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Rising PBGC Premiums: Assessing Pension Risk Management Decisions with a Shareholder Value Framework

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ON DEC. 26, 2013, PRESIDENT OBAMA signed into law the Bipartisan Budget Act of 2013, which increases Pension Benefit Guaranty Corporation (PBGC) premiums, above and beyond the increased PBGC levels coded into law as part of 2012's Moving Ahead for Progress in the 21st Century Act (MAP–21). Under the new law, effective Jan. 1, 2014, PBGC variable rate premiums (VRP) increased from their current level of 0.9 percent of unfunded liability to 1.4 percent of unfunded liability. In 2015, they will increase again to 2.4 percent plus an additional inflationary increase. In 2016, they would increase yet again to 2.9 percent plus an additional inflationary increase. They would continue to increase with inflation in years 2017+.

The rising premiums create an incentive for plan sponsors to fully fund their plans to avoid paying the premium. On the other hand, funding the plan increases the risk that the plan will develop a surplus. This may concern sponsors of frozen plans who could owe an excise tax on any plan surplus at the plan's termination date. How, then, should a sponsor weigh the benefit of reduced PBGC premiums against the increased surplus risk?

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In this paper, we attempt to answer this question in three parts:

1. In part I, we provide a framework for making pension risk management decisions from a shareholder value perspective
2. In part II, we show how the framework can be used to make pension funding decisions in light of changing PBGC VRP
3. In part III, we quantify this impact

PART I: PENSION RISK MANAGEMENT SHAREHOLDER VALUE FRAMEWORK

We present a shareholder value framework to help sponsors with pension risk management decisions, building on prior work from Sharpe, Tepper, and others. [1] This framework is just one of many lenses sponsors must use to make pension risk management decisions. Importantly, the sponsor must weigh the shareholder perspective against the fiduciary obligation to invest plan assets solely for the benefit of plan participants.

We imagine a simplified defined benefit pension with a single deterministic liability payment **L** due in exactly one year. The plan has asset $\mathbf{A_t}$ which can fluctuate with time. The risk-free discount rate **r** is assumed to be constant and yields a discount factor **V**. The corporate tax rate is **T** and is assumed to be constant. The plan's funded status at time zero is as follows

$$\text{Funded status} = A_0 - L*V \qquad (1)$$

Since the plan duration is one year, any plan surplus at the end of the year will revert to shareholders. As such, $(A_0 – L*V)*(1-T)$ can be thought of as a shareholder asset. Shareholder value in the pension must account for three additional elements:

1. The plan will need to fund the VRP on any shortfall. Thus, shareholders have an additional liability in the amount of $\max((L*V-A_0)*VRP,0)*V*(1-T)$ where VRP is the variable rate premium percentage[2].
2. If the plan ends the year with a surplus, the sponsor might be forced to share some of that surplus with the government in the form of taxes on plan reversions or with participants in the form of benefit increases. If we assume that the sponsor would share ϕ percent of the surplus with participants and the government, then the surplus pay-out to the government and participants would be $\phi*\max\{A_1-L,0\}$. This is equivalent to ϕ percent of the payoff on a call option on the plan asset with strike price L. We call this option C_A and say there is a shareholder liability in the amount of $\phi*C_A$.

3. Suppose the company will go bankrupt during the year with probability λ.[3] In that scenario, the sponsor could default on any unfunded liability at year's end. The benefit to the sponsor of this default would be equal to max $\{L-A_1,0\}$. This is equivalent to the payoff of a put option on the plan asset with strike price L. We will denote this put option as P_A and say there is a shareholder asset of $\lambda^* P_A$.

Folding in these three elements, the shareholder value can be expressed as follows:

$$\text{Shareholder value} = [(A_0-L*V-\phi*C_A+\lambda*P_A-max((L*V-A_0)*VRP,0)*V]*(1-T) \quad (2)$$

