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5 Pension Funding, Pension Asset Allocation, and Corporate Finance: Evidence from Individual Company Data

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Private pension funds now constitute one of the largest pools of investment assets in the United States. Their total assets exceed $300 billion, and for the foreseeable future they are almost certain to grow still further in relation to the overall size of the United States financial markets. These funds already comprise by far the largest major category of institutional investor in the United States corporate equity market and the second largest (after the life insurance industry) in the corporate bond market. As private pension funds continue to account for a steadily growing share of these key markets, their behavior becomes increasingly important to the understanding of how the United States financial markets determine the yields on, and prices of, financial assets.

At the same time, both the assets held by private pension plans and these plans' liabilities for future benefit payments are now large—and growing—in relation to the nonpension assets and liabilities of the United States private business sector. Many major corporations' pension assets and pension liabilities represent substantial fractions of the net worth of the company, and in some cases even bulk large in comparison to the company's total assets. Because corporate equity shares therefore represent ownership claims on two pools of assets, and obligations via two sets of liabilities, shareholders clearly have a direct interest in the company's pension plan in addition to the quantities that appear on its balance sheet. The larger are the assets and liabilities of the company's pension plan, the

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greater is their role, along with the nonpension assets and liabilities, in determining the sponsoring company's overall risk-return prospects. Hence private pension plans increasingly matter not just for employees but for corporations' shareholders and, in the event of default, for corporations' creditors.

The growing importance of pension plans' assets and liabilities for nearly all constituencies within a typical corporation raises the possibility that the corporation's overall financial position and prospects may influence its strategy for funding its pension liabilities, as well as its subsequent allocation of these funds among alternative investment assets, in any of a number of ways. Companies may use unfunded pension liabilities as a substitute for credit market debt, or to extend overall indebtedness in conjunction with credit market debt. Similarly, companies may invest pension assets so as to mitigate, or to compound, the leverage and other risk-determining characteristics of their business. Then, too, there may be no connection at all—perhaps because managements feel a responsibility to subordinate the corporation's interest in its pension plan to the interests of the plan's beneficiaries.

Moreover, as private pension assets and liabilities continue to grow in relation to the balance sheet of the typical corporation, the possibility arises that the connection between corporate finance and pensions may be as relevant for understanding the former as the latter. If companies face limitations on the management of their pension assets and liabilities (as they do under the 1974 Employee Retirement Income Security Act), or if the treatment for tax purposes of any specific asset or liability depends on whether if falls within the pension (as it does under the current United States Tax Code), then the desired positioning of the company's consolidated pension plan and balance sheet may not be attainable solely through actions executed in the pension plan. In such circumstances companies may take at least some features of (or constraints on) the pension plan as given in making decisions about the structure of their other assets and liabilities. More generally, a company may act so as to determine the structure of its pension plan and that of its balance sheet jointly.

The object of this chapter is to test empirically for interrelationships along just these lines between United States corporations' management of their pension plans and their management of the more familiar aspects of corporate financial structure. One motivation underlying this effort is to subject to empirical scrutiny some of the theoretical hypotheses that have already emerged in the nascent literature of private pensions and corporate finance. In addition, the goal is to examine the data more broadly, to allow other regularities to appear which may be suggestive in the further development of theory describing these aspects of corporations' financial behavior.

Because of the overwhelming heterogeneity of both pension arrangements and financial structure within the United States corporate business sector, and because of the profusion of powerful economic, regulatory, and other institutional influences that have shaped the pension and general corporate financial environments in recent years, any attempt to conduct such an investigation using aggregated time-series data would be of limited value. Instead, the analysis undertaken here relies on individual company data assembled from the pension plan information that each plan sponsor provides to the Internal Revenue Service and the United States Department of Labor on Form 5500, used in conjunction with additional conventional individual company financial statistics contained in the Standard and Poor's Compustat file. The pension data are for plan year 1977, the only year for which a nearly complete Form 5500 file exists as of the time of writing.

