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## Illustration of Discount Rate Effects On Funding

The compromise pension reform bill negotiated between the Senate Finance and Senate Health, Education, Labor, and Pensions committee would allow airlines greater latitude in choosing their discount rates than would be available to other companies. (For ease of exposition, a discount rate chosen under this provision will be referred to as a “flexible discount rate”.) Discount rates have a powerful impact on calculated liabilities, as was shown in the recent report sponsored by the American Benefits Council concerning calculations of PBGC’s current financial condition. This paper uses hypothetical illustrations to examine the potential effects of discount rate flexibility.

The simplest example is one in which the use of a higher discount rate actually allows a plan sponsor to stop contributions to a pension fund for a period of time. This can happen even if there is substantial underfunding that would deteriorate further under the alternative calculations used by the Pension Benefit Guaranty Corporation (PBGC) to measure the potential claim should such a plan be terminated in bankruptcy (“termination liability.”)

Figures 1 and 2 illustrate this possibility with a simple, hypothetical example. It is important to note that the illustrations in this paper leave out considerable complexities that would arise in real life, such as transition periods under the proposed law and fluctuations in future interest rates. The illustrations are intended to show the general magnitude of potential discount rate effects without attempting a comprehensive and precisely accurate study, which is beyond the scope of this short paper. (We hope the actuarial community will perform such a study.) Nor should the figures be seen as reflecting the situation of any particular company – they are truly hypothetical.

We assume the plan has liabilities with a termination value of \$1,000, using PBGC’s methodology and a discount rate of 4.8%, the rate used last year to value PBGC’s liabilities. 4.8% still appears to be a reasonable estimate for illustrative purposes, since long-term rates have been relatively stable in the interim, even though short-term rates moved sharply upwards from very low levels.

The liability declines by the amount of payment in a given year, since those payments are no longer owed. The remaining liability rises by the discount rate, since payments are one year closer to the measurement date. Consistent with the requirements of the proposed law, our example assumes a frozen plan that is not accruing any new benefits for employees’ service. (The payment stream used is roughly consistent with plan liabilities having a 15 year duration, similar to some of the airlines. We use the same payment stream for termination basis and ongoing basis calculations, although there would be modest differences in practice.)

We adjust the initial liability in the succeeding two columns to reflect the effects of assuming a different discount rate and adjust the level for payments and the passage of time. 5.5% is used as a reasonable guess at a stable discount rate for corporations subject to the standard funding rules under the proposed law, without discount rate flexibility. The actual rate generated by the funding rules will inevitably vary over time (as would the PBGC termination discount rate), but our simple illustration assumes constant rates. 7.5% is used as a discount rate that might reasonably be chosen using the flexible discount rate rules under the proposed law.

The effect of a discount rate change is estimated by dividing one plus the original discount rate by one plus the revised discount rate and raising the result to the 15<sup>th</sup> power. This is based on the assumed duration of liability payments of 15 years. Note that this is a more accurate estimation method than the one we used recently as a rough cut. That method, assuming that a one point change in interest rate results in a 15% change in the liability, (assuming a 15 year duration), is a reasonable approximation for small changes in discount rates, but is increasingly inaccurate for larger changes, such as are examined here.

The next two columns make a crude 10% downward adjustment in the initial termination liability, to unwind the effect of greater conservatism in the actuarial assumptions used by PBGC than are generally used by companies for funding calculations. This includes unwinding an expense loading that PBGC uses to reflect certain costs of taking over pension plans. Ongoing liabilities are then adjusted upwards and downwards in succeeding years in the same manner as for the termination liability. In our examples, this results in a widening percentage spread between the termination liability and the ongoing liability. This is consistent with an assumption that the differences in actuarial assumptions will build over time, since the later payments are less predictable than the early payments. However, readers should bear in mind that this is a crude approximation of a complex set of actuarial calculations.

Figure 1: Illustrative Liability Calculations

	Termination Liability	Termination Liability	Termination Liability	Ongoing Liability	Ongoing Liability	Pension Payments	Contributions Extended Amortization
Year	4.8%	5.5%	7.5%	5.5%	7.5%		
0	1,000	905	683	814	615		
1	1,013	920	699	824	625	(33)	-
2	1,025	934	713	833	634	(35)	-
3	1,035	945	726	839	641	(38)	-
4	1,040	953	735	840	644	(42)	-
5	1,044	958	743	840	645	(44)	-
6	1,045	961	748	837	643	(47)	-
7	1,042	961	750	829	637	(51)	-
8	1,035	957	748	818	626	(54)	-
9	1,024	948	741	801	611	(58)	-
10	1,008	934	730	780	589	(62)	-
11	989	918	716	755	565	(64)	-
12	967	899	699	727	536	(66)	-
13	942	876	678	695	503	(68)	-
14	914	851	653	659	465	(70)	-

The next to last column shows a stream of pension payments based on a \$1,000 liability and a duration of 15 years. The final column shows no required company contributions in this case.

Figure 2 shows the funding levels and ratios produced by the illustrative assumptions. The first column shows the level of pension assets. It starts with assets of \$620, based on an assumed termination basis funding ratio of 62%. This level was chosen for illustrative purposes because it is the lowest funding ratio that produces no required contributions over the 14 years when used with our other assumptions. Assets are assumed to decline by the pension payments, increase by contributions, and to grow by a 7.5% return on investments.

