The Economics of Pension Insurance

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CHAPTER 7

Underfunding Exposure: The Evidence

The last chapter made the assumption that the insurance contract currently enforced by the PBGC would prevail indefinitely. Prices were set either partly or fully to accommodate the resulting risk and exposure. This chapter makes the opposite assumption: that prices for the insurance policy will remain essentially flat across firms. If premiums cannot be reasonably related to risk and exposure, then the contract must in some way be tightened to reduce the potential exposure faced by the PBGC. In this chapter, the exposure experience of the PBGC is described. In the next, various efforts to control exposure (particularly through legislation enacted in 1987) are considered. These discussions lay the framework for developing a rational pension insurance policy, which will be the subject of discussion in Chapters 9 and 10.

OVERALL UNDERFUNDING SINCE ERISA

Impact of ERISA

Prior to ERISA, the most important restrictions imposed by the government on funding levels were in the form of *maximum* contribution limits. Because pension plan contributions accumulate in a tax-exempt trust fund, the Internal Revenue Code has long constrained firms from depositing too much into the pension fund. Firms were required to fund new accruals (normal cost) but could maintain past underfunding forever (except for paying interest on the deficiency). With the passage of ERISA, the government imposed stricter *minimum* contribution requirements. In addition to requirements to fund current accruals (normal cost), firms were required to (1) use reasonable actuarial assumptions in the aggregate; (2) amortize past underfunding over 30 years; and (3) amortize the difference between experience and actuarial assumptions over 15 years.

Apparently Congress felt these standards would reduce overall exposure to levels consistent with the small premium assessed for PBGC insurance. Subsequent evidence supports the opposite conclusion: overall target funding levels were unaffected by ERISA. In fact, target funding levels of the worst-funded plans became even lower after ERISA.

At first, this assertion seems counterintuitive because observed funding levels over the post-ERISA period have generally been increasing. In Figure 7–1, I have plotted termination and economic funding ratios over the 1950–87 period. Termination funding ratios generally increase during the period due to increasing interest rates. Economic liabilities are a better measure of real funding status because they account for higher expected salary growth over time and partial price indexing after retirement. To reflect these realities, economic liabilities in the figure are adjusted to a common 2 percent interest rate for all years.

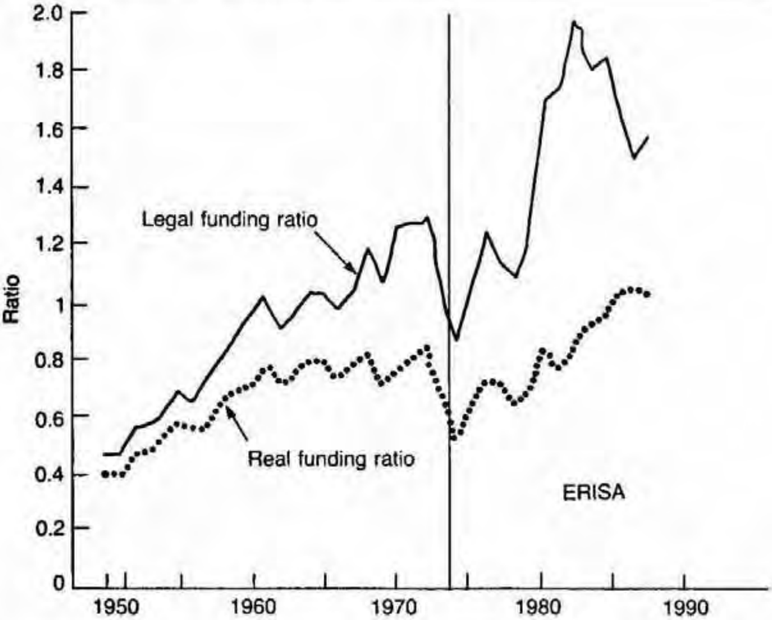
Figure 7–1 shows that, prior to ERISA, economic funding ratios increased during the 1950s but evinced little trend from 1960 through the early 1970s, though there was considerable volatility. After ERISA, a positive trend is evinced.

Closer examination of the data, however, shows that this "ERISA effect" is more apparent than real. ERISA was passed after a sharp stock market decline: during 1973–74, average economic funding ratios fell by approximately 34 percentage points (see figure). The post-ERISA increases in funding levels reflect moderate increases in stock market prices in the immediate years following its enactment and sharp increases during the 1980s. A model of pension contributions is required to separate market effects from underlying behavioral changes caused by ERISA.

Such a model is developed and estimated in the appendix to this chapter. The results show that ERISA exerted no independent impact on underlying funding ratios in the average private pension plan in the United States. Changes in market rates of return account for all of the increases in funding ratios since ERISA. In fact, the results reveal that the most underfunded plans prior to ERISA became relatively *more underfunded* after ERISA.

The essence of these results can also be glimpsed from the termination funding levels presented in the last chapter, which are reproduced in column 1 of Table 7–1. Column 1 shows the distribution of termination funding ratios in 1986 (calculated using a common 7.25 percent PBGC interest rate). Twelve years after the passage of ERISA, one out of five pension plans (weighted by participants) was less than 100 percent funded, even on a termination basis.

FIGURE 7–1 Funding Ratios, 1950–1987



On an ongoing basis, the data in column 2 of the same table reveal that over half of all plans (weighted by participants) were underfunded; one out of four was less than 75 percent funded (ongoing liabilities are estimated by converting liabilities to a common 2 percent discount rate). At the same time, almost one in five participants were in plans more than 125 percent funded on an ongoing basis. Clearly ERISA and Internal Revenue Code funding rules permit a wide distribution of funding levels to persist.[1]

Some Reasons for Persistent Underfunding

A serious gap appears between what was presumably intended by minimum funding rules and what actually happened. There can be several reasons for this, but two in particular are important. First, the

[1] Prior to the Pension Protection Act of 1987, the Internal Revenue Code reduced permissible contribution levels if firms were funded beyond 100 percent of ongoing liabilities. There are two reasons why many plans nevertheless are overfunded on this basis in Table 7–1. First, firms can make assumptions that might be inconsistent with facts. For example, if wage growth was expected to be equal to long-term nominal interest rates, the firm might use a wage growth assumption that exceeded the interest rate assumption, thus generating higher permissible contributions. Second, extraordinary market increases in trust assets could be amortized over 15 years, thereby often permitting continuing contributions even if 100 percent funding had been attained.

TABLE 7–1 Termination versus Ongoing Funding Ratios, 1986

	Distribution of Participants	
Funding Ratio	*Termination Basis** *(1)*	*Ongoing Basis†* *(2)*
0–24%	0.4%	0.8%
25–49	2.9	10.0
50–74	8.4	16.8
75–99	11.8	27.2
100–124	17.9	25.7
124–149	18.6	11.3
150+	39.8	7.9
Average	124.0	87.5

* Evaluated at a common 7.25 percent interest rate.
† Evaluated at a common 2 percent interest rate.
SOURCE: 1984 Form 5500 Annual Pension Plan Reports, projected to 1986.

Internal Revenue Code has an explicit loophole to the funding standards. By choosing a flat (instead of salary-related) pension benefit, the plan is not permitted to fund for ongoing benefits, even if the flat benefit has been, and will continue to be, increased to keep pace with wages.[2] Simply by opting for a flat benefit formula, a firm can ensure that its pension will be perpetually underfunded. Second, the amortization period of 30 years can be dramatically inadequate for a plan composed of retirees and other workers.