We will refer to this quantity as SV_0 to denote that it is the shareholder value assuming the sponsor funds 0 to the plan at the beginning of the year. If the plan is currently underfunded so the VRP is positive, we can remove the maximum from equation (2) and reorganize as follows:

$$SV_0=[(A_0-L*V)*(1+VRP*V)-\phi*C_A+\lambda*PA]*(1-T) \quad (3)$$

Next, put-call parity gives us the following:

$$C_A+L*V=P_A+A_0 \quad (4)$$

Substituting equation (4) into equation (3) gives us:

$$SV_0=[(A_0-L*V)*(1+VRP*V-\phi)+(\lambda-\phi)*P_A]*(1-T) \quad (5)$$

Equation (5) is intuitive and has important implications for pension risk management and pension plan investment decisions. In cases where $\lambda>\phi$, SV_0 increases with P_A. This suggests the sponsor should want to maximize the value of the put option which can be accomplished by increasing the riskiness of plan assets. Conversely, if $\lambda<\phi$, the sponsor should want to minimize the value of the put option which can be accomplished by derisking plan assets or purchasing annuities. This result is intuitive: if a sponsor bankruptcy is more likely than surplus sharing ($\lambda>\phi$), this means that the downside risk sharing with plan participants is greater than the upside risk sharing with participants so the sponsor is incentivized to increase risk. The opposite is true if $\lambda<\phi$.

PART IIA: ASSESSING PLAN FUNDING USING THE SHAREHOLDER VALUE FRAMEWORK

Suppose the sponsor wishes to fund the plan. This can be accomplished without changing the sponsor's cash on hand by issuing debt in the capital market to fund the pension. Suppose the sponsor issued debt D*(1-T) to the capital markets and used the debt to fund the pension in the amount D. Equation (5) would now change in four ways:

1. The unfunded pension liability is reduced by D.
2. The sponsor is now required to repay the loan to the debt holders with interest at the end of the year. Assuming the sponsor does not default on this obligation, the sponsor has assumed a liability equal to $(1-T)*D*(1+(1-T)*r_c)*V$ where r_c is the sponsor's borrowing rate in the capital markets.
3. The underlying asset of the put option in equation (5) is now A+D.
4. The sponsor has probability of default of λ on the capital market debt. This can be expressed as a shareholder asset of $(1-T)*D*(1+(1-T)*r_c)*V*(\lambda)$ which can be approximated as $(1-T)*\lambda*D$.

Thus, we can rewrite equation (5) as follows

$$SV_D=[(A_0+D-L*V)*(1+VRP*V-\phi)+(\lambda-\phi)*P_{A+D}-D*(1+(1-T)*r_c)*V+\lambda*D]*(1-T) \quad (6)$$

If we define the quantity $CS= r_c* (1-T)-r$ for corporate credit spread, we can reorganize equation (6) as follows:

$$SV_D=SV_0+[D*V*(VRP-CS)+(\lambda-\phi)*(D+P_{A+D}-P_A)]*(1-T) \quad (7)$$

We can simplify equation (7) by again invoking put-call parity (equation (4)):

$$SV_D=SV_0+[D*V*(VRP-CS)+(\lambda-\phi)*(C_{A+D}-C_A)]*(1-T) \quad (8)$$

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Similar to equation (5), equation (8) is both intuitive and important. It tells us that borrowing to fund the pension changes (pre-tax) shareholder value in two ways:

1. Shareholder value is increased by D*V*(VRP-CS). On the one hand, shareholders benefit by no longer being required to pay PBGC premiums on the piece of the unfunded liability that has been funded. On the other hand, the sponsor must pay a credit spread on the money borrowed.

2. Shareholder value is increased by $(\lambda-\phi)*(C_{A+D} - C_A)$. On the one hand, borrowing increases shareholders debt which increases the payoff of the default option in a default scenario (represented here by λ). On the other hand, funding increases the cost of surplus sharing (represented here by ϕ). The term (λ-ϕ) is multiplied by the change in the value of the call option since both of these aspects only apply if the plan ends the year in a surplus position[4].

Annual Increase in pre-tax shareholder value in 2016 (PBGC VRP=2.9%)

Credit spread (pre-tax)	Increase in SV ($MM)	Risk-free rate					
		0.00%	1.00%	2.00%	3.00%	4.00%	5.00%
	0.00%	$29	$32	$35	$38	$41	$44
	1.00%	$23	$26	$29	$32	$35	$38
	2.00%	$16	$19	$23	$26	$29	$32
	3.00%	$10	$13	$16	$19	$23	$26
	4.00%	$3	$6	$10	$13	$16	$20
	5.00%	($4)	($0)	$3	$7	$10	$13

PART IIB – IMPLICATIONS OF PBGC VRP FOR PLAN FUNDING

Using the nomenclature and results developed in Part IIA, we can now say the following:

Plan sponsors should borrow to fund unfunded pension liabilities if the sponsor's after tax credit spread is less than the variable rate premium

We can see this result in equation (8). It would make sense for the sponsor to borrow to fund the pension whenever $SV_D - SV_0 > 0$ or whenever

$$SV_D - SV_0 = [D*V*(VRP-CS)+(\lambda-\phi)*(C_{A+D} - C_A)]*(1-T)>0 \quad (9)$$

Based on the logic we developed in Part IIA, the term $(\lambda-\phi)*(C_{A+D} - C_A)$ is always nonnegative. This can be reasoned as follows:

- If λ>ϕ, the term is nonnegative because $C_{A+D} \geq C_A$.
- If ϕ>λ, this implies the case of the risk averse sponsor. In that case, we reasoned above that the sponsor should seek to minimize the risk in the plan by investing the plan assets in risk-free securities. In that case, $C_{A+D} = C_A = 0$ so the term is zero.

