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Single-Employer Risk Transfer Activities

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SUMMARY

The Pension Benefit Guaranty Corporation (PBGC) insures participants in private pension plans against loss of some or all benefits in case their plan is unable to pay benefits. The agency uses a stochastic modeling system, the Single-Employer Pension Insurance Modeling System (SE-PIMS), to make projections of future expected liabilities related to single-employer plans. SE-PIMS does not currently model activities by plan sponsors to transfer participant longevity risks and investment risks to third parties. This report makes recommendations for the potential incorporation of such risk-transfer activities in SE-PIMS.

The main mechanisms through which plans may transfer longevity and investment risks are lump-sum windows and group annuity buy-outs. A lump sum is a one-time payment to a plan participant to settle the participant's entitlement to future benefits. A group annuity buy-out is a purchase, from a third party, of annuities for the benefit of a group of plan participants. In both cases, plan participants migrate out of the plan. Plans may also pay lump sums and/or purchase annuities for all plan participants as part of a standard termination. Because risk transfers reduce the number of plan participants, they also reduce premium income for PBGC.

This report documents historical risk transfer activities, distinguishing standard terminations from lump-sum windows and annuity buy-outs. The magnitude of past transfers suggests substantial reductions of PBGC's premium income, which may have important consequences for PBGC's financial outlook.

We discuss factors that may affect risk transfers and estimate econometric models to explain historical risk transfers. We recommend that the resulting estimates form a basis for incorporating risk transfers in SE-PIMS, but caution against using the estimates as the sole basis because some unobserved determinants of past risk transfers may not repeat or persist. For example, an employer may have restructured and be left with a pension plan that is associated with terminated vested participants who were never directly associated with the eventual successor company in business today. The associated legacy risks, hard to justify to shareholders, may have prodded sponsors to transfer risks. As a result, the future incidence of risk transfers may be lower than that of the recent past. We recommend that pension actuaries develop plausible scenarios for the incidence of future risk transfers and apply those scenarios to SE-PIMS to gauge the sensitivity of PBGC's financial outlook to alternative scenarios.

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1. INTRODUCTION

Single-employer defined benefit (DB) plans are exposed to investment risks of the plan's assets, longevity risks of the plan's participants, and many other factors. Plans may engage in risk transfer activities to mitigate investment and longevity risks. The current Single-Employer Pension Insurance Modeling System (SE-PIMS) does not model risk transfer activities. The Pension Benefit Guaranty Corporation (PBGC) retained Advanced Analytical Consulting Group, Inc. (AACG) to review the desirability and feasibility of modeling plans' risk transfer behavior in SE-PIMS. This document reports on our review. It discusses legal and economic incentives for plans and sponsors to engage in risk transfers, identifies constraints on plans' ability to transfer risks, analyzes the historical prevalence and determinants of risk transfers, and recommends an approach to modeling risk transfers in SE-PIMS.

Insofar relevant to SE-PIMS, risk transfers may be categorized as follows:

1) *Lump-sum payment*. Some DB plans offer inactive participants the option of taking their accrued benefits as a one-time payment ("lump-sum payment"). The conversion of a lifetime income flow into a lump-sum payment is generally structured as a temporary offer that participants may or may not accept during a "lump-sum window." The offer generally targets former employees who are not yet receiving benefits. If accepted, the recipient ceases to be a participant in the plan. Future investment risks and the responsibility to make the funds last for the duration of the recipient's life and potentially the life of a spouse ("longevity risks") are transferred from the plan to the recipient of the lump-sum payment.

2) *Group annuity buy-out*. When plan participants retire and become eligible to receive benefits from the DB plan, they may expect to receive from the plan a series of periodic payments for life (an annuity). Instead, the plan may purchase a group annuity from an external insurance company. In an annuity buy-out, the insurance company assumes the responsibility of making pension payments, and the affected participants are removed from the plan.[1] As a result, investment and longevity risks have transferred from the plan to an external insurance company.

3) *Standard Termination*. Plans may terminate, in which case they need to make arrangements for the benefit entitlements of all remaining participants. While standard terminations involve a combination of lump-sum payments and annuity buy-outs, plans generally do not report details on such transactions in preparation for a standard termination. For that reason, we analyze standard terminations as a separate category.

In addition to mitigating longevity and investment risks, risk transfers reduce regulatory risks, such as the potential for rising premium rates or stricter funding requirements. A pension risk transfer also shrinks the number of participants in the plan. As a consequence, risk transfers reduce premium payments to PBGC and plan-related expenses such as for communication and recordkeeping.

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[1] Alternatively, a plan may purchase an annuity for its own benefit and remain responsible for making benefit payments to its participants. This type of transaction, known as an annuity buy-in, may be viewed as an asset investment which aims to match future earnings to future benefit payments. Annuity buy-ins are outside the scope of our review.

2. BACKGROUND

Legal Framework

Both lump-sum payments and annuity buy-outs are governed by legal frameworks that restrict the plans that can offer them, the type of participant they can be offered to, and the dollar value of the assets and liabilities transferred.

Pension Protection Act of 2006

The Pension Protection Act of 2006 (PPA) modified how the minimum value of a lump-sum distribution offer from a DB plan is calculated. It also curtailed underfunded plans from offering lump-sum payments. Section 103 of the PPA prohibits accelerated benefit distributions such as lump-sum payments or annuity buy-outs if 1) the plan's funding level is less than 60% or 2) the plan sponsor is in bankruptcy and the plan is less than 100% funded. If the plan funding level is between 60% and 80%, the plan may distribute the lesser of a) 50% of the lump-sum value of a participant's accrued benefit and b) the lump-sum value of the participant's benefit guaranteed by PBGC.

In a DB plan, a participant's accrued benefit may be measured as the value of an annuity that commences at the participant's normal retirement age as determined by plan rules. The lump sum should be equal to at least the present value of the annuity that benefits a specific participant. The PPA made changes to the actuarial assumptions used to calculate the present value of the annuity.

Prior to the PPA, the Internal Revenue Code (IRC) set the interest rate and mortality table that plans must use to determine the minimum lump-sum value of an annuity that a participant has earned. A plan may offer more, but not less than this minimum value as a lump-sum payment.

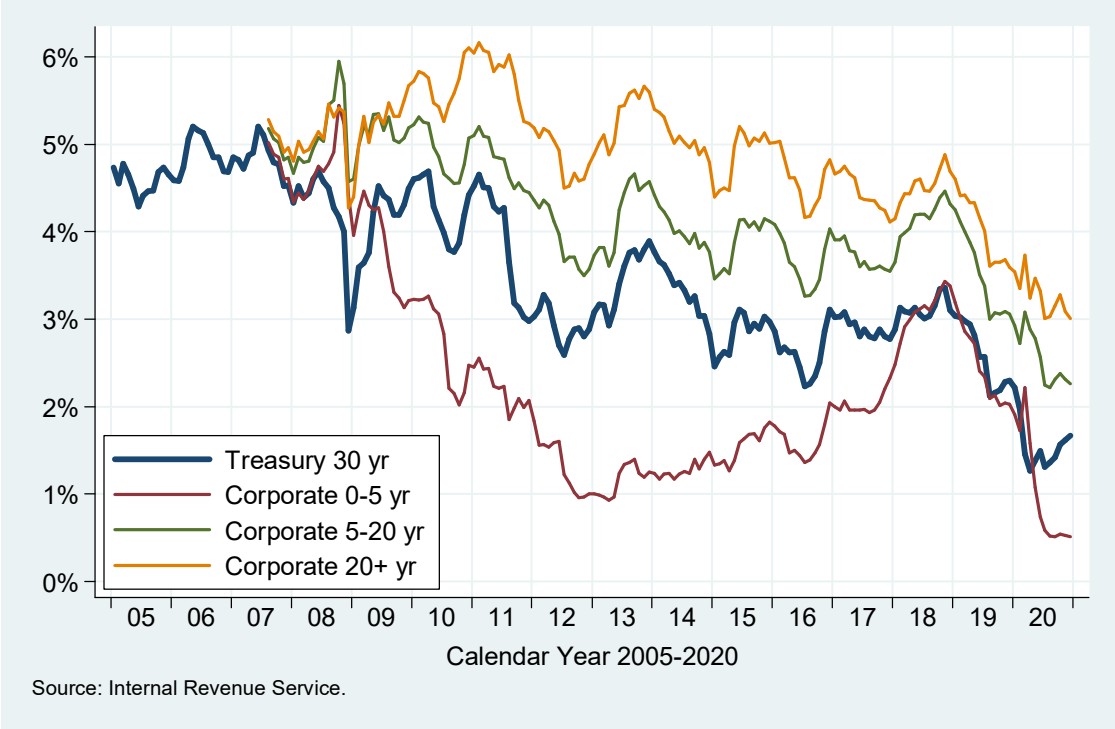
The PPA modified both the mortality assumptions and interest rates. At the time, the PPA-updated mortality estimates generally increased the value of lump sums by 1%–2%, depending on the age of the participant.

The PPA-updated interest rates replaced benchmarks tied to the interest rate on 30-year U.S. Treasury bonds with a rate tied to three corporate bond rates published monthly by the Internal Revenue Service (IRS). The first segment rate applies to projected pension payments payable within 5 years. The second and third segment rates apply to pension payments payable in 5 years but less than 20 years and payments payable in 20 years or more respectively.[2] The change to corporate rates was phased in between 2008 and 2012.

Medium- and long-term corporate bond rates tend to be higher than the 30-year Treasury rate (see Figure 1). The migration to corporate bond rates therefore reduced minimum lump-sum payments because the present value of future benefits (lump sum) is inversely related to the applicable discount rate.

[2] See https://www.irs.gov/retirement-plans/minimum-present-value-segment-rates.

Figure 1. 30-Year Treasury Bond Rate and Three Segment Corporate Bond Rates



Source: Internal Revenue Service.

The higher discount rates have resulted in lower lump-sum payments, particular for younger participants. Their future benefits are subject to a longer discounting period (20+ years) at corporate rates higher than the 30-year Treasury rate previously used by sponsors to calculate minimum lump-sum amounts. Older participants, whose future payments are discounted at the corporate 0–5 year rate, are the least affected, and may even benefit from the updated discount rates.

IRS Rule Changes

In 2015, the Treasury Department and IRS published a notice that communicated their intent to amend the regulations governing the payment of lump sums. The amendment would have limited the payment of lump sums offered to retirees or their surviving beneficiaries already receiving payments from the plan.[3] While the notice reportedly slowed down new offers of lump sums to existing retirees, no regulation consistent with the intent of the notice was issued.

In 2019, the IRS reversed course and announced that "The Treasury Department and the IRS no longer intend to propose the amendments to the regulations under § 401(a)(9) that were described in Notice 2015–49. However, the Treasury Department and the IRS will continue to study the issue of retiree lump-sum windows. Until further guidance is issued, the IRS will not assert that a plan amendment providing for a retiree lump-sum window

[3] https://www.irs.gov/pub/irs-drop/n-15-49.pdf. "The regulations, as amended, will provide that qualified defined benefit plans generally are not permitted to replace any joint and survivor, single life, or other annuity currently being paid with a lump-sum payment or other accelerated form of distribution."

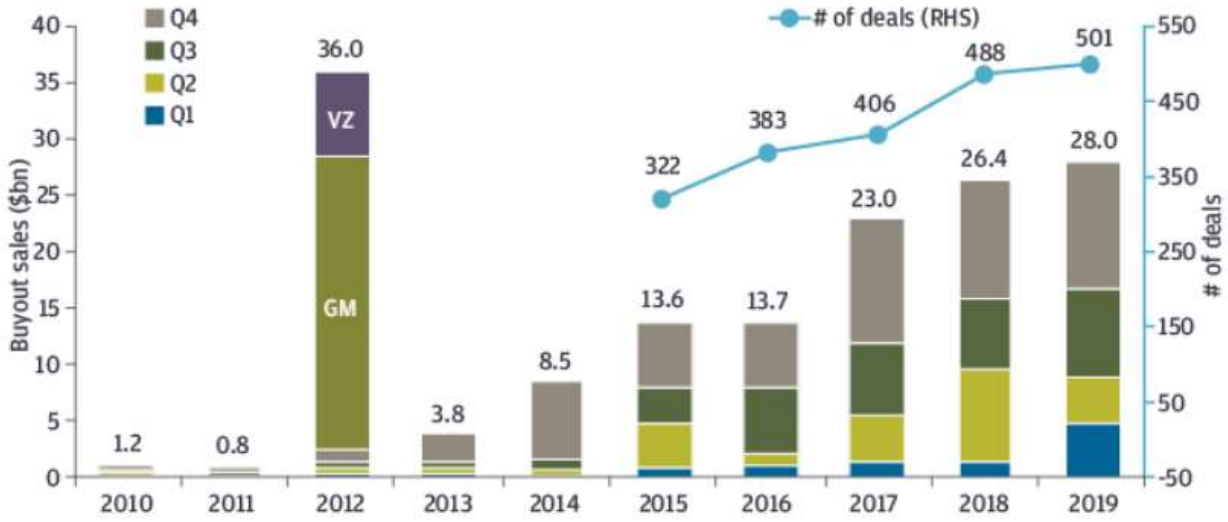
program causes the plan to violate § 401(a)(9), but will continue to evaluate whether the plan, as amended, satisfies the requirements of §§ 401(a)(4), 411, 415, 417, 436, and other sections of the Code. During this period, the IRS will not issue private letter rulings with regard to retiree lump-sum windows. However, if a taxpayer is eligible to apply for and receive a determination letter, the IRS will no longer include a caveat expressing no opinion regarding the tax consequences of such a window in the letter."

Aggregate Historical Risk Transfer Activity

Lump-sum offers accelerated in 2012 when the higher corporate bond rates were fully phased in. In a report on private sector pension de-risking, the ERISA Advisory Council (2013) stated that "calendar year 2012 saw heightened activity by plan sponsors in offering lump sum payouts. Plans could pay out lump sums, reducing the size of their obligations, at a lower cost than before the PPA changes".

The Life Insurance Management Research Association (LIMRA) conducts a quarterly survey of insurance companies to measure and publish information on the magnitude of pension buy-out sales (LIMRA 2019, 2020). Based on this survey and other information, J.P. Morgan Asset Management (2020) documented annual annuity buy-out purchases for 2010–2019 (Figure 2). The year 2012 stands out. However, while 2012 marked the beginning of an upward trend in annuity buy-outs, the 2012 spike was due to just two very large transactions by General Motors and Verizon.

Figure 2. Annuity Buy-out Transactions, 2010-2019



Source: J.P. Morgan Asset Management (2020), based on LIMRA (2019, 2020) and Company 10-K filings.

Surveys performed by various organizations point to an increased focus on managing plan liabilities as the reason for this increased annuity buy-out activity in 2012. In its annual survey of DB plan sponsors, MetLife (2012) noted that "plan sponsors appear to be building on the balanced attention paid to assets and liabilities that emerged in the 2011 study. At the top of the importance rankings are the same two liability related risks — Underfunding of Liabilities and Asset & Liability Mismatch — indicating that plan sponsors are more focused on the liability side of pension plan management than ever before."

Pensions & Investments Online ("P&I Online") maintains a database with risk transfer transactions of single-employer defined benefit pension plans. It lists the type of activity, the name of the sponsor, the assets involved, the number of employees covered, the published date, and several other fields. The information appears to be based on media reports.