Illustrations of problem: Stylized example

Flat benefit. A simple example is adequate to demonstrate these points. Consider a firm that has one worker; the firm will dissolve when this worker retires. The facts of the example are as follows (these assumptions are chosen to make the illustration easy; they do not influence the essence of the results):

- The interest and inflation rates are zero over the entire time horizon.
- The worker is age 45 with 20 years' service and will retire at 55; death is certain at age 80.
- There is no chance that the worker will quit the firm prior to age 55 or that the firm will terminate until the worker retires.
- The pension pays a flat benefit; the annual annuity equals $120 for each year of service.

[2] More particularly, the actuary uses the entry-age (normal) funding method.

- The firm's actuary uses a level contribution method for calculating required contributions.[3]
- The funding ratio is currently 100 percent; the trust fund is 100 percent invested in short-term Treasury bills.

In this example, the pension liability is currently $60,000. The annuity equals $120 times 20 years of service, or $2,400, which is collected from age 55 to age 80 (25 years × $2,400 = $60,000). Assets also equal $60,000. Absent a change in benefits, the firm is required to fund its *normal cost*.

The normal cost is merely the difference in liabilities at retirement age and current age amortized over the remaining years of service. Because liabilities at age 55 will be $90,000 (same calculations as above except substitute 30 years' service for 20 years), normal cost is $3,000; that is, $30,000 ($90,000 minus $60,000 already accumulated in trust) divided by 10 years (the remaining tenure for the worker in the firm). The portfolio in the example is entirely composed of T-bills; therefore, if there are no changes in benefit levels and if normal cost contributions equal to $3,000 are made each year, then the pension fund will remain 100 percent funded until the individual retires.

Suppose, however, that the firm awards a benefit increase: it doubles the benefit to $240 per year of service. The first impact of the benefit increase is to increase the firm's normal cost contribution: it doubles the required contribution from $3,000 to $6,000. This ensures that *future service accruals* are fully funded at retirement.

However, because the higher benefit applies to *all* years of service, including past service, underfunding will be created in the firm. In fact, liabilities attributable to the first 20 years of service increase from $60,000 to $120,000; the funding ratio falls from 100 percent to 50 percent; and $60,000 in underfunding attributable to *past service liability* is created.

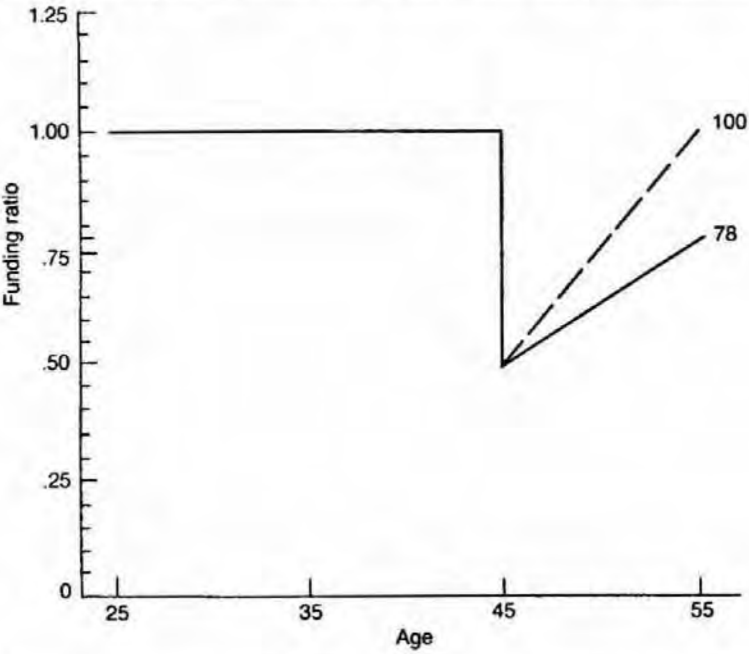
Minimum funding rules require this amount to be amortized over *30 years*, thus necessitating an annual contribution of $2,000. Maximum contribution limits would permit a contribution of up to 10 percent of past service underfunding, or $6,000 per annum.

In this example, if a firm paid the maximum allowable contribution, it would be fully funded by the time the individual retires. That is, a $6,000 contribution each year fully amortizes the $60,000 underfunding over 10 years.

If the firm makes the minimum contribution instead, it will have

[3] Ibid.

FIGURE 7–2(a) Inadequate Funding Rules—Flat Benefit Plan

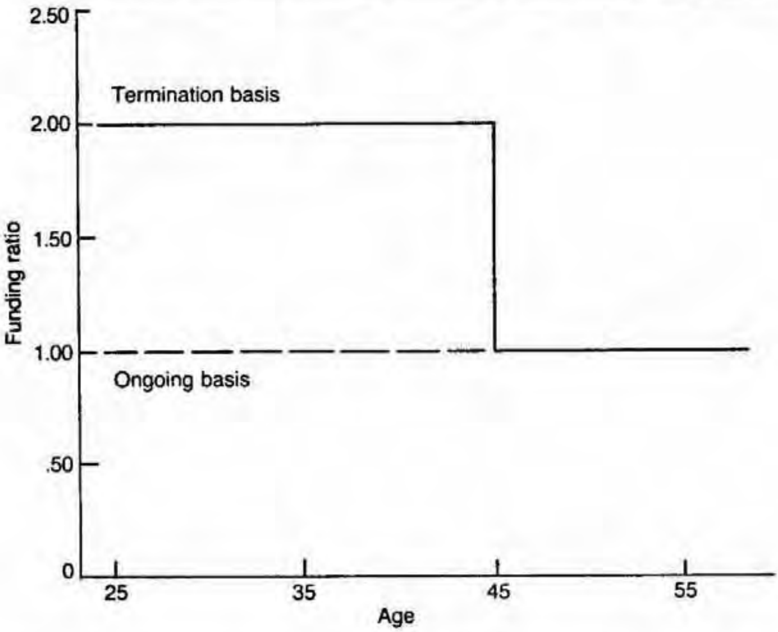


paid off only one third of the past service credit in the ensuing 10 years. If the firm dissolves at the time of the worker's retirement at age 55 (which it will by assumption in the example) and has no net worth at termination, the PBGC will inherit a claim for $40,000, even though the firm satisfied its minimum funding requirement in all years. Liabilities at termination will be $180,000, and assets will equal $140,000; thus the funding ratio will be 78 percent.[4]

Though this example is highly simplified and stylized to demonstrate a point, it illustrates the underfunding problem that can arise when plans with flat benefit formulas increase benefits when the work force is relatively old. The example is visually demonstrated in Figure 7–2(*a*). The broken line in the figure denotes the funding ratio path assuming that the plan sponsor pays the maximum contributions after the benefit increase; the solid line depicts the payment of minimum contributions.

[4] Liabilities at age 55 equal the annual annuity, $240 times 30 years of service, collected for 25 years of retirement: $240 × 30 × 25 = $180,000. Assets equal the $60,000 balance at age 45, plus $60,000 in additional normal cost contributions ($6,000 per year times 10 years), plus $20,000 in past service amortization contributions ($2,000 per year times 10 years).