Thus we have that

$$SV_D - SV_0 \geq (D*V*(VRP-CS))*(1-T) \quad (10)$$

VRP > CS is a sufficient (though not necessary) condition for the sponsor to borrow money to fund the plan. Plugging in our definition of CS, we arrive at our conclusion: whenever the following equation holds, the sponsor should borrow money and fully fund the plan to avoid paying PBGC premiums:

$$VRP > r_c * (1-T) - r \quad (11)$$

PART III: QUANTIFICATION

We quantify the annual pre-tax shareholder value created by the sponsor's borrowing $1 billion to fund a pension plan in 2016, assuming 0 percent inflation and a 35 percent corporate tax rate. We use equation (8) assuming λ= ϕ.

CONCLUSION

In conclusion, we find that a shareholder value framework supports borrowing to fund the pension for almost all tax-paying sponsors, in spite of concerns about surplus sharing risk. We showed this result mathematically in section II above. Intuitively, we can think about two different types of pension plans:

1. For sponsors where surplus sharing is a significant concern ($\phi > \lambda$), we showed in section I that derisking the plan increases shareholder value. After derisking is complete, surplus sharing is a minor issue so does not have a material impact on the funding decision. In that case, we showed in section II that borrowing to fund increases shareholder value for almost all tax-paying sponsors by reducing PBGC premiums and providing a tax deduction on the corporate debt interest payments.

2. For pension plans where surplus sharing is not a significant issue ($\lambda > \phi$), the shareholder value framework may support increased risk taking as a method to maximize the value of the sponsor's put option on plan assets.

As noted in the introduction, this shareholder value framework can often conflict with the views of other stakeholders. Although these conflicts are beyond the scope of this paper, the shareholder value model can also be used to highlight potential conflicts between different stakeholders, most notably plan participants whose interests can sometimes conflict with shareholders. ■

ENDNOTES

[1] See for example W. Sharpe, 'Corporate Pension Funding Policy,' Stanford University, January 1976,

F. Black, 'The tax consequences of long-run pension policy,' Financial Analysts Journal, 1980

I. Tepper, 'Taxation and Corporate Pension Policy,' The Journal of Finance, March 1981,

B. Alexander, 'Gentlemen Prefer Bonds,' London Business School 2002.

[2] Technically, the PBGC premium is calculated off of the liability discounted at the PBGC interest rate but we use the risk-free rate here for simplicity. Reflecting the correct PBGC discount rate would not change equation (8) which is the article's key conclusion

[3] More precisely, λ is the probability of default adjusted for (1) the expected settlement rate on debt in bankruptcy and (2) the market credit risk premium

[4] If the plan ends the year in a deficit, there is no change to the sponsor's debt (and therefore default payoff) because the borrowing increases debt to debt holders but the funding reduces debt to plan participants

On the Research Front

PAPER SUMMARIZES NATURAL RESOURCE SUSTAINABILITY SUMMIT

The SOA's Research Department announces the release of a paper summarizing its December 2012 Natural Resource Sustainability Summit. The paper contains a synopsis of presentations and discussions and outlines many considerations for the SOA on natural resources sustainability and how actuaries might get involved in this area.
http://www.soa.org/Research/Research-Projects/Risk-Management/research-2013-nat-resource-sustain.aspx

APPLYING FUZZY LOGIC TO RISK ASSESSMENT AND DECISION-MAKING

The CAS/CIA/SOA Joint Risk Management Section's new report explores areas where fuzzy logic models may be applied to improve risk assessment and risk decision-making. The report, authored by Kailan Shang and Zakir Hossen, discusses the methodology, framework and process of using fuzzy logic systems for risk management. An Excel tool showing examples of some simple fuzzy logic modeling is included.
http://www.soa.org/Research/Research-Projects/Risk-Management/research-2013-fuzzy-logic.aspx