Present Value Variable Premiums 2018-2027	Mean Present Value Flat Premiums 2018-2027	Chance of Negative 2027 Net Position
Baseline	$20.1	$17.1	$17.3	$19.3	16.7%
Standard Terminations, in 2020, For All plans At Least 100% Funded	18.7	17.0	17.2	17.8	18.1%
Standard Terminations, in 2020, For All plans At Least 85% Funded	16.4	15.8	16.6	14.6	20.2%
Participant Decline - All Plans Close to New Entrants in 2020	18.6	17.1	16.8	18.1	19.0%
All Plans Freeze Benefit Accruals in 2020	19.3	13.9	14.9	18.1	17.2%

Changes from Baseline*

Standard Terminations, in 2020, For All plans At Least 100% Funded	($1.4)	($0.1)	($0.1)	($1.5)	
Standard Terminations, in 2020, For All plans At Least 85% Funded	(3.7)	(1.3)	(0.7)	(4.7)	
Participant Decline - All Plans Close to New Entrants in 2020	(1.5)	(0.1)	(0.4)	(1.2)	
All Plans Freeze Benefit Accruals in 2020	(0.8)	(3.2)	(2.4)	(1.2)	

* Individual figures may not sum or subtract due to rounding.

Market Downturn Stress Tests

The baseline projections result from multiple simulations projecting plans through randomly generated paths of future interest rates, investment returns, sponsor bankruptcies (single-employer) and changes to the numbers of active participants (which tends to be a more significant source of variation for multiemployer plans than for single-employer plans). With the market downturn stress test scenario, only one path of financial market events is projected, but the other sources of randomness remain.

For this stress test, we use the 1999-2008 historic period, the 10-year period that concludes with the most recent actual major market downturn. We recreate the financial market events of this period, by:

1. Starting the projection with the actual, end of year 2017, long-term Treasury bond yield and then projecting forward the same pattern of proportion changes that occurred to the yield over 1999-2008.
2. Given the projected Treasury bond yields, projecting forward annual corporate bond yields to have the same spread over Treasury yields that occurred during 1999-2008.
3. Projecting annual inflation rates to have the same differential with Treasury yields as occurred over 1999-2008.
4. Projecting annual nominal stock returns such that their inflation-adjusted values recreate those experienced over 1999-2008.

Table 2 shows the effects of this test on the mean present value of the projected 2027 net positions of PBGC's single-employer and multiemployer programs. Under the test, the mean present value of the single-employer net position falls to a $20.2 billion deficit, a decline of $40.3 billion. For comparison, the fifth percentile outcome from the baseline projection is an $18.5 billion deficit.[1]

The mean present value of the multiemployer net position falls to a $125.1 billion deficit under the test, a decline of $57.0 billion from the mean baseline outcome. For comparison, the fifth percentile outcome from the baseline projection is a $117.2 billion deficit.

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[1] As presented in the 2017 Projections Report, available here: https://www.pbgc.gov/sites/default/files/fy-2017-projections-report.pdf

Table 2: Market Downturn Stress Test

Dollars in Billions	*Mean Present Value of 2027 Net Position*	*Change from Baseline**	*Comments*
Single-Employer Baseline	$20.1	-	
Repeat of 1999-2008 Economy	(20.2)	(40.3)	A significant factor of the $40.3 B decline relates to this scenario's poor investment returns. Lower returns on PBGC investments result in lower asset values and lower returns on plans' investments result in higher values of projected claims. This scenario also has declining interest rates which results in higher valuations of plan liabilities.
Multiemployer Baseline (assuming MPRA election rates)	($68.0)	-	
Repeat of 1999-2008 Economy	(125.1)	(57.0)	This scenario's poor investment returns and decreasing interest rates result in lower plan asset values and higher values of plan liabilities. However, given the relatively small value of assets relative to its current obligations, PBGC's investment returns are not as significant a factor in the decline of the multiemployer program's projected net position.

* Individual figures may not sum or subtract due to rounding.

Conclusions

Declining numbers of pension plans and insured participants have the potential to adversely affect PBGC's ability to adequately insure pension promises, particularly if low-risk plans depart and leave PBGC to insure mostly high-risk plans. The tests we have performed here involve terminations or freezes of large portions of the universe of plans insured by PBGC. Each of those tests results in a decline in the mean projected outcome for PBGC's financial position. However, the magnitude of those changes is relatively small compared to that seen in the financial market stress test. Financial market risks remain the most significant of the risks to PBGC's insurance programs. Continued analysis and monitoring of risk transfer and frozen plan termination activity will help inform future PIMS modeling.