The data set that we reviewed was extracted on August 26, 2020. Excluding buy-ins, it contains 193 unique entries for 2012–2020, or 21 transactions on average per year. The data relate to 129 unique organizations, with many transacting multiple times. Based on our own analysis of Form 5500 filings and PBGC Comprehensive Premium Filings (see below), many smaller transactions are absent from the P&I Online data. Further, even for included transactions, information on assets and employees is incomplete: assets involved is zero or missing for 57 entries (30%), and the number of covered employees is zero or missing for 79 entries (41%). Table 1 shows the number of large transactions, aggregate assets involved (insofar as known), and employees covered (insofar as known), by year in which information about the transaction was published. Both by assets and employees involved, 2012 stands out as the year with the largest transactions.

Table 1. Number of Large Transactions, Aggregate Assets Involved, and Employees Covered, by Year

Year	Large Transactions	Aggregate Assets ($m)	Aggregate Employees
2012	18	41,451	408,050
2013	3	1,225	31,000
2014	20	7,363	262,045
2015	20	7,675	163,085
2016	28	11,296	285,050
2017	27	12,086	257,443
2018	23	12,545	113,440
2019	30	10,582	255,084
2020	24	7,641	41,716
Total	193	111,864	1,816,913

Source: P&I Online.
Data are incomplete; see text.

Table 2 shows the number of large transactions, aggregate assets, aggregate employees, and average transaction amount by transaction type. Buy-out transactions reflected group annuity purchases for about 790,000 employees over nine years. Lump-sum windows were extended to 877,000 employees; if one-half of them accepted and are added to employees

in lump-sum acceptances, the data capture roughly 590,000 employees who accepted a lump-sum payment.[4]

Table 2. Number of Large Transactions, Aggregate Assets Involved, and Employees Covered, by Transaction Type (2012–2020)

Transaction Type	Large Transactions	Aggregate Assets ($m)	Aggregate Employees	Average transaction amount ($)
Buy-out	85	87,190	789,742	102,623
Lump-sum offer	62	7,975	877,000	50,296
Lump-sum acceptance	46	16,699	150,171	76,333
Total	193	111,864	1,816,913	92,426

Source: P&I Online.
Data are incomplete; see text. Average transaction amount is based on the subset of records with information on both assets and employees.

Separately, the American Council of Life Insurers (ACLI) publishes group annuity data collected from its members. The data consists of group annuities sold to both defined benefit (DB) and defined contribution (DC) plans. ACLI reported that $125 billion in group annuities were sold through DB and DC plans in 2018 (ACLI 2019, page 73). This is significantly higher than 2018 numbers reported by LIMRA ($26.6 billion) and P&I Online (12.5 billion) and appears to capture many transactions other than risk transfers by single-employer plans.

Pricing of Lump Sum Payments and Group Annuities

The cost to plans, or price, of lump-sum payments and group annuities is not necessarily 100% of the corresponding liability because of regulatory provisions related to applicable discount rates, allowances for profit of insurance companies, transaction costs, and other factors. Inglis (2013) estimated the cost to plans of lump sum distributions, annuity buy-outs, and standard terminations. Table 3 shows risk transfer prices as a percentage of the liability that such activities erase. The basis for the estimates is the accumulated benefit obligation (ABO), a measure of the pension liability defined by U.S. Generally Accepted Accounting Principles (GAAP). It is an equivalent concept to the PPA funding target, but may be measured with a different interest rate.

[4] In about eight cases, the database contains a lump-sum offer followed by a lump-sum acceptance a few months later. Such pairs of records may overstate assets or employees, but information on assets and employees is also often missing.

Table 3. Cost Ranges of Risk Transfers, as a Percentage of Accounting Liability

	Active	Vested terminated	Retired	Typical full plan
Ongoing liability (ABO or Funding target using yield curve)	100	100	100	100
Annuities paid from plan, with closely matched LDI portfolio	110–120	105–115	105–110	110
Group annuity	115–130	110–120	108–112	115
Lump sums*	95–100	95–100	100–110	n/a
Plan termination†	105–115	105–110	108–112	110

Source: Inglis (2013).
* Includes impact of anti-selection and lookback period for interest rate selection.
† Combination of lump sums and annuity purchases.

Table 3 distinguishes transfer prices for active, vested terminated, and retired participants. Group annuity purchases tend to target retired ("in-pay") participants (PBGC 2020a, page 3), for whom Inglis estimated a price of between 108% and 112% of the associated liability. Most lump-sum payments flow to vested terminated participants (PBGC 2020a, page 3), with an estimated price of between 95% and 100% of the associated liability. The cost of terminating a plan is estimated at approximately 110% of the plan's liability.

It is our understanding that today's prices may be lower than those in Table 3 because the estimates in Table 3 are based on mortality tables that were updated shortly after Inglis (2013) estimated risk transfer prices.

3. EVIDENCE FROM PLAN FILINGS

This section presents an analysis of historical risk transfers of individual plans based on Form 5500 and PBGC Comprehensive Premium Filings ("Premium Filings"). While neither source provides complete and detailed information on risk transfers, Form 5500 filings cover a longer period while Premium Filings provide more detail.

Form 5500

Plans generally discuss lump-sum windows and annuity purchases as part of the narrative plan description in an attachment to the Form 5500 Annual Return/Report of Employee Benefit Plan ("Form 5500").[5] Unfortunately, attachments do not follow any prescribed structure and it would require a manual review of each filing to extract information about risk transfers from attachments. Insofar available in structured fields, we identified two areas on Form 5500 filings that relate to risk transfers: Line 3 on Schedule R and Lines 14–15 on Schedule SB.

Lump Sum Distributions

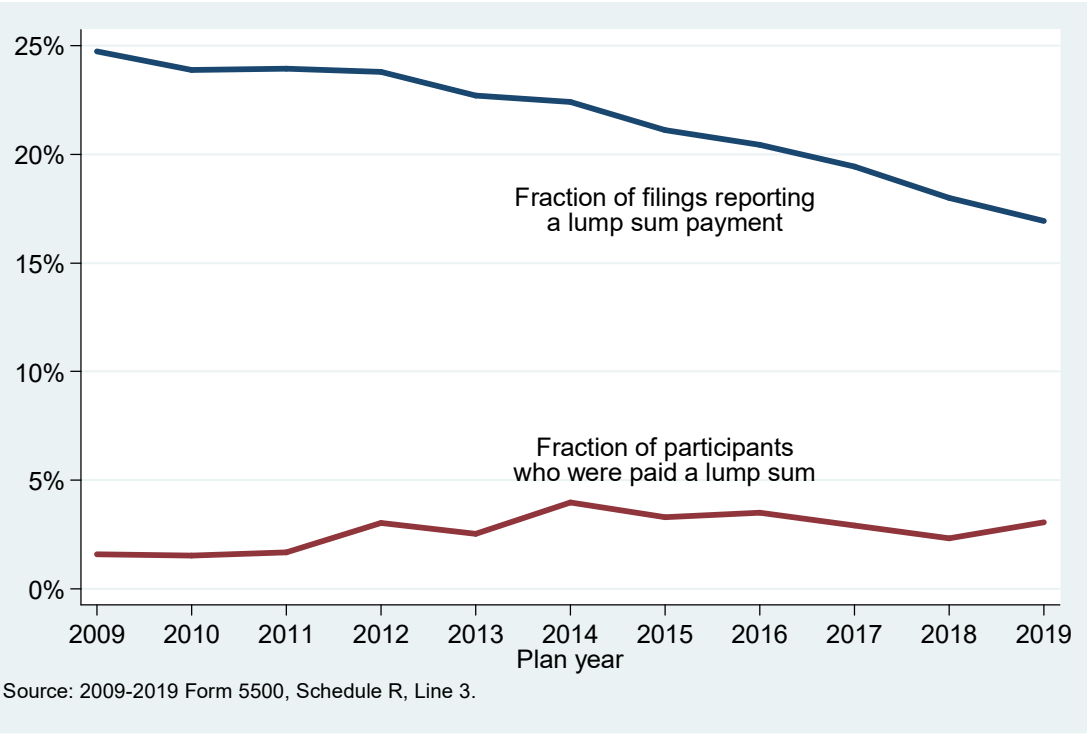
Schedule R, Line 3 asks about lump-sum distributions: "Number of participants (living or deceased) whose benefits were distributed in a single sum, during the plan year." Unfortunately, the question is not restricted to payments as part of a lump-sum window.

[5] This report uses Form 5500 filings as retrieved from the DOL website on 1/4/2021.

Instead, plans may report any participants whose entitlements were distributed in a lump-sum payment, including small payments under mandatory cash out provisions.

The blue line on Figure 3 shows the fraction of single-employer plan filings that reported making a lump-sum payment to one or more participants during the plan year.[6]

Figure 3. Fraction of Single-Employer Plan Filings Reporting Making a Lump-Sum Payment and the Aggregate Fraction of Participants Paid



Source: 2009-2019 Form 5500, Schedule R, Line 3.

The incidence of lump-sum payments has been decreasing over time, from 24.5% in 2009 to 16.9% in 2019. While plans that reported lump-sum payments were a minority of all plans, they covered 87.4% of all participants. Even in 2019, when only 16.9% of plans made lump-sum payments, those plans covered 90.6% of all participants. Many plans offer a lump-sum option to certain participants on a continuous basis (versus a one-time window), which may drive the high fraction of filings that reported making lump-sum payments.

The red line shows the number of participants who were paid a lump sum as a fraction of the total number of participants in all single-employer plans at the beginning of the plan year. The fraction affected participants grew from 1.6% in 2009 to 4.0% in 2014 and 3.1% in 2019.

[6] Our analysis includes all single-employer plans that were covered by PBGC, as inferred from the presence of a matching Premium Filing. It excludes a small number of filings that reported lump-sum payments to more participants than were in the plan at both the beginning and the end of the plan year.

Annuity Buy-Outs

Insofar we are aware, there are no questions on the Form 5500 that ask directly about annuity buy-outs. However, Schedule SB, Lines 14 and 15 may offer indirect evidence. Line 14 asks for the Funding Target Attainment Percentage (FTAP) and Line 15 for the Adjusted Funding Target Attainment Percentage (AFTAP). FTAP is calculated as the ratio of (1) assets minus credit balances (and minus interest on credit balances if the valuation date is not the start of the reporting period) and (2) liabilities (funding target). The Schedule SB instructions explain how AFTAP differs from FTAP:

> The AFTAP is calculated in the same manner as the FTAP reported in line 14, except that both the assets and the funding target used to calculate the AFTAP are increased by the aggregate amount of purchases of annuities for employees other than highly compensated employees (as defined in Code section 414(q)) which were made by the plan during the preceding two plan years.

In addition, AFTAP does not require fully funded plans to reduce assets with credit balances in the numerator.

The FTAP and AFTAP questions have been asked since the introduction of Schedule SB in plan year 2008. Our analysis indicated that on average from 2009 to 2019, AFTAP differs from FTAP on 27% of Schedules SB, suggesting that an annuity may have been purchased during the preceding two plan years. (This fraction excludes fully funded plans whose FTAP and AFTAP differed solely because AFTAP does not require reducing the numerator by credit balances.) Weighted by number of plan participants, the average incidence of a difference is 8%. Because AFTAP may reflect annuity purchases over the preceding two plan years, the incidence of annuity purchases may be roughly one-half of those rates.

In principle, the amount of annuity purchases may be derived from the reported FTAP, AFTAP, and other Schedule SB entries.

$$FTAP = \frac{A - B}{L} \quad , \tag{1}$$

where A denotes actuarial assets, B credit balance (increased with interest, if applicable), and L liabilities (funding target). AFTAP is calculated by increasing the numerator and denominator by the amount of annuity purchases, X, while ignoring the credit balance for fully funded plans:

$$AFTAP = \begin{cases} \dfrac{A - B + X}{L + X} & \text{if underfunded } (A < L) \\ \dfrac{A + X}{L + X} & \text{if fully funded } (A \geq L) \end{cases} . \tag{2}$$

It follows that the amount of the annuity purchase was:

$$X = \begin{cases} \dfrac{L(FTAP - AFTAP)}{AFTAP - 1} & \text{if underfunded} \\ \dfrac{L(FTAP - AFTAP) + B}{AFTAP - 1} & \text{if fully funded} \end{cases} . \quad (3)$$

We attempted to calculate the amount of annuity purchases based on equation (3). The calculated annuity amount was zero for 72.4% of filings, positive for 16.2%, negative for 11.2%, and indeterminate for 0.2%. Negative annuity amounts are difficult to explain.[7] Rounding errors may play a role, but most negative amounts were sizeable both in absolute terms and relative to liabilities. Negative amounts were less prevalent among larger plans: weighted by number of participants, only 2.2% of implied annuity amounts were negative. Still, the results suggest that the reported FTAP and AFTAP were internally inconsistent in a large number of cases. We therefore do not see promise in pursuing the difference between FTAP and AFTAP as a basis for detecting and measuring annuity purchases.

PBGC Comprehensive Premium Filings

Lump-Sum Windows and Annuity Buy-Outs

Single-employer plans whose benefits are insured by PBGC need to annually submit a Premium Filing to calculate their insurance premium due.[8] Since plan year 2015, the Premium Filing form has included questions on risk transfers—see Figure 4.[9]

[7] We considered the possibility that an annuity purchase reduces assets by more than liabilities because of a premium charged by the insurance company. In that case, the denominators of equation (2) would be less than L+X. However, a denominator of, for example, L+0.8X would imply even more negative annuity purchase amounts. Also, the implied annuity amounts are sensitive to the (unknown) ratio of assets spent to liability transferred.

[8] PBGC provided us with electronic databases with 2009–2019 premium filings, most recently updated on June 5, 2020. It contains 279,212 filings of 47,019 unique single-employer plans.

[9] The 2015 form asked lump-sum questions separately for not-in-pay and in-pay participants. Only 61 plans reported offering a lump-sum window to in-pay participants, compared with 934 that offered lump-sum payments to not-in-pay participants. The analysis below combines the two categories for 2015. The questions in 2016 and later years do not distinguish between not-in-pay and in-pay participants.