FIGURE 7–2(*b*) Inadequate Funding Rules—Salary-Related Plan



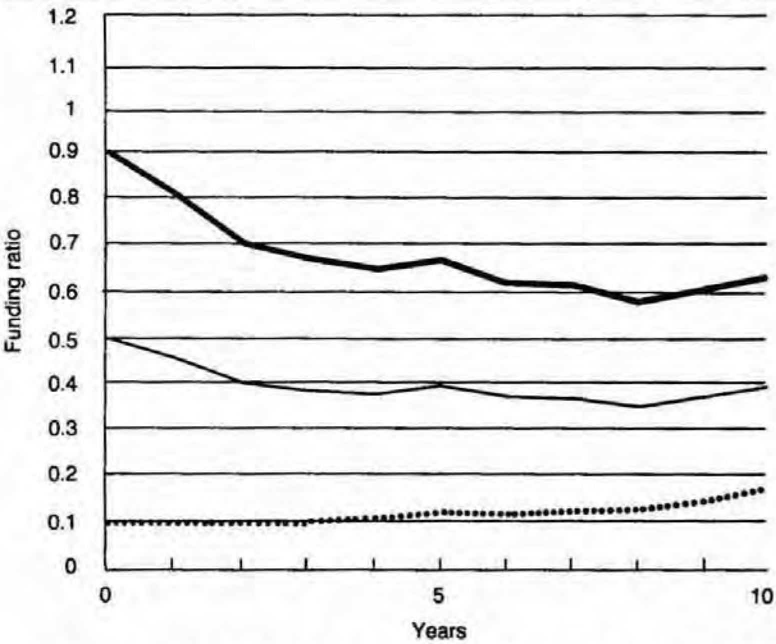
Salary-related benefit. The problem described above generally would not exist in a plan with benefits related to final salary.[5] To illustrate, suppose annuity benefits were 2.4 percent for each year of service, and starting salary was $5,000 (this is equivalent to a benefit of $120 per year of service). In this firm, real salaries generally increase at the rate of 2.3 percent per year, so the ending salary after 30 years will be twice the starting salary, or $10,000.

The Internal Revenue Code requires the actuary to take account of higher expected wages at retirement. In fact, if the level contribution method is used, the actuary in year one calculates expected benefits at retirement equal to 2.4 percent times 30 years times *projected* salary at retirement ($10,000); this generates an annuity equal to $7,200, which is valued at $180,000 at retirement (recall the assumption of a zero interest rate).

The normal cost in this plan is $6,000 per year ($180,000 spread over 30 years). If the salary remains at $5,000 through age 45 and then

[5] A similar problem to flat benefit increases arises in a salary plan if, for example, the generosity of the plan is increased midstream. This is different, however, than generating a built-in underfunding feature, merely because benefits increase because of inflation.

FIGURE 7–3(a) Adequacy of Minimum Funding Rules, 1975–1985—Flat Benefit Plan



Funding ratio over time for flat benefit plan with periodic plan amendments to bring benefit levels into line with price increases, assuming three different beginning ratios. Participants have high average age and service, with almost half over age 50. The total size of the group is slowly declining.

doubles, the ongoing funding ratio is 100 percent over the entire 30 years of the worker's career (because it recognizes the ending wage from the very beginning of tenure). The termination ratio equals 200 percent until age 45 (because this calculation reflects current, not projected, wages). At age 45, this ratio falls to 100 percent, coincident with the ongoing ratio at this age. This example is demonstrated in Figure 7–2(b).[6]

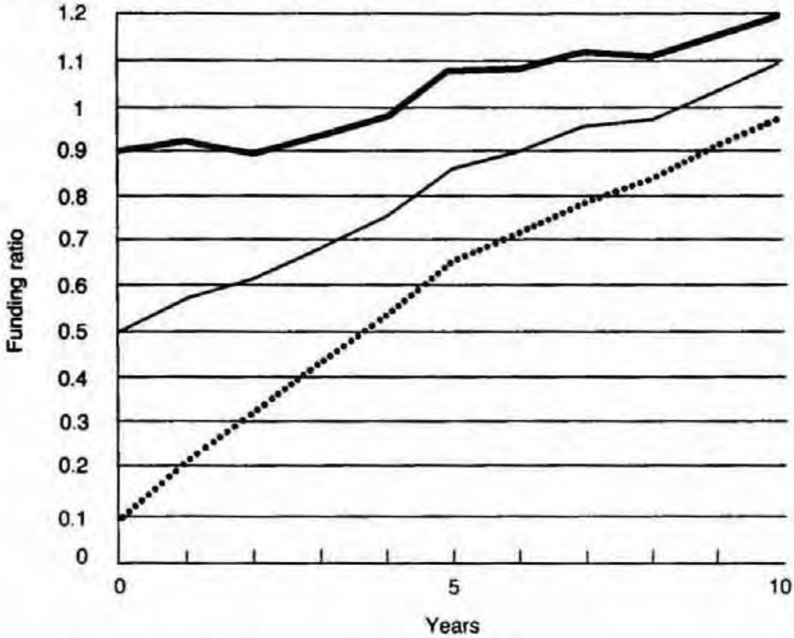
Other illustrations

American Academy of Actuaries plans. The principles developed in the above example also can be demonstrated using a realistic pension plan. In its study, *Pension Promises at Risk*, the PBGC presented the impact of funding requirements in two types of plans

[6] This does not suggest that a firm cannot deliberately underfund a salary-related plan. In the above example, underfunding could be developed by assuming that the final wage would be $7,500 instead of $10,000. Then, at age 45 when the wage was increased to $10,000, a large amount of underfunding would be generated, which would be amortized as an "actuarial loss" over 15 years. Because the plan will terminate in 10 years by definition, underfunding would exist at termination.

FIGURE 7–3(*b*) Adequacy of Minimum Funding Rules, 1975–1985—Salary-Related Plan

Funding ratio over time for a salary-related plan covering a mature and stable group of participants that is expected to grow, assuming three different beginning ratios.



The figures show the dramatically different effect of the current minimum funding standards on two "typical" defined benefit pension plans with differing characteristics. Each figure shows changes in the plan's funded ratio over a 10-year period, assuming the plan sponsor makes all contributions required by the minimum funding standards and that investment returns replicate the first 10 years after the passage of ERISA.

Part *a* of the figure reflects a flat benefit plan with periodic plan amendments to bring benefit levels into line with price increases. Its participants have high average age and service, with almost half over age 50. The total size of the group is slowly declining. These characteristics are currently typical of many plans in troubled, capital-intensive industries, such as steel. The minimum funding standards do not result in any substantial improvement in this plan's funding. Moreover, if funding begins at a relatively sound level, it may decline markedly.

Part *b* of the figure reflects a salary-related plan covering a mature and stable group of participants that is expected to grow over time. The plan and its demographics are typical of many large companies. For this plan, the minimum funding standards work reasonably well. Whatever its initial level of funding, the plan is likely to make significant progress toward full funding.

For a full description of the plan and participants characteristics underlying these figures, see American Academy of Actuaries, Committee on Pension Actuarial Principles and Practices, *Pension Cost Method Analysis*, 1985.

SOURCE: PBGC, *Pension Promises at Risk* (Washington, D.C.: 1987), pp. 29–31.

selected from the American Academy of Actuaries, *Pension Cost Method Analysis* (1985). Different initial funding ratios were chosen; and market returns on a balanced portfolio were chosen to replicate actual asset volatility over the 1975–85 period. Minimum funding rules were applied in all cases. The results are illustrated in Figure 7–3.

Part (*b*) of the figure shows the results for a salary-related plan that has a relatively young age distribution. Regardless of the initial level of funding, the minimum funding rules lead to relatively high funding levels at the end of the period.

Part (*a*) of the figure shows the results for a flat benefit plan populated by a relatively old work force. Benefits for active workers are increased every two years in the example in amounts equal to the two-year inflation rate. The results are dramatically different: plans that start with very low funding levels maintain virtually the same levels at the end of the period; those with relatively high funding levels show marked deterioration of funding levels. For example, a firm in the latter circumstance that started the post-ERISA period with a funding ratio equal to 90 percent ended with a funding ratio equal to 60 percent.