The plan starts and remains overfunded at a 7.5% discount rate. All else equal, this would eliminate the need to make funding contributions during the 14 years modeled here. However, the funding level on a termination basis would continue to decline and would in fact reach 53% by the end of the 14<sup>th</sup> year, although, as noted, our assumptions for termination basis calculations are rougher than for the ongoing figures. Still, it is worth noting that 53% is roughly the historical average termination funding ratio for plans taken over by PBGC. Using ongoing funding assumptions, and a rate consistent with likely discount rates for those companies not allowed to use flexible discount rates, the funding ratio declines from 77% to 73% over the period.

Figure 2: Illustrative Funding Levels

		Net	Net	Net	Funding	Funding	Funding
		Funding	Funding	Funding	%	%	%
Year	Assets	4.8%	5.5%	7.5%	4.8%	5.5%	7.5%
0	620						
1	631	(382)	(193)	6	62%	77%	101%
2	641	(385)	(192)	6	62%	77%	101%
3	648	(387)	(191)	7	63%	77%	101%
4	651	(389)	(189)	7	63%	78%	101%
5	653	(391)	(187)	8	63%	78%	101%
6	651	(394)	(185)	8	62%	78%	101%
7	646	(396)	(184)	9	62%	78%	101%
8	636	(399)	(182)	10	61%	78%	102%
9	621	(403)	(180)	11	61%	77%	102%
10	601	(407)	(179)	11	60%	77%	102%
11	577	(412)	(178)	12	58%	76%	102%
12	549	(418)	(178)	13	57%	76%	102%
13	517	(426)	(178)	14	55%	74%	103%
14	480	(434)	(179)	15	53%	73%	103%

Figures 3 and 4 illustrate a more complex case where the termination basis funding ratio starts at 50%, and contributions are required in all years even with a flexible discount rate regime. The other assumptions remain constant. The only difference between Figures 1 and 3 is that the lower funding ratio forces contributions to be made. The liabilities do not change, since our only change in assumptions was on the asset level. For comparison, the first year contribution under standard funding rules would be \$41 rather than \$8. This difference is partly due to discount rates and partly to the provision that allows a 14-year, rather than 7-year, amortization period.

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Figure 3: Illustrative Liability Calculations at Initial 50% Funding Ratio

	Termination Liability	Termination Liability	Termination Liability	Ongoing Liability	Ongoing Liability	Pension Payments	Contributions Extended Amortization
Year	4.8%	5.5%	7.5%	5.5%	7.5%		
0	1,000	905	683	814	615		
1	1,013	920	699	824	625	(33)	8
2	1,025	934	713	833	634	(35)	9
3	1,035	945	726	839	641	(38)	10
4	1,040	953	735	840	644	(42)	10
5	1,044	958	743	840	645	(44)	11
6	1,045	961	748	837	643	(47)	12
7	1,042	961	750	829	637	(51)	13
8	1,035	957	748	818	626	(54)	14
9	1,024	948	741	801	611	(58)	16
10	1,008	934	730	780	589	(62)	17
11	989	918	716	755	565	(64)	19
12	967	899	699	727	536	(66)	20
13	942	876	678	695	503	(68)	23
14	914	851	653	659	465	(70)	26

Figure 4 shows the resulting funding levels. The funding ratio measured at 7.5% rises to 100% by the end of the 14 years, as required. Funding under the 5.5% rate that we assume would represent standard funding rules rises from 62% to 70% and termination basis funding rises from 50% to 51%.

Figure 4: Illustrative Funding Levels at Initial 50% Funding Ratio

		Net Funding	Net Funding	Net Funding	Funding %	Funding %	Funding %
Year	Assets	4.8%	5.5%	7.5%	4.8%	5.5%	7.5%
0	500						
1	510	(503)	(314)	(115)	50%	62%	82%
2	520	(506)	(313)	(115)	51%	62%	82%
3	527	(507)	(311)	(114)	51%	63%	82%
4	532	(508)	(308)	(112)	51%	63%	83%
5	536	(508)	(304)	(109)	51%	64%	83%
6	538	(507)	(299)	(105)	51%	64%	84%
7	537	(505)	(293)	(100)	51%	65%	84%
8	533	(502)	(285)	(93)	51%	65%	85%
9	526	(498)	(275)	(85)	51%	66%	86%
10	515	(493)	(264)	(74)	51%	66%	87%
11	504	(486)	(251)	(61)	51%	67%	89%
12	491	(477)	(236)	(45)	51%	68%	92%
13	477	(466)	(218)	(26)	51%	69%	95%
14	463	(451)	(196)	(2)	51%	70%	100%

These two cases do not, obviously, comprehensively show the range of possibilities. Lower initial funding levels increase required contributions, but generally result in modestly lower final funding

levels on a termination basis. Higher initial funding ratios result in no new contributions, but can produce higher final funding ratios as a result of the improved starting conditions.

Higher discount rates used under the flexible discount rate rules would result in lower contributions and in lower funding ratios determined under the standard rules and under the termination basis. A lower difference between the flexible discount rates and the standard rates has the opposite effect.

Shorter durations, which result when the average pension payment is nearer-term, reduce the funding calculation benefits of flexible discount rates, while longer durations enhance it.

It should also be noted that our example is for a single plan. If a company has multiple plans with different initial funding ratios and demographics, it is possible that one or more plans might require contributions even if the aggregate numbers would seem to suggest otherwise.

In conclusion, discount rates have a powerful influence on the calculation of long-term liabilities. It is possible to construct plausible theoretical examples where the effect of a high discount rate chosen under flexible rules could allow a company to skip contributions for a number of years, despite having termination funding ratios that could pose considerable risk to PBGC. Further, in today's interest rate environment, virtually every plan that is significantly underfunded on a PBGC termination basis would show much lower required future contributions using a high flexible discount rate than they would under the rules mandated for other companies.