Figure 4. Risk Transfer Questions on the 2018 PBGC Comprehensive Premium Filing

18. Risk transfer activity – Do not complete this item if this is the last filing for this plan

a Lump Sum Windows: If the plan provided one or more Lump Sum Windows during the time period described in the instructions, report the number of persons eligible to elect a lump sum under any such window and the number who elected a lump sum:

(1) Persons eligible to elect lump sum _____

(2) Persons who elected lump sum _____

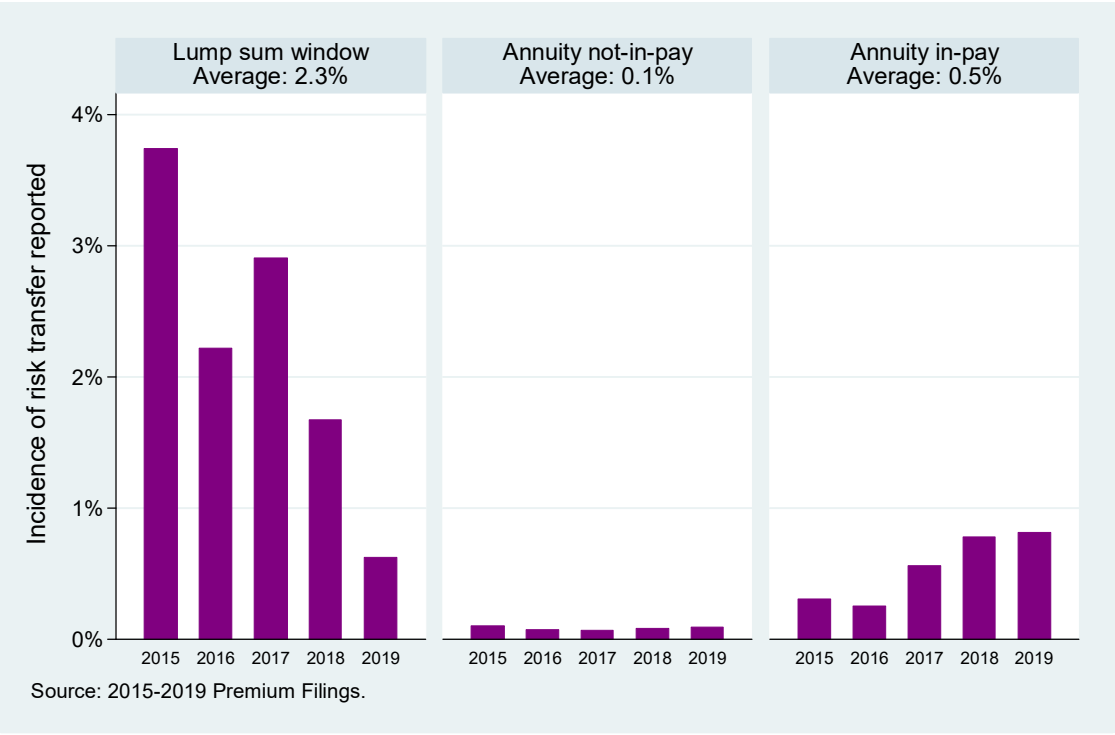
b Annuity purchases: If, during the time period described in the instructions, the plan purchased annuities for a group of people, report the number of persons for whom an annuity was purchased:

(1) Persons not in pay status when annuity was purchased: _____

(2) Persons in pay status when annuity was purchased: _____

For each plan year, Figure 5 shows the fraction of plans that reported having (1) offered a lump-sum window, (2) purchased an annuity for not-in-pay participants, or (3) purchased an annuity for in-pay participants. Lump-sum windows were offered by between 3.7% of plans in 2015 and 0.6% of plans in 2019. Purchases of annuities for not-in-pay participants were reported by only 0.1% of plans in 2015–2019. Annuities for in-pay participants were more common, increasing from 0.3% in 2015 to 0.8% in 2019.

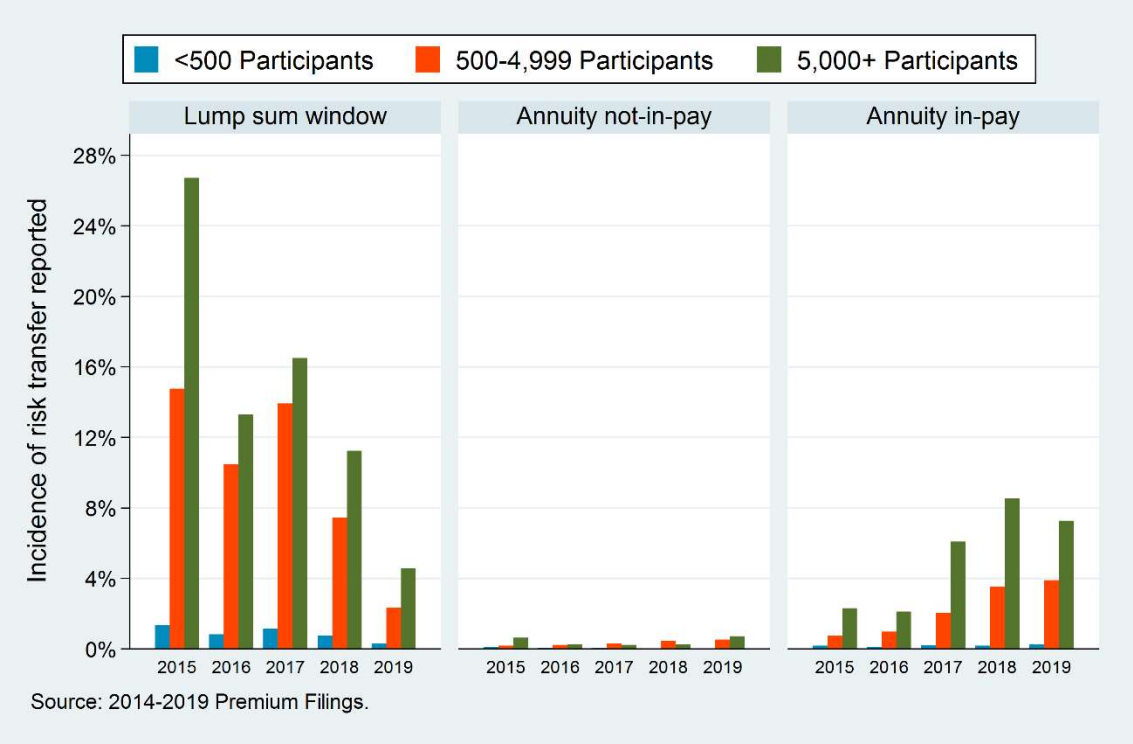
Figure 5. Fraction of Plans Reporting Lump-Sum Windows or Annuity Buy-Outs, by Type of Activity and Plan Year



To explore the relationship between risk transfers and their potential determinants, the figures below show reports of risk transfer activities by various potential determinants. Time-varying determinants are lagged by one year, in part because it is our understanding that modeling risk transfers in SE-PIMS requires explanatory factors to be lagged.

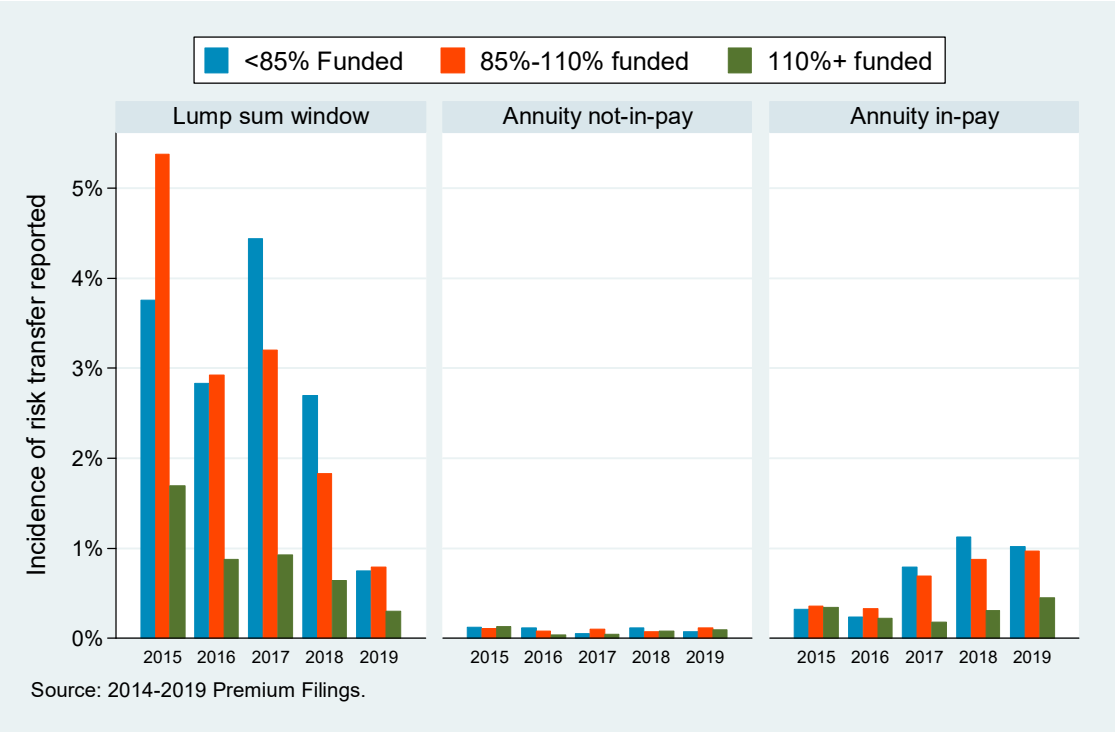
- Figure 6 shows that reports of lump-sum windows and annuity buy-outs are far more common among large plans than among smaller plans.
- Perhaps counterintuitively, Figure 7 indicates that plans funded 110% or better (as determined by assets and liabilities on Premium Filings) reported fewer partial risk transfers than less well-funded plans. While year-by-year results vary, plans that were less than 85% funded reported lump-sum windows and annuity buy-outs at roughly the same rates as plans that were 85%–110% funded.[10]
- Figure 8 demonstrates that plans in the Construction and Retail sectors were less likely to transfer risks than plans in other sectors.
- Figure 9 illustrates that plans that are closed to new participants are substantially more likely to offer lump-sum windows or purchase annuities than plans that are not frozen.

Figure 6. Fraction of Plans Reporting Lump-Sum Windows or Annuity Buy-Outs, by Type of Activity, Plan Year, and Lagged Number of Plan Participants



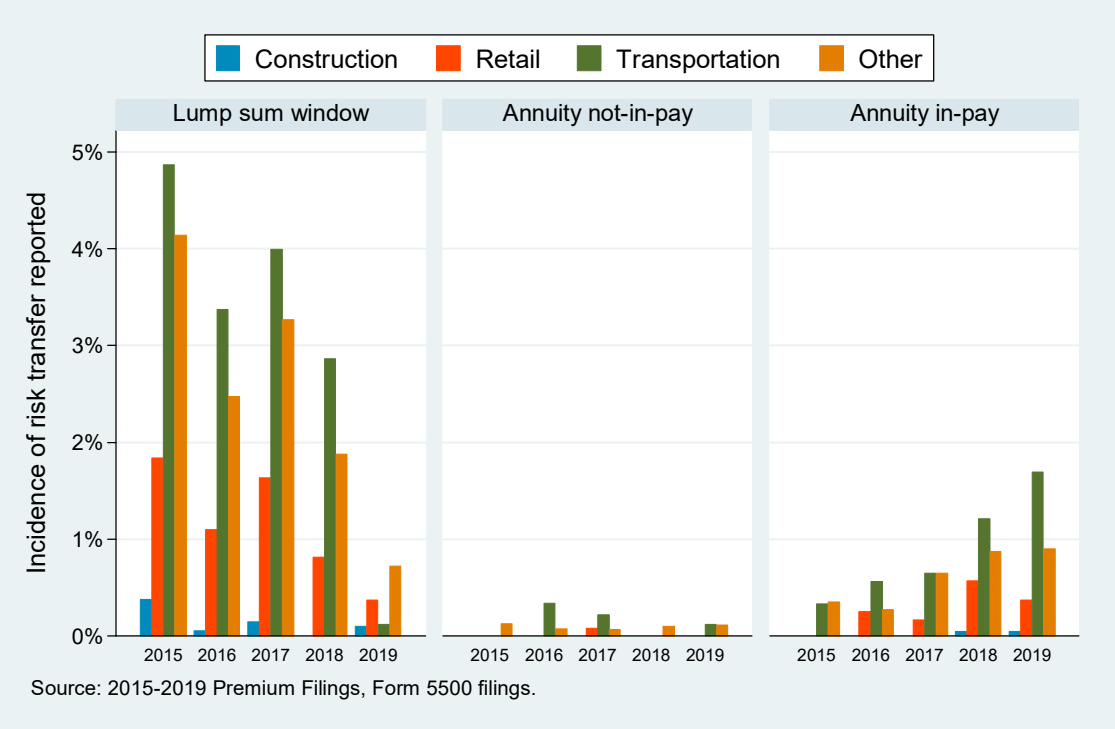
[10] While poorly funded according to their Premium Filings, most plans engaged in large risk transfers reported an adjusted funding target attainment percentage (AFTAP) above 80% on their Form 5500 filings.

Figure 7. Fraction of Plans Reporting Lump-Sum Windows or Annuity Buy-Outs, by Type of Activity, Plan Year, and Lagged Funded Status



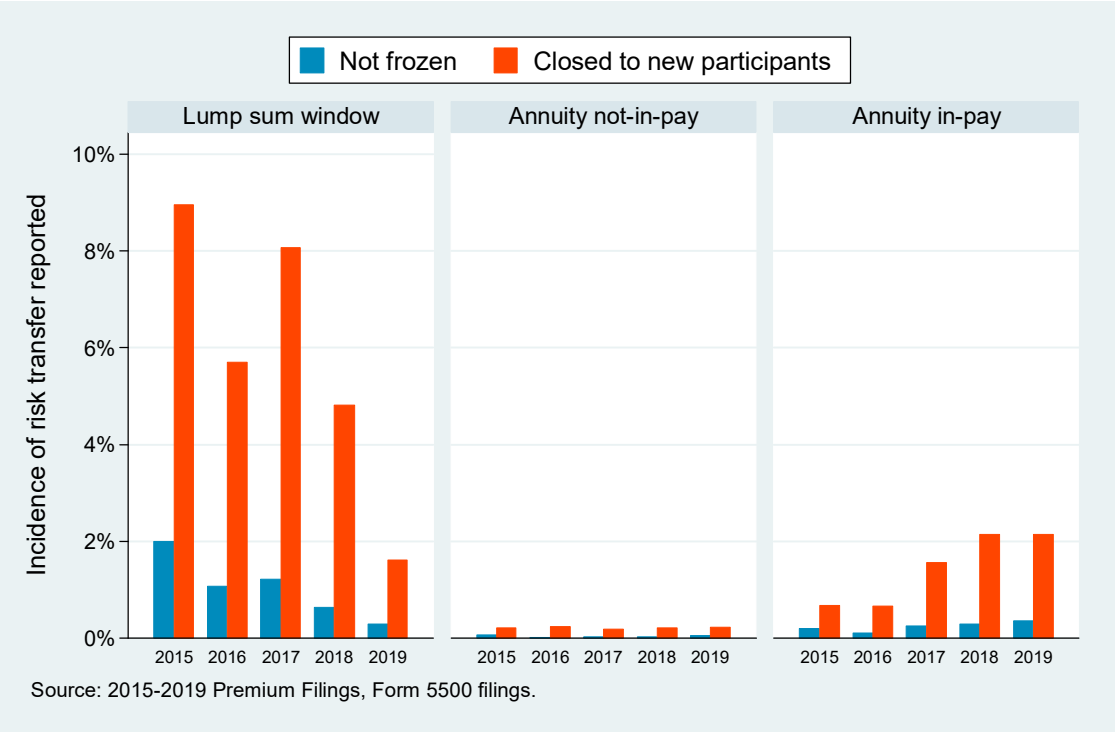
Source: 2014-2019 Premium Filings.