Section 5.1 describes the data and indicates the procedures used for such steps as within-firm aggregation of multiple pension plans, merging of the Form 5500 and Compustat files, and treatment of corporate parent-subsidiary relationships. Section 5.2, which focuses on pension funding strategy, presents the results of a series of tests for relationships between corporations' funding of their pension liabilities (the total of which is taken as given here) and other characteristics of the respective firms' business and balance sheet (also taken as given). Section 5.3, also on pension funding strategy, digresses to examine the results of tests of the familiar hypothesis that corporations' decisions in this regard are oriented not to achieving fundamental financial objectives but to smoothing their reported earnings statements over time. Section 5.4, which focuses on pension asset allocations, presents the results of a series of tests for relationships between corporations' investment of their pension assets (the total of which is taken as given here) and other characteristics of the firms' business and balance sheet (also taken as given). Section 5.5 generalizes the line of investigation pursued in section 5.2 by presenting results of tests for a joint relationship between pension funding strategy and the corporation's balance sheet, thereby allowing for the possibility that balance sheet decisions may not be predetermined with respect to pension funding decisions. Section 5.6 briefly summarizes the chapter's principal conclusions, highlights some important caveats, and indicates directions for potential future research.

5.1 The Data

The Employee Retirement Income Security Act of 1974 requires each pension benefit plan sponsored by a United States corporation to file a report annually, with the Internal Revenue Service and the Department of Labor, on Form 5500 (or Form 5500-C if the plan covers 100 or fewer

participants). The form includes information about the plan's benefit structure, income and expenses for the year, beginning-of-year and end-of-year assets broken down into a substantial detail of investment categories, and the number and current status of participants in the plan. Each defined-benefit plan must also file Form 5500 Schedule B, which provides actuarial information about the plan's accrued liabilities, including its vested and nonvested liabilities separately, together with other related items. The Appendix shows the format of Form 5500 and Schedule B.

The 1977 Employee Benefit Plan Sample File contains all 29,120 Form 5500 returns submitted for plan year 1977 and processed by the Internal Revenue Service between July 1, 1978, and June 30, 1979.[1] Those returns constituted 77.5% of the Form 5500 returns ultimately submitted for plan year 1977. The 22.5% of the returns that are missing from the file are heavily concentrated among smaller plans (as measured by asset size), however.[2] Of the 29,120 returns included in the file, 4,694 either pertained to plans sponsored by nonprofit organizations or reported zero assets. The remaining 24,426 returns form the basic sample used in this chapter.

Table 5.1 shows the distribution of assets across this sample of 24,426 plans. The combined assets for all 24,426 totaled $222 billion.[3] The great majority of this $222 billion was concentrated in a small fraction of the plans. Nearly one-half of the plans had less than $1 million in assets, and more than four-fifths had less than $5 million. By contrast, the 22 plans with more than $1 billion in assets together accounted for almost one-fifth of the total, and the 55 plans with more than $500 million together accounted for almost one-third.[4]

Because many companies sponsor more than one pension plan—one plan for salaried staff and another for wage earners, for example—the 24,426 plans in the sample represented only 15,098 sponsoring corporations.[5] For purposes of testing hypotheses about relationships between pension asset and liability decisions and corporate financial behavior in the conventional sense, what presumably matters is not the assets or liabilities of any one of a corporation's pension plans but the combined assets and liabilities of all plans that it sponsors. Table 5.2 shows the distribution of the $222 billion in total assets across the 15,098 sponsoring firms in the sample. As one might expect, aggregating all plans sponsored by a single firm shifts the distribution toward larger assets for each observation, although the effect is quantitatively small.

The most common form of pension plan in the United States is the defined-benefit plan, but other forms (primarily the defined-contribution plan) exist as well. The distinction is relevant because the concept of pension "liabilities" has meaning only for defined-benefit plans. For the same reason, shareholders in a corporation have no direct financial

Table 5.1 **Asset Distribution of Disaggregated Sample: All For-Profit Sponsors**

	Distribution of Plans				Distribution of Assets			
Asset Size	Number	Cumulative Number	%	Cumulative %	Amount	Cumulative Amount	%	Cumulative %
0–0.5	7,384	7,384	30.2	30.2	1.9	1.9	0.9	0.9
0.5–1.0	4,127	11,511	16.9	47.1	3.2	5.1	1.4	2.3
1–5	8,414	19,925	34.4	81.6	19.7	24.8	8.8	11.2
5–10	1,864	21,789	7.6	89.2	13.1	37.9	5.9	17.1
10–25	1,368	23,157	5.6	94.8	21.4	59.4	9.7	26.7
25–50	600	23,757	2.5	97.3	21.3	80.6	9.6	36.3
50–100	335	24,092	1.4	98.6	23.7	104.4	10.7	47.0
100–250	218	24,310	0.9	99.5	33.1	137.5	14.9	61.9
250–500	61	24,371	0.3	99.8	21.3	158.8	9.6	71.5
500–1,000	33	24,404	0.1	99.9	23.4	182.2	10.5	82.0
Over 1,000	22	24,426	0.1	100.0	40.0	222.2	18.0	100.0

Note: Asset size categories are in millions of dollars; asset amounts are in billions of dollars.