Allis-Chalmers. These illustrations are not merely theoretical. When the Allis-Chalmers United Auto Workers pension plan terminated in 1985, it had assets equal to $2.3 million and guaranteed liabilities equal to $176 million; the funding ratio was 1.3 percent. The plan used assumptions that were not unusual (for example, it used an assumed interest rate of 7.0 percent, compared to 7.6 percent for all plans in 1985) and met the minimum funding standards throughout the post-ERISA period. The problems in this termination are attributable to a flat benefit formula and a relatively old work force.

The problem is not isolated to one plan. Table 7–2 lists 35 terminated plans that had funding ratios of less than 20 percent at termination. These plans accounted for over $1 billion in underfunding of guaranteed benefits at termination (current dollars).

DEFUNDING PRIOR TO TERMINATION

The above discussion does not adequately describe the extent of the exposure problem facing the PBGC. In addition to ineffective funding rules, funding levels tend to fall quickly during the periods preceding termination. The incentives are apparent: the larger the amount of underfunding at the time of termination, the larger the transfer from the PBGC. Defunding can occur in numerous ways.

Methods of Defunding Prior to Termination

Waivers. Firms in financial difficulty can make a request to the Internal Revenue Service for a waiver from its minimum contribution requirement. Though the IRS generally has accommodated these requests, its policies in awarding waivers have presumably been tightened over time.[7] Prior to the Pension Protection Act (PPA) of 1987, the

[7] Based on admittedly ad hoc evidence (the overall waiver policy of the IRS is not available to study because of the confidential nature of tax records), the IRS appears

TABLE 7–2 Thirty-Five Poorly Funded Terminations

Plan Sponsor	*Date of Termination**	*Underfunding Amount ($ millions)*	*Funding Ratio*
White Motors Co. Auto Car Hourly	11/30/81	$ 6.5	0.0%
Hotel and Restaurant Employees and Bartenders Union	09/30/77	3.7	0.0
Kaiser Steel Salaried	02/28/87	31.5	0.0
Washburn Wire Co. Pension Plan	10/01/79	6.4	0.0
Retail Clerks Union 1357	10/27/80	3.5	0.2
Central Foundry Co. Molders	05/18/81	5.8	0.2
City Stores, Inc.	10/27/80	14.9	0.6
Heppenstall Co. Hourly Employees	05/31/79	13.9	1.1
Bohack Corp. Nonbargaining	10/31/77	2.8	1.2
Williams Press, Inc. Retirement Plan	12/13/85	2.7	1.2
Standard Tube of Detroit	12/30/83	2.7	1.2
Allis-Chalmers Corp. Hourly	07/26/85	173.8	1.3
White Motors Co. Salary	11/30/81	3.2	2.4
Republic Steel	09/30/86	219.2	2.7
Gateway Transportation Co.	06/15/82	4.0	2.9
McKeesport Steel Casting	04/13/84	3.9	5.2
Volco Steelworkers	10/22/85	5.8	5.7
Acme-Hamilton Local 95	05/15/78	5.1	5.8
Washburn Wire Company	10/31/76	13.2	8.1
Rath Packing Co.	09/13/82	55.4	9.1
Mid-Vale Heppenstall Company	04/30/76	5.1	9.2
AlloyTek, Inc. Hourly	10/31/79	4.6	9.7
Ingersoll Products Corp.	12/31/85	10.6	10.2
Kaiser Steel Hourly	07/28/87	201.0	12.2
Diamond REO Trucks, Inc. UAW	05/31/75	9.9	12.6
Mansfield Tire & Rubber Co.	06/30/79	24.0	13.3
White Farm Equipment—Hopkins	09/14/82	6.3	13.4
White Farm Equipment—Hourly	09/14/82	32.7	13.6
Phoenix Steel Corp. Claymont	08/22/83	22.8	14.4
LTV—Continental Emsco	04/30/88	8.4	14.9
Alan Wood Steel Co. Hourly	11/01/77	34.8	16.8
Penn Dixie Cement Division Hourly	05/10/81	19.4	17.4
Century Brass Products, Inc.	12/02/85	29.7	18.7
Chase Brass and Copper Co.	06/28/76	13.3	19.3
White Motors Co. Cleveland Union	11/30/81	45.7	19.9
Total		$1,046.3	7.5%

* Estimated for pending cases.
SOURCE: PBGC Case Processing File.

IRS could approve these waivers in any 5 out of 15 years. (The PPA reduced the number from five to three.)

Chapter 4 discussed the case of Rath Packing. During the period prior to termination, Rath obtained five waivers amounting to almost

over time to be more aggressive in requiring security against its waivers. In the absence of security, the IRS, even before SEPPAA, began requiring as a condition to the waivers that unpaid waivers would be treated as taxes in bankruptcy proceedings.

TABLE 7–3 Waiver Amounts in Relation to Claims (dollars in millions)

	Number	*Amount*	*Number*	*Amount*
Waivers granted 1980 and 1981			115	$622
Claims from this group through 1987	23	$136		
Waivers to subgroup	—	$26.6		$26.6
Percent of claims		19.5%		
Percent of all waivers to claimants through 1987				4.2%
Claims made 1983–1985			321	$840
Waivers awarded to this group, 1981–1984			44	$113
Percent				13.4%

Note: Numbers in this table do not represent the population of all claims and waivers; the numbers are taken from the sample of plans studied by VanDerhei.

SOURCE: Jack VanDerhei, "An Empirical Analysis of Risk-Related Insurance Premiums for the Pension Benefit Guaranty Corporation," final report submitted to the PBGC, 1988.

$30 million. In 1982, it terminated its plan, making a claim in the amount of $60 million. When Continental Steel terminated its plans in 1986, it too had received five consecutive waivers accounting for roughly half of its claims.[8]

Table 7–3 provides more systematic data on this point. In his study, VanDerhei (see Chapter 6) made two calculations reflecting the importance of waivers. First, using Form 5500 data, he calculated all waivers granted during the 1980–81 period. He found 115 waivers in his database amounting to $622 million.

Using the PBGC Case Processing File, he then tracked all waiver recipients through 1987 to find those that became claimants to the PBGC. He found that 23 claims from this group accounted for roughly one in five waivers granted during the 1980–81 period. The claimants, however, tended to be small, accounting for only $26.6 million in waiver amounts, or 4.2 percent of the total amount of waivers granted. Among the waiver recipients that became claimants, however, waivers accounted for 19.5 percent of their total claims. These data are reflected in the top part of Table 7–3.

In short, most waivers granted do not turn out to be bad loans, but

[8] Information on Continental Steel is taken from the PBGC Annual Report, 1986, p. 24.

TABLE 7–4 Unpaid Contributions (amounts in millions)

Years	*Unpaid Contributions (Uncollectible)*	*Claims*	*Percent*
1975–1980	$ 26.4	$147.3	17.9%
1981–1987	154.7	738.3	20.9
Total	$181.1	$885.6	20.4%

Note: Numbers based on a sample of 598 claims from the PBGC Case Processing File. Other cases did not have records sufficiently complete to include in the calculations.

those that do, account for a significant portion of total claims. Data in the bottom part of Table 7–3 provide more information on this point. VanDerhei found that of $840 million in claims paid by the PBGC from 1983 to 1985 for which he had data, fully 13.4 percent was attributable to waivers.

Unpaid contributions. In addition to obtaining legal waivers from the IRS, many firms anticipating a termination simply do not pay minimum contributions to the plan, particularly those firms anticipating filing for Chapter 11 of the Bankruptcy Code. One legal way this can occur is if the firm makes a *request* for a waiver from the IRS. Until the IRS makes a determination (which can take upward of one year), the firm is not required to make a contribution. Or the firm simply may fail to make its required contribution. In this case, the IRS may take more than one year to discover the underfunding (through subsequent 5500 reports); and even then it may take no action.