Figure 8. Fraction of Plans Reporting Lump-Sum Windows or Annuity Buy-Outs, by Type of Activity, Plan Year, and Industry Sector



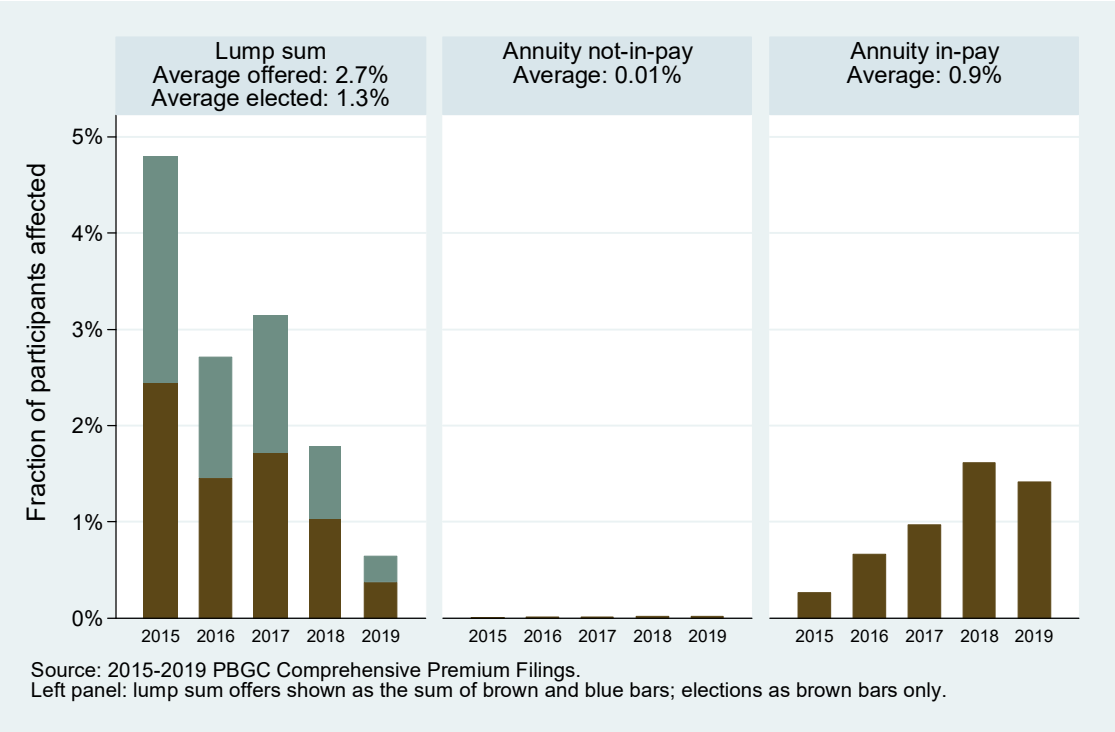
Source: 2015-2019 Premium Filings, Form 5500 filings.

Figure 9. Fraction of Plans Reporting Lump-Sum Windows or Annuity Buy-Outs, by Type of Activity, Plan Year, and Participant Freeze



The above figures considered only the incidence of reported risk transfer activities, without taking into account the number of participants involved. Figure 10 shows the number of participants involved, as a fraction of the total number of participants reported on Premium Filings. (The fractions are defined as the ratio of the sum of participants involved in a risk transfer activity and the sum of all participants, regardless of whether the plan reported any risk transfer activity.) Lump-sum windows were offered to between 4.8% of participants in 2015 and 0.6% in 2019; the acceptance rate was roughly one-half. The number of not-in-pay participants for whom an annuity was purchased was negligible compared to total participants, averaging just 0.01% in 2015–2019. The number of in-pay participants for whom an annuity was purchased ranged from 0.3% in 2015 to 1.6% in 2018.

Figure 10. Fraction of Participants Involved in Risk Transfer Activities, by Type of Activity and Plan Year



Source: 2015-2019 PBGC Comprehensive Premium Filings.
Left panel: lump sum offers shown as the sum of brown and blue bars; elections as brown bars only.

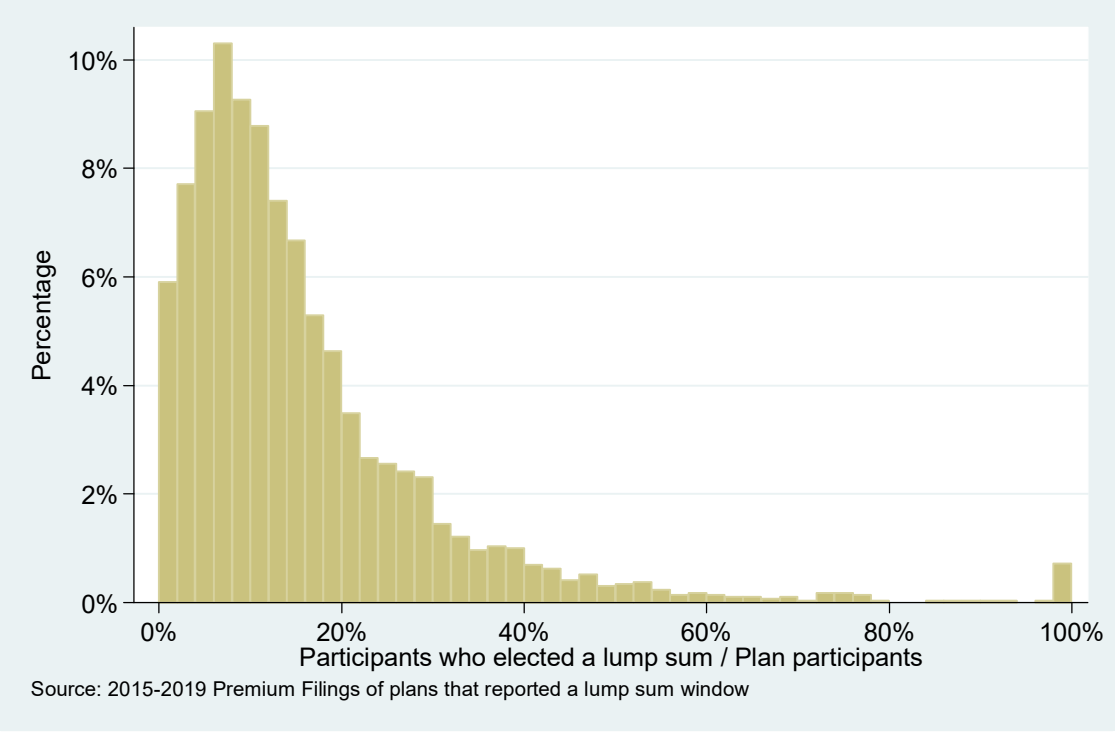
On average per year in 2015–2019, 1.3% of participants accepted a lump-sum offer and group annuity contracts were purchased for another 0.9% of participants. Given approximately 25 million participants in single-employer plans over this period, these fractions translate into roughly 320,000 and 240,000 participants per year, respectively.[11] This means that single-employer pension plans moved roughly 560,000 participants annually off their rolls. At the 2020 rate of $83 per participant per year, this implies a reduction in PBGC's flat-rate premium income of 560,000 x $83 = $46.5 million per year. This premium income loss continues in every future year in which the now-transferred participants would have remained in the plan. We do not know the expected remaining duration of participation. Purely for illustration and ignoring discounting, if participants would have remained in their plan for another 10 years, then PBGC's flat-rate premium income loss caused by a single year of risk transfer activity would be roughly $465 million. If risk transfers reduce participation by 560,000 participants every year, the loss in income to PBGC would thus be hundreds of millions of dollars annually. If variable-rate premiums (VRPs) paid by underfunded plans that are at the VRP cap are also taken into account, the loss of premium income to PBGC would be even higher.

Figure 10 indicates that roughly one-half of participants who were offered a lump sum accepted the offer. For the purpose of SE-PIMS projections, only these elections are relevant. For plans that reported a lump-sum window, Figure 11 shows the distribution of the number of participants who elected to accept a payment, as a percentage of total plan participants. In most cases (75%), between 0% and 20% of plan participants transferred

[11] For comparison, PBGC (2020a) documented risk transfers affecting 2,444,460 participants in 2015–2018, or approximately 611,000 participants per year.

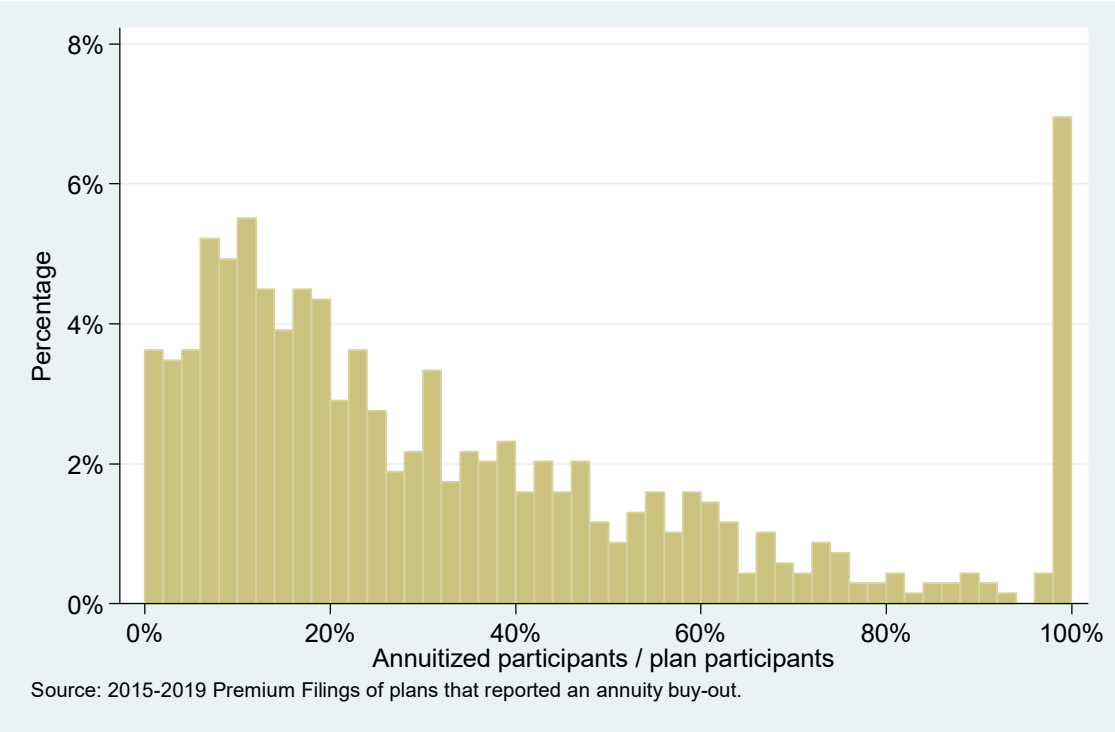
out of the plan through a lump sum payment. A small fraction of filings (0.6%) reported more lump sum acceptances than plan participants; these are depicted at 100%.

Figure 11. Distribution of the Number of Participants Who Elected a Lump-Sum Offer, as a Percentage of the Number of Plan Participants



Similarly, for plans that reported an annuity buy-out for in-pay participants, Figure 12 shows the distribution of affected participants, as a percentage of all plan participants. At 43% of plans that reported an annuity buy-out, between 0% and 20% of participants were affected. The bar at 100% suggests that 6.5% of plans reported annuitizing the benefits for at least as many participants as the plan reported having. However, the plan continued operating in almost all such cases, suggesting that the participant counts were subject to anomalies, such as due to plan mergers.

Figure 12. Distribution of the Number of Participants for Whom an Annuity Was Purchased, as a Percentage of the Number of Plan Participants



In conclusion, the results suggest that lump-sum windows have become less common from 2015 to 2019, which is consistent with lump-sum payments reported on Schedule R (see Figure 3).[12] However, the magnitudes of both the incidence of lump-sum payments and the numbers of participants affected differ greatly. For example, 16.9% of plans reported on Schedule R making lump-sum payments to participants in 2019, compared with just 0.6% on Premium Filings. The fraction of participants whose benefits were paid in a lump sum was 3.1% according to Schedule R and 0.6% (offered) or 0.3% (elected) according to Premium Filings. Part of the differences is due to the scope of the questions. The instructions to Schedule R ask for "the number of living or deceased participants whose benefits under the plan were distributed during the plan year in the form of a single-sum distribution." The scope of the question on Premium Filings is more restrictive. Among others, the instructions state:

- Disregard any Lump Sum Window for which the time period for electing a lump sum ended less than 60 days before the premium filing is made.
- Disregard any Lump Sum Window for which the requested information was reported in the premium filing for the prior premium payment year.
- Disregard lump sums offered:
  - In the course of routine plan operations,
  - In conjunction with a plan termination,
  - Upon a participant's separation from service, or

[12] The downward trend is also consistent with the IRS notice of 2015, which discouraged some forms of lump sums; see Section 2.

  - As part of an incentive program to encourage active participants to retire early (commonly called an early retirement window).
- Disregard lump sums paid under mandatory cash out provisions.

In particular, the exclusion of lump-sum payments made upon a participant's separation from service and under mandatory cash-out provisions may affect many participant payments. The exclusion of lump-sum payments offered on a routine basis, presumably captured in Schedule R but excluded from premium filing data, may also explain the lower lump-sum rates associated with the latter data source. The difference may be smaller in dollar terms, but unfortunately, neither the Schedule R nor Premium Filings present a full picture of lump-sum payment amounts.

In contrast to the declining trend in lump-sum payments, Figure 5 and Figure 10 indicate that annuity purchases for in-pay participants have generally become more common between 2015 and 2019. This trend is matched by external sources such as the quarterly LIMRA survey (see Figure 2 on page 6). However, the scope of annuity questions on Premium Filings is limited. The instructions state, among others:

- Disregard annuities purchases made less than 60 days before the premium filing is made.
- Disregard annuities purchases for which the requested information was reported in the premium filing for the prior premium payment year.
- Do not include annuity contracts:
  - Purchased in the course of routine plan operations,
  - Purchased in conjunction with a plan termination, or
  - That remain an asset of the plan (commonly called a "buy-in").

Importantly for our purposes, both lump-sum payments and annuity purchases reported on Premium Filings exclude any transactions "in conjunction with a plan termination." Another limitation is that Premium Filings do not document the amounts that plans spend on risk transfers.

Standard Terminations

We identified no information on lump-sum payments or annuity purchases in conjunction with standard terminations of plans. In a standard termination, PBGC does not assume any assets or liabilities. However, standard terminations can be important to PBGC and to SE-PIMS because they result in a loss of future premium income. It is our understanding that SE-PIMS currently assumes that plans exist (and pay premiums) until all participants are projected to have died. A standard termination accelerates the end date of a plan.

While little information is available, it may be assumed that terminating plans resolve their benefit obligations through lump-sum payments, annuity purchases, or a combination thereof. Both types of transactions migrate participants out of plans. Given that the main implication of standard terminations is a loss in premium income, it is not critical to understand whether a plan's obligations are resolved through lump-sum payments or annuity purchases. We therefore study standard terminations directly, rather than the related lump-sum windows or annuity purchases.

Standard terminations are readily identified in Premium Filings from Line 13, where plans can indicate that the current filing is their last filing because of a distribution pursuant to termination—see Figure 13.