Table 5.2 **Asset Distribution of Aggregated Sample: All For-Profit Sponsors**

	Distribution of Sponsors				Distribution of Assets			
Asset Size	Number	Cumulative Number	%	Cumulative %	Amount	Cumulative Amount	%	Cumulative %
0–0.5	3,893	3,893	25.8	25.8	1.1	1.1	0.5	0.5
0.5–1.0	2,389	6,282	15.8	41.6	1.9	2.9	0.8	1.3
1–5	5,308	11,590	35.2	76.8	12.6	15.5	5.7	7.0
5–10	1,301	12,891	8.6	85.4	9.2	24.7	4.1	11.1
10–25	1,036	13,927	6.9	92.2	16.5	41.2	7.4	18.5
25–50	491	14,418	3.3	95.5	17.2	58.4	7.7	26.3
50–100	296	14,714	2.0	97.5	20.6	78.9	9.3	35.5
100–250	246	14,960	1.6	99.1	36.7	115.6	16.5	52.0
250–500	73	15,033	0.5	99.6	25.6	141.3	11.5	63.6
500–1,000	38	15,071	0.3	99.8	26.1	167.3	11.7	75.3
Over 1,000	27	15,098	0.2	100.0	54.8	222.2	24.7	100.0

Note: Asset size categories are in millions of dollars; asset amounts are in billions of dollars.

interest in how the assets of a defined-contribution plan perform. Of the 24,426 plans in table 5.1, 16,200 sponsored by 10,470 different companies, and with $165 billion in assets, were defined-benefit plans. Nevertheless, 856 of these plans failed to file Schedule B in time for the Internal Revenue Service to process it, along with the corresponding Form 5500 return, before June 30, 1979. The remaining 15,344 plans, sponsored by 9,899 companies, reported $152 billion in combined assets. Table 5.3 shows the distribution of these assets across the 9,899 firms.

The information contained in Form 5500 is insufficient, of course, to facilitate tests of hypotheses about relationships between pension asset and liability decisions and corporate finance decisions in the conventional sense. Some source of information about each sponsoring company's balance sheet, as well as its income statement and other aspects of its financial situation, is also necessary. Because many of the 15,098 companies sponsoring pension plans included in the 1977 Form 5500 sample are either small or closely held, however, obtaining such information on a comprehensive basis would be impractical if not impossible. By contrast, most of the larger companies are included in the Standard and Poor's Compustat file. A systematic search, based on a computer procedure supplemented with "by hand" inspection, revealed 1,690 corporations included in the Compustat file that were sponsors of 5,788 pension plans included in the 1977 Form 5500 sample.[6]

Even so, simply matching Compustat firms with pension plan sponsors would still be inadequate. The Compustat file reports balance sheets and earnings statements for each included corporation on a consolidated basis—that is, including all of the corporation's wholly owned subsidiaries. From the perspective of analyzing corporate financial behavior at the level of the relationships posited in this investigation, consolidation is presumably the correct procedure. Matching Compustat firms with pension plan sponsors would be inadequate, therefore, without also consolidating plans sponsored by each Compustat firm with plans sponsored by its subsidiaries (if any). A laborious "by hand" search revealed that 593 Compustat firms were sponsors—not directly but through subsidiaries—of 2,040 pension plans included in the 1977 Form 5500 sample.[7] Of the 593 Compustat firms sponsoring pension plans through subsidiaries, 447 also sponsored one or more plans directly.