The IRS is entitled to assess a 100 percent excise tax on a missed contribution, but it has not been successful in enforcing this option. In bankruptcy proceedings, these assessments are treated as penalties, which take on a very low priority. Once in a bankruptcy proceeding, the PBGC has usually recaptured only a small portion of missed minimum funding contributions.

Data in Table 7–4 describe the extent of the problem. A sample of 598 claims that had sufficient data was used to compare claims amounts against due and unpaid contributions to the plan at the time of the termination. The first column in the table lists the amounts uncollectible after settlement of claims. Of $885 million in final claims against the PBGC from this sample, fully $181 million (accounting for 20.4 percent of claims) was attributable to uncollectible, unpaid contributions to the plan.

Shutdown benefits. The principal funding problem affiliated with a shutdown is that new benefits arise only if a plant closes. Actuaries are supposed to attach some probability to this event, particularly when firms encounter financial difficulty. In practice, it is usually treated as a very small probability and therefore essentially ignored. In essence, shutdown benefits are not funded until the event occurs, and until 1987 they were amortized over 15 years.

Recall our above example with one worker in the firm, aged 45 with 20 years of service. The interest rate was zero, and an annual annuity equal to $120 per year of service was paid from age 55 (retirement) to age 80 (death). The firm's current liability was $60,000, which by assumption was equal to assets. If benefits are not increased, then when the worker retires at age 55 with 30 years of service, normal cost contributions would ensure sufficient assets to cover $90,000 in liabilities at that age.

Suppose, however, that the firm closes its plant immediately (when the worker is age 45). The plan has a shutdown benefit "rule of 65"; thus, with his current 20 years' service plus 45 years in age, the worker qualifies for full benefits immediately. Liabilities are no longer equal to an annuity of $120 times 20 years' service times 25 years of retirement ($60,000). Instead, the retirement period increases from 25 years to 35 years, and the plan is immediately underfunded. It has $60,000 in assets, but its liabilities are $84,000 (35/25 times $60,000). On shutdown, the funding ratio falls from 100 percent to 71.4 percent. Because the PBGC guarantees shutdown benefits (assuming the shutdown preceded the plan termination date), it faces a claim in this example equal to approximately 30 percent of the liability amount, even though the firm satisfied all its funding requirements.[9]

As discussed in Chapter 5, shutdown benefits (and other early benefit guarantees) have been responsible for a significant portion of claims made against the PBGC. But terminations during the 1980s have shown that these guarantees are more costly than recognized in the original PBGC study (see Chapter 5). For example, with the termination of LTV Corporation's pension plans in 1986, the agency assumed a claim of $2.3 billion. Of this, rough estimates suggest that fully $600 million to $700 million was attributable to shutdown benefits alone; unreduced early benefits might have accounted for another $400 million to $500 million. Thus, shutdown and unreduced early benefits could have accounted for fully half of the $2.3 billion claim.[10] Similar calculations apply to other steel terminations in the early to mid-1980s.

Changing actuarial assumptions. Actuaries are not supposed to change their assumptions to facilitate defunding of plans prior to termination. If they are accommodating, however, they can help the

[9] I chose an example where the monthly full benefit is $200 and therefore fully guaranteed by the PBGC at age 45. More generous benefits might be constrained by the maximum benefits limitation (see Table 5–2).

[10] These estimates account for the erosion of funding attributable to payment of shutdown benefits prior to plan termination. Other estimates presented in Chapter 5 reflected only the post-termination cost of continuing to pay these benefits.

firm increase its expected transfer. For example, recall the one-worker example used above. The yearly pension annuity equals $120 times years of service beginning at age 55 after 30 years of service; death occurs at age 80. Assuming a zero interest rate, the normal cost contribution is $3,000 per year. At age 40, assets equal $45,000 ($3,000 contribution per year times 15 years). The present value of pension benefits at retirement age 55 is $90,000 ($120 per year of service times 30 years, collected from age 55 to age 80).

For the sake of illustration, consider an extreme example. Suppose that when the worker is age 40, the actuary switches to a 5 percent discount rate instead of zero (despite the fact that market interest rates are zero). At 5 percent, the present value of the annuity based on a projection of service to be paid starting at age 55 is valued at age 40 at roughly $25,000. With a zero percent interest rate, the value of the full pension based on 30 years of service evaluated at age 40 is $90,000.

This change in liability valuation at age 40 generates a $65,000 gain from a change in actuarial assumptions ($90,000 minus $25,000). The gain must be amortized and offset against the normal contribution using a 5 percent interest rate and a 30-year amortization period. This yields a $4,183 credit to the funding account, which completely offsets the required $3,000 normal contribution,[11] and thus the net required contribution goes to zero.[12] This game might be even easier to play after 1988, because the Pension Protection Act made amortization periods shorter.[13]

Evidence of accommodating actuarial assumptions is apparent even when cross-section funding ratios are observed. In the top portion of Table 7–5, funding ratios are listed for firms filing Form 5500 Reports in 1984. Funding ratios are normalized to a standard interest rate, 7.25 percent. The distribution of these ratios is compared against the interest rate assumed in the plan. Other things equal, the higher the assumed interest rate, the lower the required contribution.

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[11] Amortization of $65,000 (like a house) over 30 years using a 5 percent interest rate yields a credit of $4,183.

[12] After three years, the actuary would be required to assess the reasonableness of the 5 percent assumption. Assuming actual interest rates turn out to be zero, he would be required to annuitize the "actuarial loss"; but by the time this occurs, termination may already have occurred. In addition, if an actuary took the extreme step described above, he might be liable to the PBGC for losses attributable to his actions. A smaller change, however, would substantially lessen this possibility and still make a significant difference in required contributions to the plan.

[13] The Pension Protection Act (PPA) changed the amortization period for gains and losses due to changes in assumptions to 10 years. In the context of the example which assumes a 5 percent interest rate, this generates a credit of $8,259, not $4,183. As long as the assumed interest rate is reasonable, the PPA does not preclude opportunistic use of assumptions. In the above example, it might be considered unreasonable if the interest rate were increased from zero to 5 percent. It would be harder to make the case that a 2 percent interest rate assumption was unreasonable.

TABLE 7–5 Relation of Assumed Interest Rates to Type of Plan

Category of Plan	*Assumed Interest Rate*
1984 Funding ratios	
Less than 75%	8.2%
75–125	7.9
More than 125	7.7
1986 Risk categories	
Very-high-risk plans with exposure	8.7
All plans	7.6

Note: Funding ratios are normalized to a 7.25 percent interest rate.
SOURCE: Form 5500 Annual Pension Plan Reports, 1984; and PBGC exposure calculations.

The results in the table suggest that firms with the lowest standardized funding ratios use the highest assumed interest rates. For example, plans that are over 125 percent funded using the PBGC rates use a 7.7 percent assumed interest rate on average; those with less than 75 percent funding use an 8.2 percent rate on average.

Data in the bottom portion of Table 7–5 are even more revealing. The 1987 PBGC exposure measurements identified 14 firms as "very high risk"; these firms hold over $5 billion in exposure for the PBGC (see Chapter 4). On average, these plans used an assumed interest rate equal to 8.7 percent, compared to 7.6 percent for all firms included on the Compustat database.

The VanDerhei study also included information consistent with these findings. He indexed assumed interest rates of PBGC claimants relative to all pension plans over the five-year period prior to termination. He found that interest rates assumed in terminated plans were the same as the pension universe until the plan year prior to termination. In that year, interest rate assumptions increased to 154 percent of the average assumed interest rate (see Table 7–6).