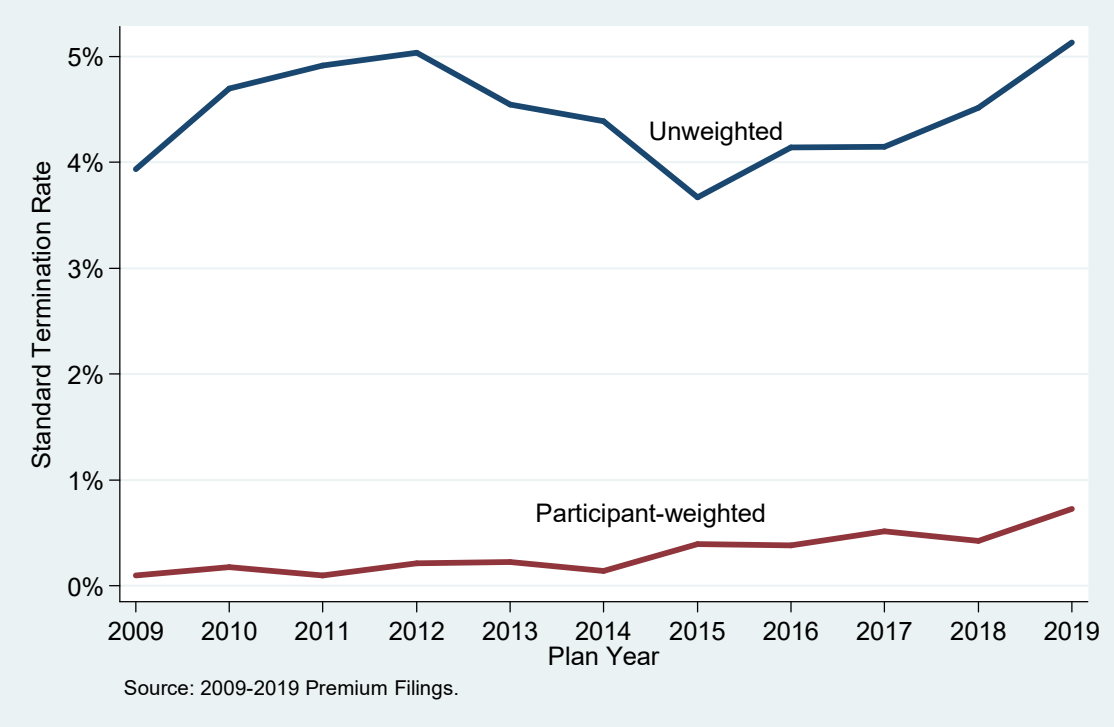
Figure 13. Final Filing Question on the 2018 PBGC Comprehensive Premium Filing

13. Final filing – If this is the last filing for this plan, enter the date of event __/__/____ and check box that best describes why filing obligation is ceasing:

- ❑ Merger/Consolidation
- ❑ Trusteeship
- ❑ Distribution pursuant to termination
- ❑ Cessation of covered status

The blue line in Figure 14 shows the fraction of plans that reported a standard termination, for plan years 2009 through 2019. The termination rate fluctuated between 3.7% and 5.1% without a general upward or downward trend, averaging 4.5% in 2009–2019. However, the trend was generally upward when weighted by plan participants, suggesting that the average size of terminating plans has grown. Terminating plans accounted for 0.1% of all plan participants in 2009 and that fraction grew to 0.7% in 2019.

Figure 14. Fraction of Plans That Reported a Standard Termination, by Plan Year



The termination rates in Figure 14 translate into between 31,000 and 158,000 participants per year, averaging more than 120,000 participants per year in 2015–2019. Above, on page 17, we noted that partial risk transfers reduced the number of participants in PBGC-covered plans by roughly 560,000 per year; standard terminations add roughly 120,000 per year to that figure. Each participant affected by a risk transfer results in potentially several years of lost premium income.

The figures below show unweighted termination rates by various potential determinants. As before, time-varying determinants are lagged by one year because modeling risk transfers in SE-PIMS may require explanatory factors to be lagged and because of the potential for reverse causality: plans may have reduced their size just prior to the final filing, and the final filing often does not report funded status (assets and liabilities).

- As anticipated from the rising participant-weighted termination rates in recent years, termination rates among large plans were roughly constant in 2010–2014 and subsequently increased to 1.7% in 2019; see the orange line in Figure 15.
- As displayed in Figure 16, fully funded plans terminated at higher rates than underfunded plans.
- Figure 17 indicates that, until 2015, plans in the Construction and Retail sectors terminated at higher rates than plans in other sectors, but the differences diminished or even reversed in recent years.
- Figure 18 demonstrates that plans that reported a benefit accrual freeze terminated at higher rates than plans that were not frozen.

Figure 15. Fraction of Plans That Reported a Standard Termination, by Plan Year and Lagged Plan Size

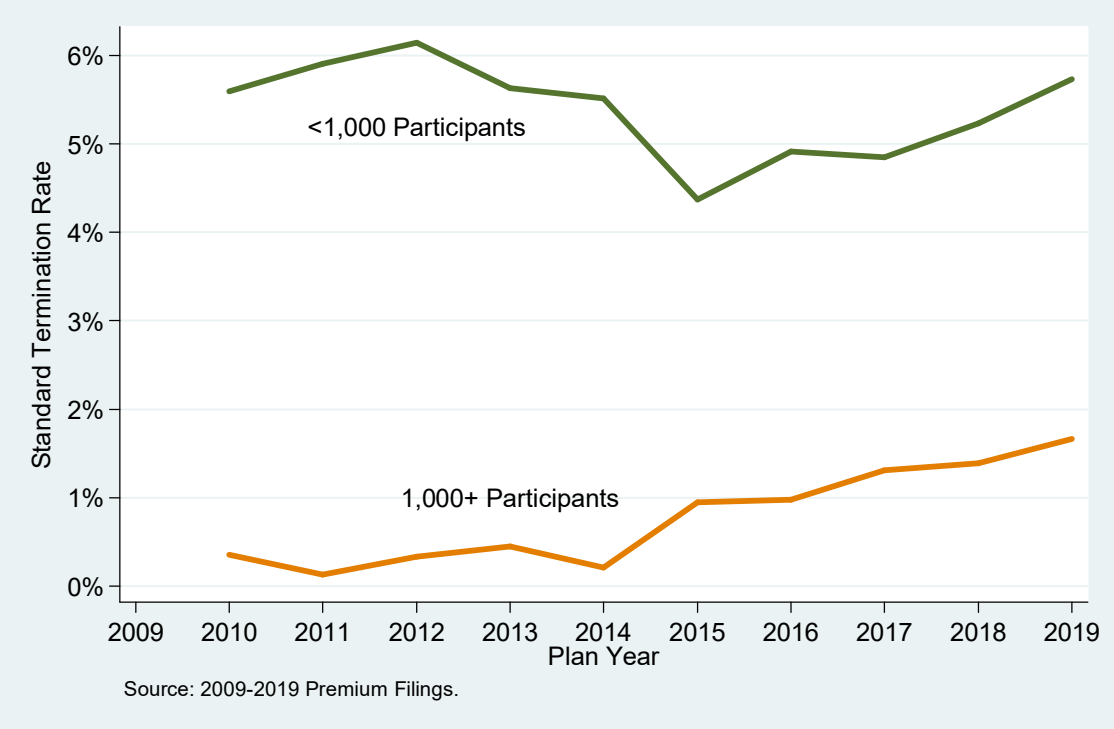
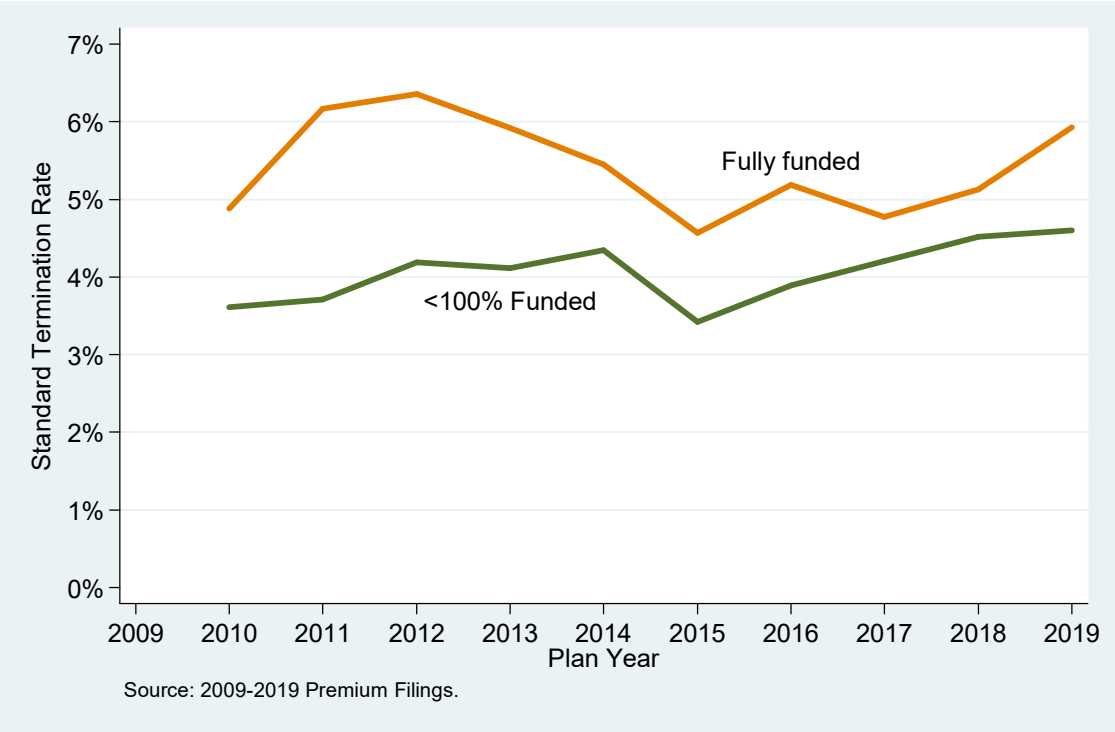
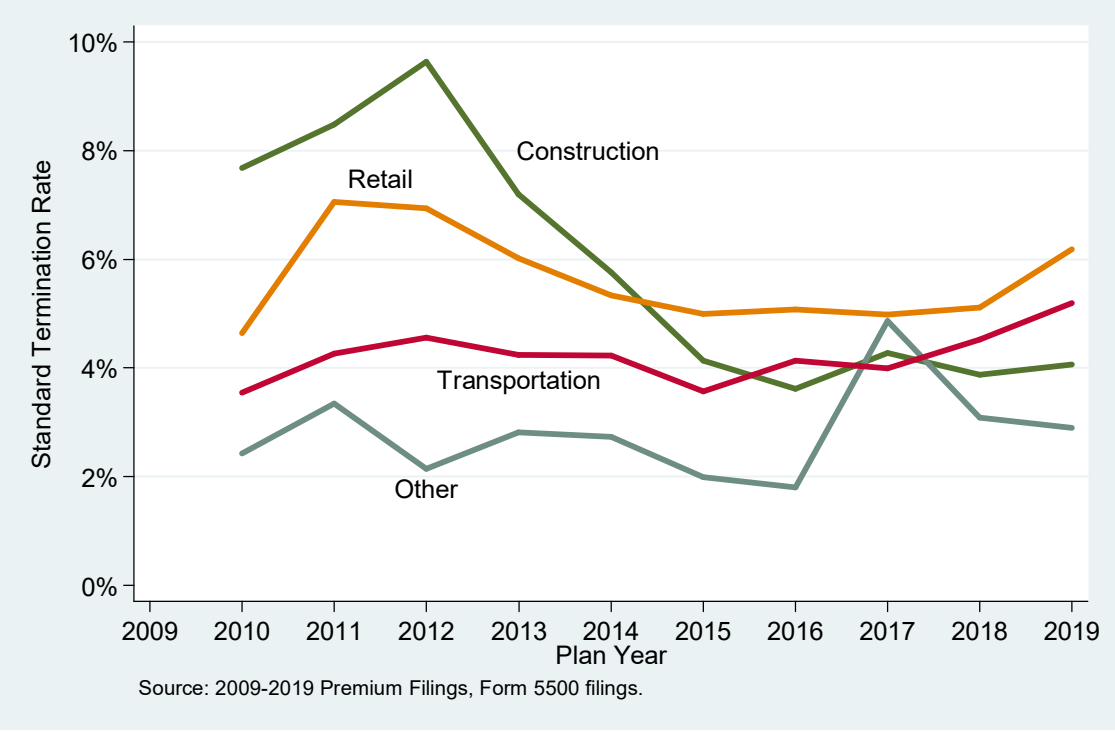


Figure 16. Fraction of Plans That Reported a Standard Termination, by Plan Year and Lagged Funded Status



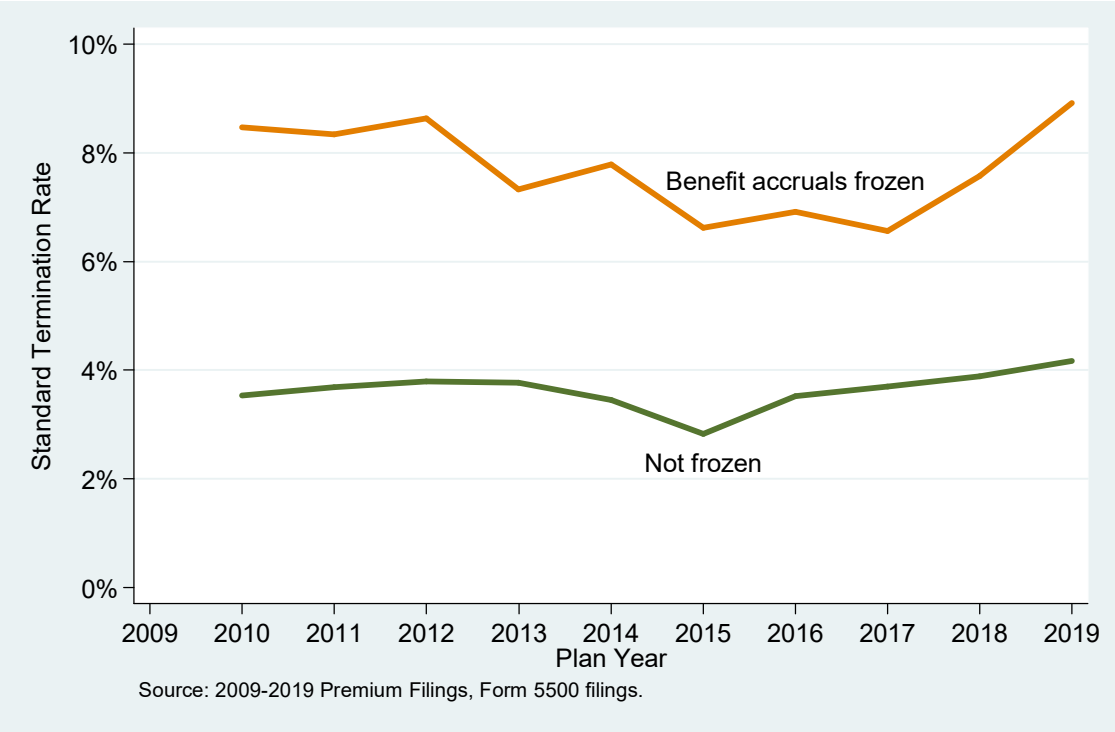
Source: 2009-2019 Premium Filings.

Figure 17. Fraction of Plans That Reported a Standard Termination, by Plan Year and Industry Sector



Source: 2009-2019 Premium Filings, Form 5500 filings.

Figure 18. Fraction of Plans That Reported a Standard Termination, by Plan Year and Accrual Freeze



4. POTENTIAL FACTORS AFFECTING RISK TRANSFERS

Multiple studies and memos identify factors that may have spurred and continue to drive pension risk transfer activities. Below, we discuss the most important factors.

Volatility

Pension plans are subject to changing inputs and assumptions that can affect a plan's earnings, assets, and liabilities.

Accounting standard changes by the Financial Accounting Standards Board (FASB) in 2006 required sponsors to recognize the mark-to-market values of assets and liabilities of their SE plans directly on their corporate balance sheet. By bringing the obligation, volatility and costs of the pension plan onto the balance sheet, this change impacted the sponsor's financial statements, financial performance, and executive compensation, and brought increased attention to the plan from management (Jones Day 2006). For example, responding to a company seeking permission from the IRS to offer a lump-sum window to its plan's participants, the IRS noted: "The Company represents that this volatility increases the cost of financing, makes cash flow management (including contributions to the Plans) more difficult, and makes the Company less competitive in the marketplace."[13]

[13] See https://www.irs.gov/pub/irs-wd/1228045.pdf.