For illustrative purposes, Table 3a shows the same 10-year values as discussed in Table 1, except the results shown are at the 15th percentile (rather than the mean). Care should be taken when interpreting these results. For example, the 15 percent of economic and bankruptcy paths that produce the lowest present value of 10-year cumulative claims is not the same as those producing the 15th percentile of 2027 Net Position. Table 3b shows the 85th percentile results.

Table 3a: Declining Participation Stress Tests – Single Employer Program

Dollars in Billions	*15th Percentile Present Value of 2027 Net Position*	*15th Percentile Present Value of Claims 2018-2027*	*15th Percentile Present Value Variable Premiums 2018-2027*	*15th Percentile Present Value Flat Premiums 2018-2027*
Baseline	($2.2)	$4.2	$6.9	$18.9
Standard Terminations, in 2020, For All plans At Least 100% Funded	(3.0)	4.2	6.9	16.9
Standard Terminations, in 2020, For All plans At Least 85% Funded	(4.7)	3.9	6.9	11.9
Participant Decline - All Plans Close to New Entrants in 2020	(3.8)	4.2	6.9	17.7
All Plans Freeze Benefit Accruals in 2020	(2.3)	3.0	6.4	17.7
Changes from Baseline*				
Standard Terminations, in 2020, For All plans At Least 100% Funded	($0.8)	($0.0)	($0.0)	($2.0)
Standard Terminations, in 2020, For All plans At Least 85% Funded	(2.5)	(0.3)	(0.0)	(7.0)
Participant Decline - All Plans Close to New Entrants in 2020	(1.6)	(0.0)	(0.0)	(1.1)
All Plans Freeze Benefit Accruals in 2020	(0.1)	(1.2)	(0.5)	(1.2)

* Individual figures may not sum or subtract due to rounding.

Table 3b: Declining Participation Stress Tests – Single Employer Program

Dollars in Billions	*85th Percentile Present Value of 2027 Net Position*	*85th Percentile Present Value of Claims 2018-2027*	*85th Percentile Present Value Variable Premiums 2018-2027*	*85th Percentile Present Value Flat Premiums 2018-2027*
Baseline	$40.2	$30.7	$29.6	$19.7
Standard Terminations, in 2020, For All plans At Least 100% Funded	38.9	30.5	29.4	18.9
Standard Terminations, in 2020, For All plans At Least 85% Funded	36.2	28.3	28.6	17.6
Participant Decline - All Plans Close to New Entrants in 2020	38.9	30.6	28.9	18.5
All Plans Freeze Benefit Accruals in 2020	38.5	25.7	25.5	18.5
Changes from Baseline*				
Standard Terminations, in 2020, For All plans At Least 100% Funded	($1.4)	($0.2)	($0.2)	($0.8)
Standard Terminations, in 2020, For All plans At Least 85% Funded	(2.5)	(0.3)	(0.0)	(7.0)
Participant Decline - All Plans Close to New Entrants in 2020	(1.3)	(0.1)	(0.8)	(1.2)
All Plans Freeze Benefit Accruals in 2020	(1.7)	(5.1)	(4.1)	(1.2)

* Individual figures may not sum or subtract due to rounding.

Appendix 2 -Impact of the assumed Standard Terminations in 2020 on Flat Rate Premiums

Table 4 below provides some additional detail regarding the magnitude of the assumed Standard Terminations in 2020 assumed for purposes of the first 2 sensitivity tests. Both are assumed to be one-time events which result in the standard termination of any plan meeting the specified percent Funded criteria (either 100% or 85% on a Standard Termination Basis).

Table 4: Impact of the assumed Standard Terminations – Single Employer Program

	Percent drop in Fixed Rate Premiums received in 2021	*Dollar drop in Fixed Rate Premiums received in 2021**	*Participants involved in the assumed Standard Terminations*
Standard Terminations, in 2020, For All plans At Least 100% Funded	10.1%	$0.2 billion	2.5 million
Standard Terminations, in 2020, For All plans At Least 85% Funded	30.7%	$0.7 billion	7.7 million

Note: Figures shown are the change from the Baseline mean 2021 Fixed Rate premium receipts of $2.2 billion.
* Each year after 2021 similarly affected.