Lump-sum payouts. Another way to increase the PBGC transfer is to pay lump-sum cash-outs prior to termination. ERISA permits pension plans to offer lump sums in defined benefit plans in lieu of an annuity, if the worker agrees. (The firm may unilaterally cash out a worker if the lump-sum benefit is less than $3,500.) The advantage to this method is that a firm anticipating a plan termination can manipulate the PBGC into paying a larger transfer than it otherwise would. The plan can essentially (1) cause the PBGC to pay more than the maximum guaranteed amount and (2) use an interest rate lower than the PBGC rates.

These effects can be illustrated by a simple example. There are only two workers in a firm, both age 55. One just retired on an annuity of

TABLE 7–6 Changing Interest Rate Assumptions

Years to Termination	*As a Percent of Average of All Plans*
5	100%
4	98
3	97
2	103
1	154
0	N/A

SOURCE: Jack VanDerhei, "An Empirical Analysis of Risk-Related Insurance Premiums for the Pension Benefit Guaranty Corporation," final report submitted to the PBGC, 1988.

$1,250 per month; the other is about to retire at the same annuity level. Suppose the PBGC interest rate is 10 percent, and the plan uses this rate to pay lump sums. Assume all retirees die with certainty at age 80 and there is no joint and survivor option in effect. Using a 10 percent discount rate, the present value of the $1,250 monthly annuity for the current retiree is almost $138,000. If the second worker retires on the same annuity, the present value for these two annuities at that instant is twice this amount, or $276,000.

Suppose the plan has $200,000 in assets. If the plan terminates at this time (assuming none of the underfunding is recoverable from the employer), the PBGC would first reduce the annuity to its maximum amount, $859 at age 55 (see Table 5–2). This would reduce its liabilities to approximately $190,000, and thus there would be no claim: there are $190,000 in guaranteed liabilities and $200,000 in plan assets.

If, however, the firm cashes out the second retiree instead of awarding an annuity, it could evade the maximum. That is, the plan would give the retiring worker a lump sum equal to $138,000, leaving $62,000 in assets in the plan. On termination, the PBGC is faced with $95,000 in guaranteed liabilities for the sole existing retiree ($859 monthly from age 55 to age 80, discounted at 10 percent) and $62,000 in assets; it faces a claim of $33,000. In effect, the plan has circumvented the maximum benefits constraint for its about-to-retire worker.

The transfer can be increased yet again if the plan cashes out the new retiree at a lower interest rate than the PBGC close-out rate. Suppose the plan reduces its interest rate assumption from 10 percent to 7.5 percent in anticipation of the impending termination. It would then award a cash-out in the amount of almost $170,000, which leaves $30,000 in assets in the pension plan. The PBGC is still left with a liability of $95,000 for the sole existing annuitant; thus, the claim increases from $33,000 to $65,000. This example is summarized in Table 7–7.

Theoretically, the excess portion of lump sums distributed between

TABLE 7–7 Illustration of Lump-Sum Effects

Plan Variables at Termination	*No Lump Sum*	*Lump Sum*	
		i = 10 percent	*i = 7.5 percent*
Assets	$200,000	$62,000	$30,000
Liabilities	190,000	95,000	95,000
Claims	–0–	33,000	65,000

Note: The variable *i* denotes the interest rate used by the plan.

Assumptions: Two workers age 55, one just retired, one about to retire. Annuities of both are $1,250 per month; death occurs at age 80; the PBGC interest rate is 10 percent.

the date of termination and three years prior to termination can be recaptured under Section 4045 of ERISA. This provision, however, is costly to enforce. If pursued, the PBGC must try to recapture "excessive" payouts from individual participants, some of whom may not be able to repay and all of whom have a right to appeal.[14]

Benefit increases. In principle, benefit enhancements during the pretermination period present a significant moral hazard problem. The PBGC insures 100 percent of benefit increases adopted five years prior to termination. It also insures benefit increases more recent than five years at the rate of 20 percent each year the increase is in effect. Therefore, only 20 percent of increases awarded 12 months prior to termination are guaranteed. Suppose a pension benefit is $120 per year of service, and the firm increases the benefit to $220. If termination occurs in five years, the entire $220 benefit would be guaranteed at termination. If termination occurs in two years, $160 would be guaranteed (the original $120 benefit plus 40 percent of the $100 increase).

Increases in benefits in exchange for lower wages may be rational behavior for failing firms. Consider the one-worker firm used above. If the interest rate is zero, the $120 annual benefit per year of service is worth $60,000 when the worker is age 45 with 20 years of service (retirement occurs at 55; death at 80). A troubled firm can obtain a loan from the worker, guaranteed by the PBGC, by doubling the pension benefit to $240, thus increasing pension value as of age 45 to $120,000. In exchange, as the benefit becomes fully insured over five years, the worker ought to be willing to give up $60,000 in cash wages over his 10 years of remaining tenure.

Further, because his next 10 years of pension accrual (from age 45 to retirement at age 55) amounts to $60,000 instead of $30,000, an

[14] Under certain circumstances, the PBGC can pursue the plan sponsor for these overpayments, but this would not be typical.

additional $30,000 in wage concessions ought to be possible. Thus, if the worker's wage was $30,000 per year plus a $120 pension benefit, he would earn the same compensation if his insured pension benefit was doubled to $240 and his cash wage reduced to $21,000 per year.[15]

Some risk premium would be required at first because the loan is not fully guaranteed for five years. But because this guarantee is phased in at 20 percent per year, the premium could be reduced rapidly. After five years, the loan is fully guaranteed by the PBGC; thus the worker earns the same compensation in the two schemes, and the firm obtains working capital at a risk-free rate.

While this is a potentially important problem, it has been the subject of little study. The only study I know of was done by the General Accounting Office (see below). The study found "numerous" benefit increases in a sample of terminations it studied for the 1983–85 period, but it did not quantify the magnitude of the increases in relation to claims.

Another example is found in the steel industry. In 1978, the United Steelworkers of America renegotiated shutdown benefits from a "rule of 70" to a "rule of 65", thereby reducing the age-plus-service requirement to receive early benefits on a plant shutdown.

Quantitative Effects of Defunding

VanDerhei study. The above discussion demonstrates numerous avenues available to firms to defund their plans prior to termination; and certainly firms have taken advantage of these provisions. VanDerhei's study (see Chapter 6) made a quantitative estimate of the overall effect of defunding prior to terminations. In particular, VanDerhei had a list of 48 claims filed against the PBGC through 1985 for which he also had records on Form 5500 filings in prior years.

It is inappropriate to infer behavioral effects simply by tracking funding ratios in soon-to-be-terminated plans. Funding ratios are influenced by volatility in asset values and interest rates, not just changes in contributions and benefits. Thus, VanDerhei calculated funding ratios in soon-to-be-terminated plans, indexed by overall funding ratios in the defined benefit universe. All these funding ratios in a given year were converted to a common PBGC interest rate prevailing at the time. These calculations were made for the year of termination and for each of five years prior to termination.

The study showed that, on average, funding ratios among claimants

[15] In the old contract, the worker would earn $300,000 in salary in the next 10 years and have $90,000 in pension benefits, for a total of $390,000. In the new contract, he earns $210,000 in cash wage and $180,000 in pension benefits, which also totals $390,000.

TABLE 7–8 Defunding Prior to Termination

Years Prior to Termination	*Standardized Funding Ratio*	*Defunding*	
		Annual	*Cumulative*
5	77%	—	—
4	72	−5	−5
3	68	−4	−9
2	53	−15	−24
1	45	−8	−32
0	27	−18	−50

Standardized funding ratio: Funding ratios in soon-to-terminate plans divided by average funding ratio in pension plan universe during same year, evaluated at the same interest rate. Result is multiplied by 160 percent, the average funding ratio over the period using PBGC close-out rates. Results based on 148 terminated plans from 1980 to 1985.