The inputs or assumptions that contribute to volatility include:

Actuarial Changes: Even in well-funded plans, lower investment returns in a given year may create a large funding requirement that the sponsor may or may not be able to remedy and also affect its credit rating, access to capital and ability to borrow.[14]

Interest Rates: Interest rates play a major role in stirring volatility. The higher the interest rate, the lower the present value of future payments and vice versa. For example, a sensitivity analysis in Boeing's 10-K report shows that an increase and decrease of 25-basis-points in the discount rate used for valuing its pension plans would change its liabilities by $2.1 billion and $2.6 billion respectively (P&I Online 2012).

Regulatory changes have also affected interest rates and thus, volatility. The effect that interest rate changes, brought upon by regulation, have on plan de-risking is well demonstrated by the increased de-risking activity seen in 2012, the first year for full phase-in of corporate bond rates for lump-sum calculations (shown in Figure 2). Also, the IRS allowed sponsors to select an interest rate from up to 17 months prior to the month of the lump-sum offer ("lookback rate"). In 2012, as interest rates were declining, this rule allowed plans to offer lower lump-sum payments by looking back to higher rates from as early as August 2011. Separately, a lookback period reduces volatility because permissible interest rates change less frequently.

The GAO examined 11 packets of information materials provided by sponsors that offered lump sums in 2012. It noted that "[o]f the 11 sponsors whose information packets [GAO] examined, all sponsors who disclosed the interest rates used for the lump-sum calculations had used sponsor-favorable "lookback" interest rates from between 11 and 16 months prior to the lump sum payment date" (GAO 2015, p. 20).

Mortality Assumptions: Plan liabilities are also affected by the mortality tables that are published by the IRS. As life expectancy of participants increases, mortality tables have been updated in every decade and increased pension liabilities. (Recent decreases in life expectancy illustrate that mortality assumptions may change plan liabilities in either direction.)

Restructuring: Particularly in declining industries, restructuring may leave the sponsor much smaller in terms of revenue or market capitalization. A large pension obligation compared to revenues may induce significant volatility in the sponsor's financials.

For example, as of August 2012, General Motors had $134.2 billion in worldwide pension obligations, underfunded by $25.4 billion, while its market capitalization was only $30.7 billion (P&I Online 2012). Volatility was cited as one of the reasons why General Motors embarked on a de-risking strategy in 2012 (ERISA Advisory Council 2013).

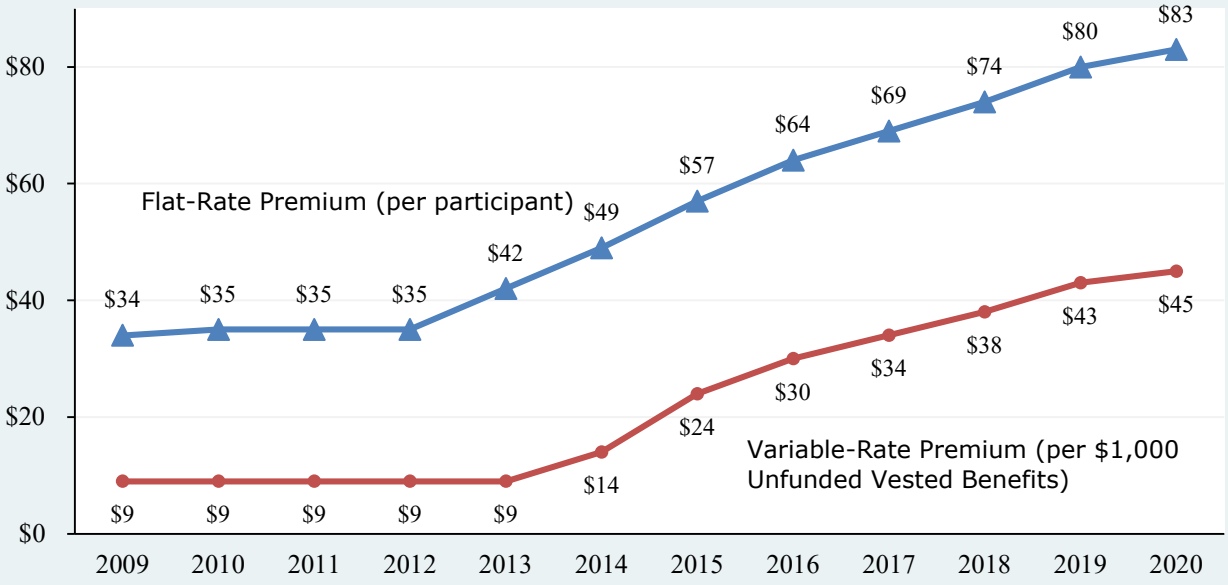
[14] "Moody's makes standard adjustments in its use of financial statements to treat pension obligations as being debt-like since these liabilities represent a commitment for a future use of cash.", from https://www.moodys.com/research/Moodys-Recent-spike-in-corporate-pension-deficits-is-expected-to--PR_328750.

Savings to the Sponsor

Risk transfers reduce the size of the plan in terms of participants and liabilities. A decline in participants also eliminates some per-participant costs.

PBGC Premiums: Numerous reports and written testimony cite PBGC premiums as a factor in a sponsor's choice to de-risk. Between 2012 and 2020, flat-rate premium rates more than doubled from $35 to $83 per participant and variable-rate premium (VRP) rates quintupled from $9 to $45 per $1,000 unfunded vested benefits (UVB). Premiums owed are based in part on the number of participants. Reducing the number of participants therefore has a direct impact on plan costs.

Figure 19. PBGC Premium Rates, 2009-2020



Source: https://www.pbgc.gov/prac/prem/premium-rates

Underfunded plans pay both the flat-rate premium per participant and a variable-rate premium (VRP) that is tied to the magnitude of unfunded vested benefits (UVB).[15] If risk transfers reduce assets and liabilities by approximately the same amount, UVB does not change much. However, VRPs are subject to a cap of $561 per participant in 2020. Therefore, an underfunded plan that is subject to the cap and capable of de-risking can save on both flat-rate premiums and variable-rate premiums and thus has an additional incentive to engage in a risk transfer.

Other Per Participant Costs: A pension risk transfer also lowers or eliminates administrative costs associated with tasks such as investment management, actuarial design, recordkeeping, communication and regulatory compliance. Prudential (2016) estimated that plans incur about $40 in annual costs related to participant servicing and plan administration.

[15] https://www.pbgc.gov/about/factsheets/page/premiums.

Reduced Benefits: Certain supplemental benefits that are available within a plan can be excluded when calculating a lump-sum payment. These benefits include a) subsidized early retirement benefits b) subsidized joint-and-survivor benefits and c) supplemental early retirement benefits. A lump-sum payment calculation may not have to account for these plan-specific benefits (GAO 2015).

Other Factors

Funding Levels: The PPA incentivized plans to become better funded by shortening the amortization of any funding shortfall from 30 to 7 years and by restricting plans that are funded less than 80% from offering lump-sum payments. These regulatory changes led to an increase in contributions and put sponsors in a position to offer relatively inexpensive lump sums.

Plan May Not Support Its Sponsor's Current Mission: Mergers and acquisitions may result in pension costs associated with separated, vested participants who have never been directly associated with the eventual successor company and plan sponsor. This legacy risk becomes hard to justify to shareholders when the pension plan is substantially focused on non-current employees.

5. POTENTIAL MODELING FRAMEWORK

Overview

This section presents potential approaches to project (1) lump-sum windows, (2) group annuity purchases, and (3) standard terminations in SE-PIMS. The models are based on econometric estimates of the three types of risk transfer activities in recent years.

Lump-sum windows can be offered at any time, potentially multiple times per year. They are reported annually on a consolidated basis. We propose to model these transactions as annual outcomes on (1) whether a lump-sum window is offered and (2) how many participants will elect a payment. The plan sponsor decides on the number of participants to whom an offer is made, but for projection purposes only the number of participants who accept the offers matter. We propose to model lump-sum windows with an annual logit for whether offers are made, and, conditionally on an offer, the number of acceptances with a continuous model of the number of acceptances as a fraction of total plan participants. On the financial side, we propose to reduce assets and liabilities in accordance with average discounts/premiums, discussed above.

Very few plans reported purchasing group annuities for not-in-pay participants. We propose that SE-PIMS ignore such risk transfers.

Like lump-sum windows, annuity buy-outs for in-pay (retired) participants can occur at any time and potentially multiple times per year. We propose a model structure that is similar to that of lump-sum windows: an annual logit for whether to purchase a group annuity and, conditionally on a purchase, a continuous model for the ratio of affected participants to total participants. Assets and liabilities may be reduced in accordance with average amounts and discounts/premiums, discussed above.

A standard termination may be viewed as an annual decision by the plan sponsor to continue or terminate the plan. We propose a logit model to capture these annual binary decisions. Once a plan is projected to be terminated, it cannot be resumed.

Lump-Sum Windows

We propose to model lump-sum windows with an annual logit for whether offers are made, and, conditional on an offer, the number of acceptances with a continuous model of the number of acceptances as a fraction of total plan participants.

Table 4 shows parameter estimates of logit models of lump-sum window offers.[16] Standard errors are printed in parentheses and asterisks highlight statistically significant estimates. The first column is illustrative of exploratory attempts to control for a variety of factors. For example:

- *Cash balance plan*. Plans with a cash balance feature were less likely to offer lump-sum windows than other plans. We are unaware of any plausible theoretical foundation for this finding.
- *Marginal VRP rate*. Higher marginal VRP rates appear to discourage lump-sum windows, which is counterintuitive.
- *VRP capped*. No statistically significant effect was found of being at the VRP cap.
- *Offered lump-sum window last year*. An indicator for whether the plan offered a lump-sum window in the previous year was associated with a higher probability in the current year. A negative coefficient could have suggested that plans tend to wait a while before offering another lump-sum window. Instead, the result suggests persistency in lump-sum offers. We rejected this variable because of concerns that it may cause longer-term projections to go "off the rails" in the sense that some plans would be projected to become ever more likely to offer lump-sum windows.
- *30-Yr Treasury yield*. Higher yields on 30-year Treasury bonds appear to encourage lump-sum windows. An increase of 1 percentage point (0.01) elevates the propensity to offer a lump sum by about 0.49. However, while higher interest rates lower the cost of lump-sum payments, they also lower liabilities, and it is unclear whether lump sums become more advantageous to plans when interest rates rise. The parameter estimate may instead reflect a time trend because lump-sum windows became less common while the Treasury yield decreased in recent years. Separately, we hesitate to recommend projections based on the Treasury yield because it moved in a narrow range during the period on which risk transfer models are estimated. The yield ranged from 2.2% to 3.8% over the estimation period, and extrapolating results to periods with potentially much higher yields would be subject to much uncertainty.

[16] Formally, the logit model may be written as: $P(L_{it} = 1) = 1/\left(1 + exp(-\beta' X_{it})\right)$, where $P(L_t = 1)$ is the probability that plan i will offer a lump-sum window in year t, β is a vector of model parameters, and X_{it} represents a vector of explanatory variables. Explanatory variables may be time-invariant or time-varying; to support projections in SE-PIMS, all time-varying variables are lagged by one year. The term $\beta' X_{it}$ is known as the logit propensity; higher values correspond to higher lump-sum offer probabilities.

Table 4. Logit Estimates of Lump-Sum Windows

	Exploratory	Preferred
Cash balance plan	-0.3961 ***	
	(0.0589)	
Marginal VRP rate	-3.7242 *	
	(2.2548)	
VRP capped	-0.0066	
	(0.0869)	
Offered lump-sum window last year	0.2890 ***	
	(0.0714)	
30-Yr Treasury yield	48.7668 ***	
	(4.9289)	
Participant freeze	0.2246 ***	0.2281 ***
	(0.0462)	(0.0462)
Terminated/total participants	1.6727 ***	1.7303 ***
	(0.1353)	(0.1328)
Retired/total participants	1.0049 ***	1.1392 ***
	(0.1105)	(0.1067)
Funded<75%	0.1175	0.1091
	(0.1148)	(0.0954)
75%<=Funded<85%	0.4818 ***	0.4436 ***
	(0.1010)	(0.0830)
85%<=Funded<95%	0.5602 ***	0.5208 ***
	(0.0989)	(0.0818)
95%<=Funded<110%	0.4294 ***	0.4163 ***
	(0.0825)	(0.0802)
Piecewise-linear in log(participants); see text		
— from 1 to 20 participants	0.4804 ***	0.4497 ***
	(0.1470)	(0.1465)
— from 20 to 200 participants	1.1228 ***	1.1589 ***
	(0.0644)	(0.0641)
— from 200 to 2,000 participants	0.4748 ***	0.4614 ***
	(0.0299)	(0.0295)
— over 2,000 participants	0.1738 ***	0.1411 ***
	(0.0269)	(0.0263)
Intercept	-9.9252 ***	-8.5472 ***
	(0.4164)	(0.3831)
Observations	108,837	108,837
Pseudo R-Squared	0.2581	0.2512

Standard errors in parentheses.
Significance: *=10%, **=5%, ***=1%.

The second column shows our preferred specification.

- *Participant freeze*. Plans that are closed to new entrants were more likely to offer lump-sum windows. The effect of a participant freeze was stronger than that of an accrual freeze (not shown).[17]

[17] A potential issue is that freeze status is time-varying and not projected in SE-PIMS. Relying on freeze status at the beginning of the projection period may understate lump-sum windows in outer projection years.