SOURCE: Jack VanDerhei, "An Empirical Analysis of Risk-Related Insurance Premiums for the Pension Benefit Guaranty Corporation," final report submitted to the PBGC, 1988.

amounted to 17.1 percent of the funding ratios in the pension universe at the time of termination. Five years prior to termination, these plans had funding ratios equal to 48.5 percent of funding ratios for the pension universe. Because the average funding ratio over the period was 160 percent (using the PBGC immediate annuity interest rate), this finding means that the average terminated plan in the sample exhibited a termination funding ratio of 27 percent at the time of termination and 77 percent five years prior to the event. Defunding was evident during the entire five-year period prior to termination (see Table 7–8).

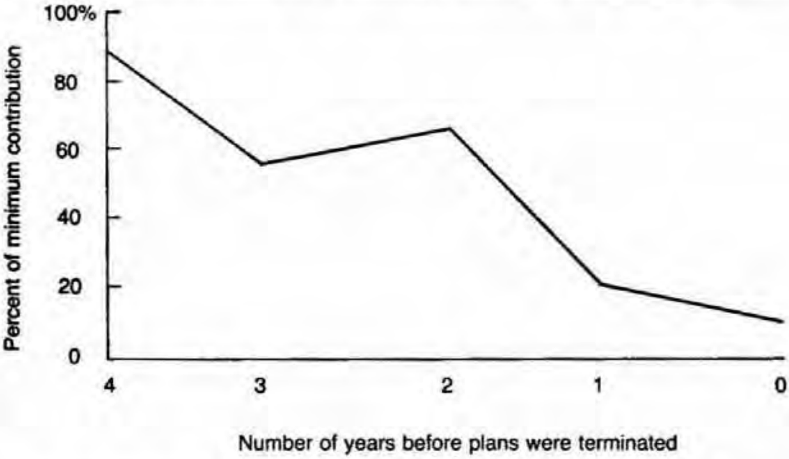
The GAO study. These results are similar to those found in a March 1987 study performed by the U.S. General Accounting Office entitled *Pension Plans: Government Insurance Problem Threatened by Its Growing Deficit*. The study evaluated the 33 largest claims paid by the PBGC from 1983 to 1985. By normalizing liabilities to interest rates prevailing at the date of termination, the study found that funding ratios fell from 56 percent of vested benefits five years prior to termination to 34 percent at termination.

These results are not as revealing as the VanDerhei study because they do not adjust for generally increasing asset values over the period of study, which underestimates reductions in funding for those plans relative to the entire defined benefit plan universe. Nevertheless, the GAO results are consistent with those found in the VanDerhei study.

The GAO study also calculated the ratio of actual to minimum contribution amounts. The results are shown in Figure 7–4 for the five years preceding termination. There is a clear trend toward lower contribution rates as the termination event approaches.

The GAO study concluded that this defunding process was attributable to several factors, including inadequate funding standards,

FIGURE 7–4 Decline in Ratio of Actual to Minimum Contributions



SOURCE: U.S. General Accounting Office, "Pension Plans: Government Insurance Program Threatened by Its Growing Deficit," Report to the Subcommittee on Oversight, Committee on Ways and Means, House of Representatives, March 1987.

increases in benefits prior to termination, waivers, and unpaid contributions. Consistent with data shown in Tables 7–3 and 7–4, the study found that waivers and unpaid contributions alone accounted for 30 percent of the PBGC's claims for these plans. Of this amount, 23 percent was due to waivers, 32 percent to overdue unpaid contributions, and 45 percent to contributions due but unpaid at termination.[16] A summary of the GAO findings is presented in Table 7–9.

Trends in relative funding. The combination of persistent low funding levels for some plans in the universe and defunding prior to termination has important effects on claims paid by the PBGC. Moreover, the problem appears to be growing over time. In column 1 of Table 7–10, funding ratios are listed for insufficient terminations taken over by the PBGC. In column 2, comparable funding ratios are listed for all defined benefit plans, evaluated at the same PBGC interest rates. The funding ratios of PBGC claims indexed to overall market termination funding ratios are shown in column 3.

The results show a clear reduction in relative funding ratios of terminated plans over time. From 1975 to 1980, relative funding ratios averaged 42 percent; from 1981 to 1987, they averaged 28 percent.

[16] While required contributions are due only 8.5 months after the close of the plan year, they become due immediately on a termination. Following the Pension Protection Act of 1987, estimated contributions are required to be paid to the plan quarterly, with the balance, if any, due 8.5 months after the close of the plan year.

TABLE 7–9 Results of the GAO Study

Category		*Amounts*
Period of sample		1983–85
Plans in sample		33
Funding ratio at termination (%)		34
Funding ratio 5 years prior*		56
Percentage of claims attributable to waivers and unpaid contributions		30
Waivers	23%	
Overdue contributions	32	
Due and unpaid at termination†	45	
Total	100	

* Funding ratios five years prior to termination converted to same interest rate used at termination.

† Contributions are due 8.5 months after end of plan year but become due immediately on termination.

SOURCE: GAO, "Pension Plans: Government Insurance Program Threatened by Its Growing Deficit," Report to the Subcommittee on Oversight, Committee on Ways and Means, House of Representatives, March 1987.

These data are consistent with the notion that firms are learning over time how to take better advantage of the insurance system. The goal of funding reform is to reverse this trend.

CONCLUSION

In this chapter, an attempt was made to demonstrate the shortcomings of ERISA in controlling exposure for the Pension Benefit Guaranty Corporation. Despite the introduction of minimum funding rules, target funding ratios have not been affected by ERISA. In fact, the data suggest relatively poorly funded plans have become even more poorly funded during the post-ERISA period.

In addition to the persistence of large exposure levels, firms have discovered how to defund their plans prior to filing a claim with the PBGC. They do this by obtaining or simply requesting waivers, changing actuarial assumptions, increasing benefits, awarding lump-sum payments, or simply not paying required contributions to the plan.

In short, the PBGC insures against a pension underfunding exposure over which it has little control. Because its price does not reflect exposure and risk, firms have incentives to maximize the benefits of the insurance by increasing exposure. Clearly, the problem of controlling exposure needs to be addressed: exposure levels need to be consistent with premium levels permitted by Congress. Efforts toward reform are the subject of the next chapter.

TABLE 7–10 Funding Ratios: PBGC Claimants versus Universe

Year	*PBGC Claimants (1)*	*Defined Benefit Plan Universe* (2)*	*Relative (1)/(2) (3)*
1975	34%	94%	.36
1976	51	104	.49
1977	40	101	.40
1978	37	93	.40
1979	40	88	.45
1980	46	107	.43
1981	42	128	.33
1982	38	131	.29
1983	55	139	.39
1984	42	154	.27
1985	29	146	.20
1986	33†	128	.26
1987	32	138	.23

* Liabilities adjusted to end-of-year PBGC interest rates; reflects all vested liabilities.

† This number excludes the restored LTV terminated plans.

SOURCE: Appendix A to book, Tables A–7 and A–10; Wyatt Company, *1987 Survey of Actuarial Assumptions and Funding* (Washington, D.C.: 1988); and Richard Ippolito and Walter Kolodrubetz, eds., *The Handbook of Pension Statistics, 1985* (Chicago: Commerce Clearing House, 1986).

APPENDIX
Impact of ERISA on Funding Levels

This appendix evaluates the impact of ERISA on funding levels for the pension system and for underfunded plans. The impact of ERISA cannot be measured simply by observing funding levels over time. Funding levels also are affected by exogenous shocks to trust asset values; and firms react to these shocks gradually. A model incorporating behavioral changes and exogenous asset shocks is needed to estimate the underlying funding ratio the firm is trying to maintain.

Overall Funding Ratios

Consider a simple model of pension funding. The funding ratio is $f = A/P$, where A denotes trust assets and P denotes economic pension liabilities. Suppose the firm's pension contribution policy is described by the following equation:

$$\begin{aligned} C_t &= \Delta A_t - rA_{t-1} \\ &= df_{t-1}\Delta P_t + b(f^* - f_{t-1})P_{t-1} \end{aligned} \qquad (7\text{–}1)$$

TABLE 7–11 Impact of ERISA on Funding Levels

Parameter	*Coefficient*	*t-Statistic*
d	.313	2.95
b	.177	2.82
f^* (target funding ratio)	.693	9.28
E (impact of ERISA on f^*)	.014	.13
Observations	31	
Mean of dependent variable	.687	
Standard error of estimate	.042	

Note: The dependent variable is the current funding level; the equation is estimated by nonlinear least squares [see Equation (7–2)].

SOURCE: Richard A. Ippolito, *Pensions, Economics and Public Policy*, Pension Research Council Monograph (Homewood, IL: Dow Jones-Irwin, 1986), chaps. 4 and 5.

The firm's net contribution to the pension plan (C_t) is by definition equal to the net change in assets (ΔA_t) minus trust earnings (rA_{t-1}) where r is the rate of return. This amount equals some portion d, times the existing funding ratio, times the change in pension liabilities (ΔP_t), plus some portion b of the difference between the desired or *target* funding ratio (f^*) and the *actual* funding ratio (f_{t-1}), all times pension liabilities (P_{t-1}). The parameters d and b (presumably numbers between zero and unity) reflect the notion that firms cannot accommodate funding deficiencies instantaneously (due to either financial or IRS constraints).

Manipulating Equation (7–1) I can derive an equation that permits an estimate of the target funding level (f^*) for the pension industry as a whole:

$$f_t = f_{t-1}[1 + r + (d - 1)\Delta P_t/P_{t-1}] + b(f^* - f_{t-1}) \qquad (7\text{–}2)$$

The intuition behind the "stock adjustment" model in Equation (7–2) is that by observing firms increasing contributions when funding levels are low and decreasing them when they are high, firms reveal the target funding level (f^*) they are trying to attain. While actual funding levels are affected by market valuations, the target funding levels can be used as an index of long-term trends in the pension industry.

It is easy to introduce a test for ERISA in this model: simply replace f^* with $f^* + E\cdot\text{ERISA}$ in Equation (7–2), where ERISA is a dummy variable equal to unity for years after 1974, zero otherwise. A coefficient E that is significantly positive supports the hypothesis that ERISA increased average pension funding levels.

Equation (7–2) was estimated by nonlinear least squares for a time series over the 1950–81 period.[17] The results are presented in Table

[17] The time series stop in 1981 because in the following years the underlying series for the Federal Reserve Flow of Funds Accounts was changed, making data after 1982 incomparable to the earlier periods.

7–11. Estimates on the adjustment parameters d and b are within the expected range; they are significantly greater than zero but less than unity. For example, the parameter b implies that firms, on average, close about one fifth of the gap between desired and actual funding ratios in a single year. The target funding ratio (f^*) is estimated to be 69.3 percent (the 95 percent confidence intervals are 54.5 and 84.1).

The results are inconsistent with the hypothesis that the target funding level is affected by ERISA: the coefficient on the ERISA variable is insignificantly different from zero; the t-statistic is almost zero.

Underfunded Union Funding Ratios

In this section a more specific question is asked: If overall funding ratios did not change as a result of ERISA, does the evidence indicate that the most underfunded pension plans in the system were required by ERISA to enhance funding levels, thereby reducing expected levels of transfers? To test this hypothesis, I evaluated contribution behavior after ERISA for pension plans covering unionized workers. Funding ratios in these plans are one-third lower than nonunion plans (Ippolito, 1986) and represent the vast majority of past PBGC claims (see Table 3–5).

To develop this test, the contribution Equation (7–1) is rewritten for a particular firm:

$$C_t = df_{t-1}\Delta P_t + b(f^{**} - f_{t-1})P_{t-1} \quad (7\text{–}3)$$

where

C_t = contributions to the pension plan during period t
f_{t-1} = actual funding ratio last period
f^{**} = post-ERISA target funding ratio
P_{t-1} = pension liabilities last period

Let the target funding ratio be related linearly to the actual funding ratio, and industry growth IG:

$$f^* = a_0 + a_1 f_{t-1} - a_2\text{IG} \quad (7\text{–}4)$$

That is, adjusting for the economic well-being of the firm as measured by the industry growth rate, the higher the actual funding ratio, the more likely will the target funding ratio also be high.

The minimum funding rules under ERISA are presumably designed to increase firms' target funding ratios. In particular, because union funding levels are relatively low, the impact of ERISA can be modeled in the following way:

$$f^{**} = f^* + a_3 \text{ Union} + a_4 \text{ Union} f_{t-1} \quad (7\text{–}5)$$

TABLE 7–12 Impact of ERISA on Contribution Rates

Variable	*Coefficient*	*t-Statistic*
Intercept	.47	14.53
f_{t-1}	−.69	17.01
$f_{t-1}\Delta P_t/P_{t-1}$	.92	56.18
Union	−.170	3.36
Union f_{t-1}	.107	1.49
Small (<1,000 participants)	.078	3.89
Industry variables*	X	
R^2	.75	
Obs.	1,144	

Note: The dependent variable is the contribution rate divided by liabilities; the equation is estimated using ordinary least squares [see Equation (7–6)].

* Industry variables included two-digit industry dummy variables and a three-digit industry growth variable (measured by employment levels, 1972–81).

SOURCE: Annual Pension Plan 5500 Form Reports, 1978, 1981.

where

f^* = pre-ERISA target funding ratio
f^{**} = post-ERISA funding ratio

If ERISA was designed to close the union-nonunion funding gap, the coefficient a_3 will be positive (union plans in general will have increased their target funding levels disproportionately) and the coefficient a_4 will be negative (the lower the union plan's funding level, the larger the increase in its target funding ratio mandated by ERISA).

Combining these equations, the following estimable equation is derived

$$C_t/P_{t-1} = ba_0 + df_{t-1}\Delta P_t/P_{t-1} + (a_1 - 1)bf_{t-1} + ba_3\,\text{Union} + ba_4\,\text{Union}\,f_{t-1} - ba_2\text{IG} + \text{error} \quad (7\text{–}6)$$

If ERISA required union plans to close the funding gap, the coefficient on the union variable should be positive; the coefficient on the union-funding ratio interaction term should be negative. Equation (7–6) was estimated for 1,144 pension plans, using a three-year net contribution rate from 1978–81 and 1978 as the base year for liabilities and funding ratio calculations. The results are reported in Table 7–12. They not only reject the notion that ERISA required underfunded union plans to enhance funding levels, they show that the funding situation in these plans has become even worse.

The sign on the union variable is significantly negative, suggesting union plans reduced their target levels after ERISA. The positive sign on the union funding-level interaction term suggests the target funding ratio has been reduced even more by plans with the lowest funding levels to start with. While the data reject the notion that ERISA exerted a positive effect on overall funding levels, they are consistent with the notion that the most underfunded plans are becoming even more underfunded in the presence of PBGC insurance.