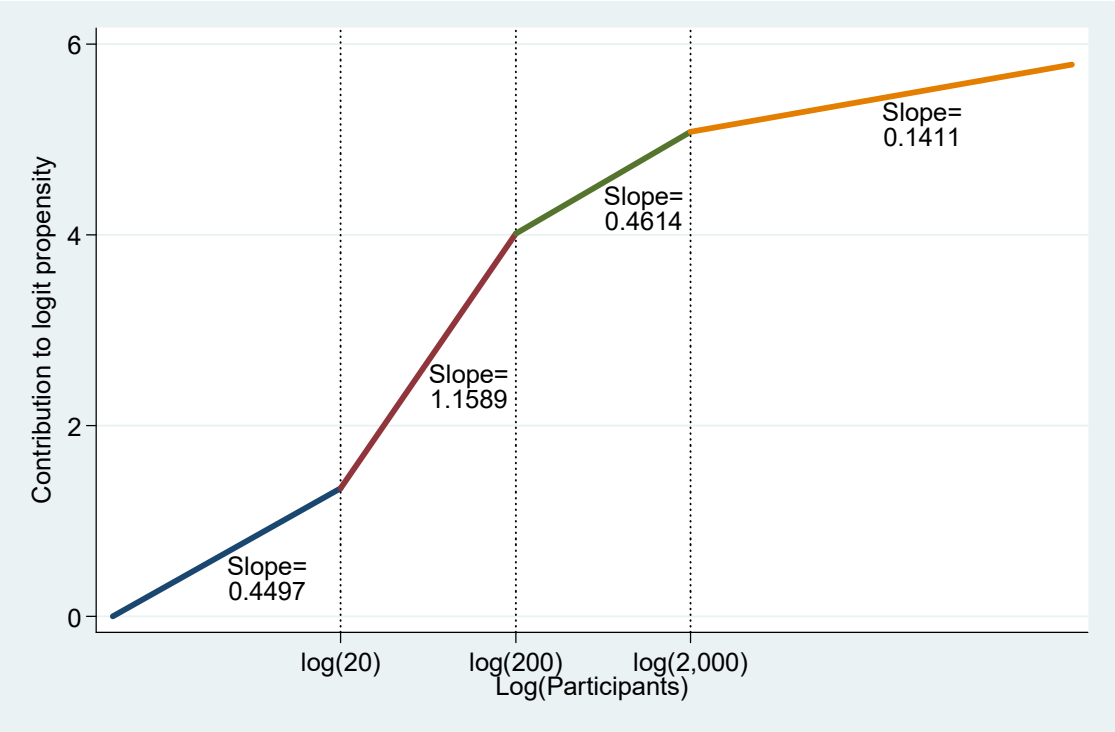
- *Terminated/total participants*. The fraction of total participants who are terminated is positively related to the probability that a plan offers a lump-sum window. An increase of 10 percentage points (0.10) elevates the logit propensity by about 0.173.
- *Retired/total participants*. Similarly, the fraction of total participants who are retired is positively related to the probability that a plan offers a lump-sum window. An increase of 10 percentage points (0.10) lifts the logit propensity by about 0.114.
- *Funded status*. Indicator variables for plan funding categories show that plans that are between 75% and 110% funded are more likely to offer a lump-sum window than plans outside that funding range.
- *Number of participants*. Larger plans tend to be more likely to offer a lump-sum window than smaller plans. The model captures plan size through piecewise-linear effects in the natural logarithm of plan participants, with bend points at log(20), log(200), and log(2,000) participants. Figure 20 illustrates the estimated effect of plan size on plans' propensity to offer a lump-sum window.[18] All four slopes are positive, i.e., the larger the plan, the more likely it is to offer a lump-sum window. However, the rates at which the propensity increases vary. Above 20 participants, the propensity increases at a decreasing rate.

[18] The logit model guarantees that the average in-sample predicted probability matches the average rate in the analysis data (2.16%), but the predicted participant-weighted rate—of critical importance to SE-PIMS—need not match the rate in the analysis data. Highly flexible controls for plan size are therefore essential to accurate projections. With piecewise-linear controls in the natural logarithm of the number of participants, the average predicted participant-weighted termination rate was 15.4%, which is close to the rate in the data (14.9%). The four segments, known as a piecewise-linear spline transformation, are defined as follows:

$$\begin{aligned}
\text{From 1 to 20 participants} &= \min(\log(N), \log(20)) \\
\text{From 20 to 200 participants} &= \max(\min(\log(N)-\log(20), \log(200)-\log(20), 0) \\
\text{From 200 to 2,000 participants} &= \max(\min(\log(N)-\log(200), \log(2000)-\log(200), 0) \\
\text{Over 2,000 participants} &= \max(\log(N)-\log(2000), 0),
\end{aligned}$$

where N denotes number of participants. Piecewise-linear spline transformations are highly flexible because they can approximate any nonlinear pattern. We explored capturing plan size effects through up to seven indicator variables, but the predicted participant-weighted rates failed to approximate the actual rate.

Figure 20. Estimated Effect of Plan Size on the Propensity to Offer a Lump-Sum Window



In-sample predictions based on this model range from a predicted lump-sum window probability of 0.02% for very well-funded plans that are not frozen and cover just one participant who is active to 32.3% for a very large frozen plan (about 143,000 participants) that is 120% funded and has mostly terminated (68%) and retired (26%) participants.

Conditional on offering a lump-sum window, the model needs to project the number of participants who accept a lump-sum payment.[19] As shown in Figure 11 (page 18), the distribution of the ratio of affected participants to total participants is bell-shaped but truncated on the low end at 0%. (Theoretically, it is also truncated on the high end at 100%, but the upper truncation is rarely binding.) The first column of Table 5 shows parameter estimates of a truncated normal regression model.[20] The main findings are:

- *Terminated/total participants*. The more terminated participants, as a fraction of total participants, the higher the fraction of participants who accepted a lump-sum payment.
- *Retired/total participants*. Similarly, the more retired participants as a fraction of total participants, the higher the fraction of participants who accepted a lump sum.

[19] To test the hypothesis that unobserved factors may affect both the decision to offer a lump-sum window and the affected share of participants, we estimated a Heckman (1979) selection model. The correlation between the selection and share residuals was small and statistically insignificant, suggesting that the selection and share equations may be estimated separately.

[20] The truncated normal regression model is described in, among others, Greene (2000). The model is available in SAS as `proc qlim` and in Stata as `truncreg`.

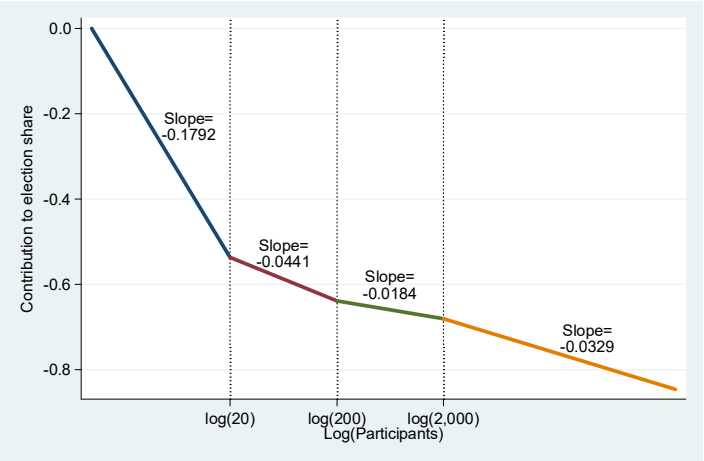
- *Offered lump-sum window last year*. Plans that offered a lump-sum window in the previous year experienced fewer participants who accepted a lump-sum payment.

Table 5. Truncated Regression and Ordinary Least Squares Regression Estimates for the Fraction of Plan Participants Who Accepted a Lump-Sum Offer

	Truncated normal	Ordinary least squares
Terminated/total participants	0.6771 ***	0.3474 ***
	(0.0320)	(0.0121)
Retired/total participants	0.1027 ***	0.0390 ***
	(0.0231)	(0.0095)
Offered lump-sum window last year	-0.1458 ***	-0.0432 ***
	(0.0186)	(0.0057)
Piecewise-linear in log(participants); see text		
— from 1 to 20 participants	-0.1792 ***	-0.1310 ***
	(0.0236)	(0.0140)
— from 20 to 200 participants	-0.0441 ***	-0.0234 ***
	(0.0114)	(0.0058)
— from 200 to 2,000 participants	-0.0184 ***	-0.0106 ***
	(0.0056)	(0.0025)
— over 2,000 participants	-0.0329 ***	-0.0098 ***
	(0.0060)	(0.0021)
Intercept	0.4524 ***	0.4655 ***
	(0.0579)	(0.0360)
Standard deviation of residual	0.1328 ***	
	(0.0038)	
Observations	2,837	2,837
R-Squared		0.3151

Standard errors in parentheses.
Significance: *=10%, **=5%, ***=1%.

- *Number of participants*. Estimates of the piecewise-log-linear effects of the number of participants are all negative, indicating that the number of participants who accepted a lump-sum payment, relative to total plan participants, decrease with plan size; see the figure to the right.[21]



If SE-PIMS implements a truncated normal regression model to project the fraction of participants who accept a lump-sum payment, the predicted outcome is given by (Greene 2000):

[21] The figure illustrates the effect of plan size on the right-hand side of the truncated regression equation, i.e., on $\beta' x$. As discussed next, the share of participants who elected a lump sum involves additional terms.

$$E\left(\frac{Accepting\ participants}{Total\ participants}\right) = \hat{\beta}'X + \hat{\sigma}\frac{\phi\left(-\hat{\beta}'X/\hat{\sigma}\right)}{1-\Phi\left(-\hat{\beta}'X/\hat{\sigma}\right)}$$

where $E()$ denotes the expected value, $\phi()$ the normal density function, $\Phi()$ the cumulative normal probability function, and $\hat{\sigma}$ the estimated standard deviation of the model's residual.

A simpler alternative to the truncated normal regression model is the linear model estimated by ordinary least squares (OLS), as shown in the second column of Table 5. The results are qualitatively the same as those of the truncated normal model, but smaller in absolute value because OLS ignores truncation. The predicted outcome is simply $\hat{\beta}'X$. Unlike predictions of the truncated normal model, OLS predictions can be negative, in which case the predicted outcome may be replaced with max(0, $\hat{\beta}'X$). However, none of the 2,837 in-sample predictions was in fact negative. The correlation between the predicted outcomes of the two models was 0.68.

A logit model for whether a lump-sum window is offered, in combination with a (truncated) regression for the share of total participants who elect a lump-sum payment, can provide projections of the number of participants who will transfer out of the plan through a lump-sum payment. If implemented in SE-PIMS, the model must additionally specify (1) the type of affected participant (active, terminated, or retired) and (2) the amounts by which assets and liabilities will reduce.

Roughly 97% of participants who elected a lump-sum window were terminated participants in 2015–2018 (PBGC 2020a, p. 3). We recommend assuming that all participants who are projected to accept a lump-sum payment are terminated participants.

It is well-known that lump-sum distributions upon job separation or retirement are generally associated with below-average benefit entitlements (e.g., Hurd and Panis, 2006). However, we are unaware of any pattern in the context of a lump-sum window. Absent new information, we recommend assuming that the per-participant liability that is transferred in a lump-sum window is equal to the average liability associated with terminated participants. According to Inglis (2013), the cost of lump-sum payments to terminated participants is 95%–100% of the transferred liability; see Table 3 above. We recommend reducing assets by 100% of transferred liabilities.

Group Annuity Purchases

The proposed model structure for annuity buy-outs is similar to that of lump-sum windows, namely an annual logit model for whether the plan purchased a group annuity and, conditional on an annuity buy-out, a truncated normal regression (or OLS) model for the number of participants covered by the annuity, as a fraction of total plan participants.

Table 6 shows estimates of annual logit models of annuity buy-outs. Standard errors are printed in parentheses and asterisks highlight statistically significant estimates. The first column is illustrative of exploratory attempts to control for a variety of factors. For example:

- *Cash balance plan*. Plans with a cash balance feature were less likely to purchase an annuity than other plans. We are unaware of any plausible theoretical foundation for this finding.
- *Marginal VRP rate*. Higher marginal VRP rates appear to encourage lump-sum windows. However, its estimated effect is greatly reduced if the controls for funded level are removed (not shown). We are concerned that the estimated effect of the VRP rate may be confounded by funding level.
- *VRP capped*. Plans at the VRP cap appear to purchase more annuities.

Table 6. Logit Estimates of Annuity Buy-Outs

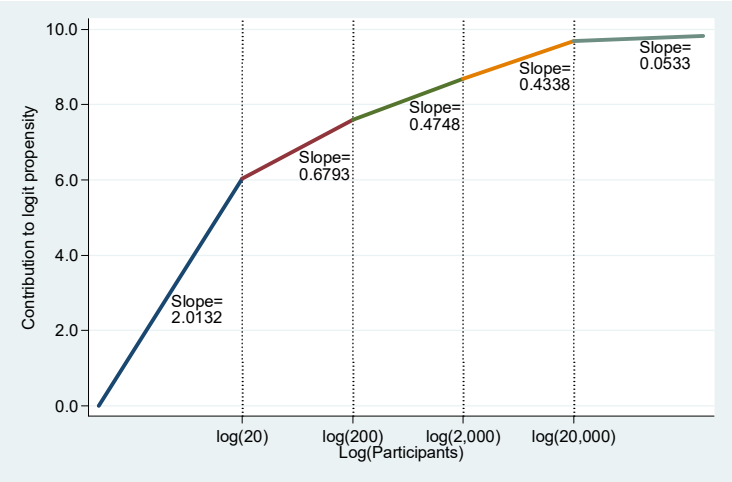
	Exploratory	Preferred
Cash balance plan	-0.2646 **	
	(0.1119)	
Marginal VRP rate	23.6035 ***	
	(4.2152)	
VRP capped	1.3765 ***	
	(0.1653)	
Purchased annuity last year	1.7901 ***	
	(0.1510)	
30-Yr Treasury yield	12.0115	
	(10.9161)	
Accrual freeze	0.3840 ***	0.4089 ***
	(0.0883)	(0.0848)
Retired/total participants	2.0405 ***	2.2603 ***
	(0.1911)	(0.1818)
Funded<75%	-1.0726 ***	
	(0.2175)	
75%<=Funded<85%	-1.0754 ***	
	(0.1957)	
85%<=Funded<95%	-0.7709 ***	
	(0.1856)	
95%<=Funded<110%	-0.4145 ***	
	(0.1530)	
Piecewise-linear in log(participants); see text		
— from 1 to 20 participants	2.2947 ***	2.0132 ***
	(0.6366)	(0.6163)
— from 20 to 200 participants	0.7264 ***	0.6793 ***
	(0.1222)	(0.1220)
— from 200 to 2,000 participants	0.4594 ***	0.4748 ***
	(0.0661)	(0.0653)
— from 2,000 to 20,000 participants	0.4056 ***	0.4338 ***
	(0.0690)	(0.0669)
— over 20,000 participants	0.0928	0.0533
	(0.1370)	(0.1343)
Intercept	-14.6093 ***	-13.5148 ***
	(1.8627)	(1.7660)
Observations	108,837	108,837
Pseudo R-Squared	0.2436	0.2194

Standard errors in parentheses.
Significance: *=10%, **=5%, ***=1%.

- *Purchased annuity last year*. An indicator for whether the plan purchased an annuity in the previous year was associated with a higher probability in the current year. A negative coefficient could have suggested that plans tend to wait a while before purchasing another annuity. Instead, the result suggests persistency in annuity buy-outs. We rejected this variable because of concerns that it may cause longer-term projections to go "off the rails" in the sense that some plans would be projected to become ever more likely to purchase annuities.
- *30-Yr Treasury yield*. There was no statistically significant effect of 30-year Treasury bonds on annuity buy-outs.
- *Funding levels*. Indicator variables for funding level suggest more frequent annuity purchases as funding levels improve. However, without a control for the marginal VRP rate, none of the funding level indicators remained statistically significant (not shown).

The second column of Table 6 documents our preferred specification.

- *Accrual freeze*. Plans that reported having frozen accruals due to service on Line 17 of Premium Filings were more likely to purchase an annuity than those that did not. The effect of an accrual freeze was stronger than that of a participant freeze (not shown).
- *Retired/total participants*. The fraction of total participants who are retired is positively related to the probability that a plan purchased an annuity. An increase of 10 percentage points (0.10) increases the logit propensity by about 0.226.
- *Number of participants*. As in other models, a highly flexible functional form to capture the effect of number of plan participants was critical. In the case of annuity buy-outs, an additional bend point at log(20,000) participants was required. The slope coefficients are positive, indicating that the likelihood of annuity buy-outs increases with plan size; see the figure to the right.



On average, 0.62% of plans purchased a group annuity in any year, and the average predicted logit probability matches that rate. Larger plans are more likely to purchase annuities: plans covering 5.1% of participants bought an annuity in any year, and the average participant-weighted predicted logit probability was 5.4%.

In-sample predictions based on this model range from a predicted annuity buy-out probability of less than 0.001% for plans that are not frozen and cover just one participant who is active to 19.3% for a very large frozen plan (about 35,000 participants) with mostly retired participants (87%).

Conditional on purchasing an annuity, the model needs to project the number of participants who leave the plan because of the annuity.[22] The first column of Table 7 shows parameter estimates of a truncated normal regression model. The main findings are:

- *Retired/total participants*. The more retired participants, as a fraction of total participants, the higher the fraction of participants who are included in the annuity.
- *Purchased annuity last year*. Plans that purchased an annuity in the previous year purchased an annuity for fewer participants.
- *Funded level*. Plans that were funded at less than 85%, as reported on Premium Filings, purchased annuities for fewer participants.

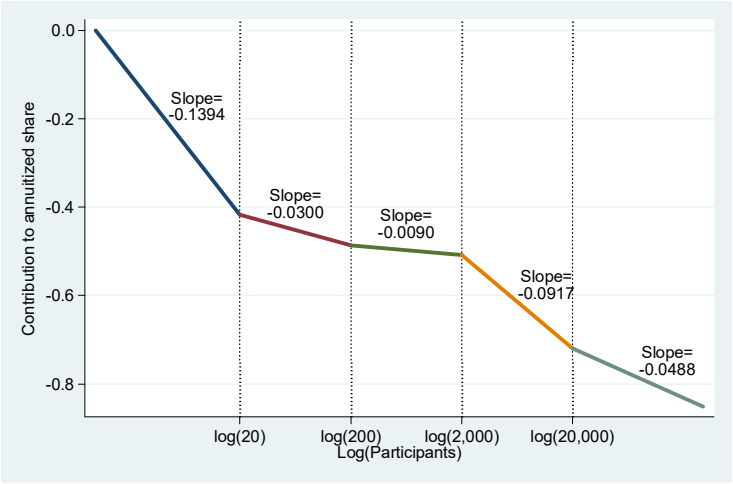
Table 7. Truncated Regression and Ordinary Least Squares Regression Estimates for the Fraction of Plan Participants Affected by an Annuity Buy-Out

	Truncated	OLS
Retired/total participants	0.9222 ***	0.5003 ***
	(0.0701)	(0.0302)
Purchased annuity last year	-0.1982 ***	-0.0778 ***
	(0.0490)	(0.0204)
Funded<75%	-0.1211 ***	-0.0825 ***
	(0.0440)	(0.0247)
75%<=Funded<85%	-0.1482 ***	-0.0871 ***
	(0.0410)	(0.0223)
85%<=Funded<95%	-0.0523	-0.0390 *
	(0.0386)	(0.0217)
95%<=Funded<110%	-0.0345	-0.0229
	(0.0382)	(0.0214)
Piecewise-linear in log(participants); see text		
— from 1 to 20 participants	-0.1394	-0.0640
	(0.1297)	(0.0815)
— from 20 to 200 participants	-0.0300	-0.0183
	(0.0323)	(0.0192)
— from 200 to 2,000 participants	-0.0090	-0.0117
	(0.0170)	(0.0100)
— from 2,000 to 20,000 participants	-0.0917 ***	-0.0419 ***
	(0.0200)	(0.0101)
— over 20,000 participants	-0.0488	-0.0250
	(0.0475)	(0.0206)
Intercept	0.3790	0.3630
	(0.3638)	(0.2322)
Standard deviation of residual	0.2021 ***	
	(0.0097)	
Observations	674	674
R-Squared		0.3666

Standard errors in parentheses.
Significance: *=10%, **=5%, ***=1%.

[22] To test the hypothesis that unobserved factors may affect both the decision to purchase an annuity and the affected share of participants, we estimated a Heckman (1979) selection model. The correlation between the selection and share residuals was statistically insignificant, suggesting that the selection and share equations may be estimated separately.

- *Number of participants*. Estimates of the piecewise-log-linear effect of the number of participants are all negative, indicating that the number of participants for whom an annuity was purchased, relative to total plan participants, decrease with plan size. The slopes are statistically insignificant, except for the slope from 2,000 to 20,000 participants; see the figure to the right.[23]



The second column of Table 7 shows OLS estimates. The results are qualitatively the same as those of the truncated normal model, but smaller in absolute value because OLS ignores truncation. Unlike predictions of the truncated normal model, OLS predictions can be negative. Indeed, 10 of the 674 in-sample predictions were negative. Having changed those predictions to the theoretical minimum of 0%, the correlation between the predicted outcomes of the two models was 0.96.

A logit model for whether an annuity is purchased, in combination with a (truncated) regression for the included share of total participants, can provide projections of the number of participants who will transfer out of the plan through an annuity buy-out. If implemented in SE-PIMS, the model must additionally specify (1) the type of affected participant (active, terminated, or retired) and (2) the amounts by which assets and liabilities will reduce.

Roughly 99% of participants who were included in an annuity buy-out were retired participants in 2015–2018 (PBGC 2020a, p. 3). We recommend assuming that all participants who are projected to be included in an annuity buy-out are retired participants.

We are unaware of any evidence on whether participants with above-average benefit entitlements are more or less likely to be included in an annuity buy-out. Absent new information, we recommend assuming that the per-participant liability that is transferred in an annuity buy-out is equal to the average liability associated with retired participants. According to Inglis (2013), the cost of annuity buy-outs to retired participants is 108%–112% of the transferred liability; see Table 3 above. We recommend reducing assets by 110% of the transferred liability.

[23] The figure illustrates the effect of plan size on the right-hand side of the truncated regression equation, i.e., on $\beta' x$. As discussed on page 33, the share of participants for whom an annuity was purchased involves additional terms.

Standard Terminations

From a modeling perspective, the outcome of interest for standard terminations is the combination of (1) whether and (2) when a standard termination takes place. This type of outcome is often modeled with a hazard model, also known as a duration, failure time, or risk-intensity model (e.g., Kalbfleisch and Prentice, 1980; Tee 1992). Statisticians and econometricians have developed many functional forms. We propose to use the sequential logit, one of the simplest types of hazard model, to project standard terminations. SE-PIMS already uses a sequential logit model to project bankruptcy risks, and the functional form of the proposed sequential logit model for standard terminations is identical to that of the sequential logit model for bankruptcies.

Recall that large plans terminated at higher rates in recent years than before 2015; see Figure 15. The analysis data therefore included terminations from 2015 and later only (and lagged explanatory variables from 2014 and later). Plans with zero participants or missing information on assets and liabilities in their Premium Filing were excluded.[24]

Table 8 shows parameter estimates of the sequential logit model of standard terminations. Standard errors are printed in parentheses and asterisks highlight statistically significant estimates. The first column is illustrative of exploratory attempts to control for a wide variety of factors. For example:

- *Cash balance plan*. Plans with a cash balance feature terminated at higher rates than other plans, but we are unaware of any plausible theoretical foundation for this finding.
- *Marginal VRP rate*. The marginal Variable Rate Premium (VRP) rate appears to have a negative effect on terminations, which is counterintuitive. Numerous attempts to incorporate measures of the VRP rate failed to result in plausible estimates.
- *VRP capped*. An indicator for whether the plan's VRP was capped had a statistically significant and negative effect, which is counterintuitive. The estimate that may partly reflect an effect of funded level because plans that are at the VRP cap tend to be very poorly funded.
- *30-Yr Treasury yield*. The yield on 30-year Treasury bonds has generally decreased while the VRP rate increased since 2014. Its estimate likely reflects collinearity of covariates rather than a causal effect. If the VRP rate were omitted from the model, its estimate would be statistically indistinguishable from zero (not shown).

[24] Information on assets and liabilities is often missing in a plan's final Premium Filing. However, this is inconsequential because funding and other explanatory variables are lagged by one year. Also, we imputed any missing values from plans' previous filings. The exclusions due to missing assets and liabilities were primarily plans that were exempt from Variable Rate Premiums.

Table 8. Logit Estimates of Standard Terminations

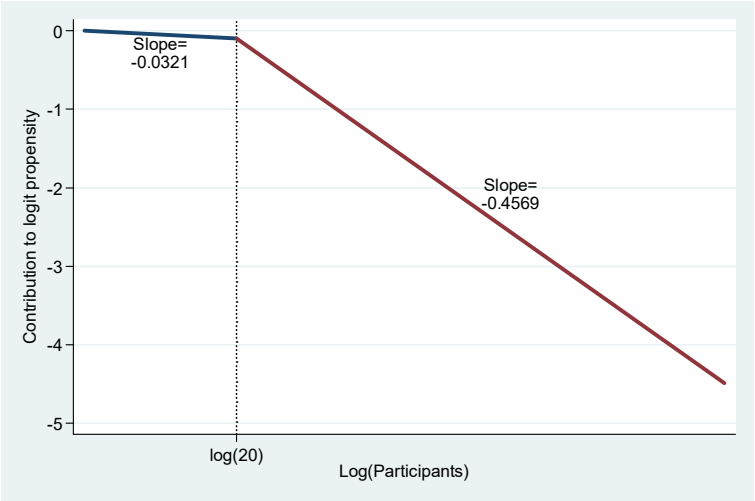
	Exploratory	Preferred
Cash balance plan	0.2579 ***	
	(0.0351)	
Marginal VRP rate	-22.0849 ***	
	(1.9153)	
VRP capped	-0.4432 ***	
	(0.0467)	
30-Yr Treasury yield	-14.4979 ***	
	(3.8054)	
Accrual freeze	1.2704 ***	1.1752 ***
	(0.0352)	(0.0337)
Funded<75%	0.0306	-0.4318 ***
	(0.0721)	(0.0602)
75%<=Funded<85%	0.1024	-0.3675 ***
	(0.0696)	(0.0578)
85%<=Funded<95%	0.5077 ***	0.0460
	(0.0633)	(0.0497)
95%<=Funded<110%	0.3482 ***	0.2019 ***
	(0.0423)	(0.0396)
Piecewise-linear in log(participants); see text		
— from 1 to 20 participants	-0.0542 **	-0.0321
	(0.0214)	(0.0206)
— over 20 participants	-0.4424 ***	-0.4569 ***
	(0.0153)	(0.0150)
Intercept	-2.4565 ***	-2.8377 ***
	(0.1250)	(0.0500)
Observations	95,154	95,154
Pseudo R-square	0.0688	0.0628

Standard errors in parentheses.
Significance: *=10%, **=5%, ***=1%.

The second column reflects our preferred specification.

- *Accrual freeze*. Plans that reported having frozen accruals due to service on Line 17 of Premium Filings were much more likely to terminate than those that did not. Accrual freezes outperformed participant freezes in exploratory models (not shown).
- *Funded status*. The model controls for indicators for funded status levels. The reference category consists of plans that are at least 110% funded. Plans that are less than 75% funded are least likely to terminate. Plans with a funded ratio of 95%–110% funded are most likely to terminate; they are more likely to terminate than even the reference category.

- *Number of participants*. Larger plans tend to be less likely to terminate than smaller plans. The model captures plan size through piecewise-linear effects in the natural logarithm of plan participants, with a bend point at log(20) participants; see the figure to the right. (Additional bend points were explored, but the slopes were statistically indistinguishable.)



In-sample predictions based on this model range from a predicted termination probability of 0.04% for a very large plan (about 470,000 participants) that is not frozen and poorly funded (78%) to 18.8% for frozen plans that are fully funded and have only one participant.

Scenario and Sensitivity Analyses

Recent years have experienced substantial variation in risk transfer activities: the fraction of plans offering lump-sum windows decreased from 3.7% in 2015 to 0.6% in 2019 while the fraction annuity buy-outs increased from 0.3% to 0.8% over the same period (see Figure 5); the rate of standard terminations remained roughly constant in 2009–2019, but among plans with 1,000 or more participants it increased from 0.2% in 2014 to 1.7% in 2019 (see Figure 15). Projections based on the models estimated above should generate rates of activity that are approximately equal to the average rates over the respective estimation periods, but those averages may or may not be plausible in future years.

Mechanically, the issue stems from omitted variables. If the econometric models would fully control for every factor that drives risk transfer activities, and those factors were known during the projection period, the model estimates may be expected to project future activities in an unbiased manner. However, it is plausible that certain determinants are unobserved in historical data and subject to change in the future. For example, a plan sponsor may have offered lump-sum windows and purchased group annuities in the first few years after a restructuring reduced the strategic importance of its pension plan. Once many participants have been transferred out of the plan, the scope for future risk transfers is diminished. If the pension landscape were in a steady state, aggregate risk transfers could maintain their level, but the industry is experiencing a transition from DB to defined contribution (DC) plans.

For those reasons, we recommend that the econometric estimates be adjusted to generate projections of plausible levels of risk transfers. The models should inform the direction and magnitude of effects of various explanatory covariates, but we suggest the intercepts be calibrated. (In this context, calibration means adjusting the intercept such that the aggregate projected activity matches a target level.)

6. RECOMMENDATIONS

From the perspective of PBGC, the net effect of risk transfers is ambiguous. On the one hand, risk transfers reduce the number of plan participants and thus PBGC's future premium income. On the other hand, risk transfers shrink plan sizes or eliminate plans altogether, thereby reducing the risk of future claims on PBGC.

The reduction in flat-rate premium income due to risk transfers likely amounts to hundreds of millions of dollars annually, which is a substantial fraction of the $1.874 billion that PBGC collected in flat-rate premiums from single-employer plans in FY 2020 (PBGC 2020b). The loss of variable rate premiums may further erode PBGC's future income. We therefore recommend that SE-PIMS incorporate risk transfer activities.

During plan years 2015–2019, we estimate that lump-sum windows transferred roughly 320,000 participants annually, that annuity buy-outs were purchased for roughly 240,000 participants annually, and that standard terminations affected an additional 120,000 participants annually. While standard terminations may have the smaller effect on aggregate number of plan participants, they erase both flat- and variable rate premium income. (Lump-sum windows and annuity buy-outs tend to reduce variable rate premiums only if the plan was at the per-participant cap, or reaches the cap as a result of the risk transfer.) Also, the model for standard terminations may be easier to implement than the other models because it consists of a single equation and is similar to the existing model of bankruptcy risks. In sum, when incorporating risk transfers in SE-PIMS, it may be advisable to commence with standard terminations.

After exploring many potential determinants of risk transfers, we estimated relatively parsimonious model specifications that control for combinations of (1) plan freeze status, (2) maturity (ratios of inactive to total participants), (3) funded level, and (4) number of participants. Large plans are much more likely to offer a lump-sum window or purchase a group annuity, and much less likely to terminate than small plans. Because of the direct implications of risk transfers for premium income, it is critically important that SE-PIMS target not just the incidence of risk transfers, but also the participant-weighted incidence. We found that only highly flexible specifications, such as piecewise log-linear in the number of participants, closely replicated historical differences by plan size.

The model specifications that we presented can help inform the choice of explanatory variables and the magnitude of their effects. However, the estimates are based on data from plan years 2015–2019, when the aggregate level of risk transfer activities varied substantially. The outlook for aggregate risk transfer activity during SE-PIMS projection years may deviate from the average level of activity in 2015–2019. We therefore recommend that the models are adjusted to generate plausible targets. A straightforward way to achieve this is by calibrating the intercepts. This approach was also taken to model active participation in ME-PIMS and possibly in other components of ME-PIMS and SE-PIMS.

As with any model calibration, it is difficult to determine ex ante whether the target rates are reasonably within the distribution of potential rates. The importance of selecting target rates depends in part on the sensitivity of SE-PIMS's outcomes to those target rates. We therefore recommend that pension practitioners and actuaries develop plausible scenarios for the expected incidence of future risk transfers and test those scenarios in SE-PIMS to gauge the sensitivity of PBGC's financial outlook to alternative scenarios.

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