The fully aggregated and consolidated sample available for use in testing for relationships between pension decisions and corporate financial decisions therefore consists of 7,828 pension plans (including defined-benefit as well as other plans, and, among defined-benefit plans, those that did and did not file Schedule B), with $153 billion in combined assets, sponsored by 1,836 consolidated companies.[8] Table 5.4 shows the distribution of this $153 billion of assets across the 1,836 firms. Of the 7,828 plans sponsored by consolidated Compustat companies, 5,836 were de-

Table 5.3 **Asset Distribution of Aggregated Sample: Defined-Benefit Plans Only**

	Distribution of Sponsors				Distribution of Assets			
Asset Size	Number	Cumulative Number	%	Cumulative %	Amount	Cumulative Amount	%	Cumulative %
0–0.5	2,398	2,398	24.2	24.2	0.7	0.7	0.4	0.4
0.5–1.0	1,498	3,896	15.1	39.4	1.2	1.8	0.8	1.2
1–5	3,414	7,310	34.5	73.8	8.2	10.0	5.4	6.6
5–10	923	8,233	9.3	83.1	6.5	16.5	4.3	10.9
10–25	776	9,009	7.8	91.0	12.3	28.8	8.1	19.0
25–50	388	9,397	3.9	94.9	13.8	42.6	9.1	28.0
50–100	240	9,637	2.4	97.4	16.9	59.5	11.2	39.2
100–250	164	9,801	1.7	99.0	24.9	84.4	16.4	55.6
250–500	53	9,854	0.5	99.5	18.6	103.0	12.3	67.9
500–1,000	30	9,884	0.3	99.8	20.9	124.0	13.8	81.7
Over 1,000	15	9,899	0.2	100.0	27.8	151.8	18.3	100.0

Note: Asset size categories are in millions of dollars; asset amounts are in billions of dollars.

Table 5.4 **Asset Distribution of Aggregated and Consolidated Sample: All Compustat Sponsors**

	Distribution of Sponsors				Distribution of Assets			
Asset Size	Number	Cumulative Number	%	Cumulative %	Amount	Cumulative Amount	%	Cumulative %
0–0.5	87	87	4.7	4.7	0.0	0.0	0.0	0.0
0.5–1.0	108	195	5.9	10.6	0.1	0.1	0.1	0.1
1–5	389	584	21.2	31.8	1.0	1.1	0.7	0.8
5–10	243	827	13.2	45.0	1.8	2.9	1.2	1.9
10–25	317	1,144	17.3	62.3	5.2	8.1	3.4	5.3
25–50	226	1,370	12.3	74.6	8.0	16.2	5.3	10.6
50–100	180	1,550	9.8	84.4	12.6	28.8	8.2	18.8
100–250	180	1,730	9.8	94.2	27.4	56.2	18.0	36.8
250–500	59	1,789	3.2	97.4	20.4	76.6	13.4	50.2
500–1,000	28	1,817	1.5	99.0	19.2	95.8	12.6	62.7
1,000–5,000	18	1,835	1.0	99.9	38.5	134.3	25.2	87.9
Over 5,000	1	1,836	0.1	100.0	18.4	152.7	12.1	100.0

Note: Asset size categories are in millions of dollars; asset amounts are in billions of dollars.

Table 5.5 **Asset Distribution of Aggregated Sample: Defined-Benefit Plans Only, All Compustat Sponsors**

	Distribution of Sponsors				Distribution of Assets			
Asset Size	Number	Cumulative Number	%	Cumulative %	Amount	Cumulative Amount	%	Cumulative %
0–0.5	87	87	5.6	5.6	0.0	0.0	0.0	0.0
0.5–1.0	78	165	5.0	10.6	0.1	0.1	0.1	0.1
1–5	342	507	22.0	32.7	0.9	1.0	0.9	0.9
5–10	204	711	13.1	45.8	1.5	2.5	1.3	2.3
10–25	283	944	18.2	64.0	4.7	7.2	4.3	6.5
25–50	187	1,181	12.0	76.1	6.6	13.8	6.0	12.5
50–100	170	1,351	11.0	87.0	12.2	26.0	11.1	23.6
100–250	128	1,479	8.2	95.3	20.0	46.0	18.1	41.8
250–500	44	1,523	2.8	98.1	15.9	61.8	14.4	56.2
500–1,000	18	1,541	1.2	99.3	12.7	74.5	11.5	67.7
1,000–5,000	10	1,551	0.6	99.9	19.2	93.7	17.5	85.1
Over 5,000	1	1,552	0.1	100.0	16.4	110.1	14.9	100.0

Note: Asset size categories are in millions of dollars; asset amounts are in billions of dollars.

fined-benefit plans, of which 5,670 filed Schedule B in time for Internal Revenue Service processing. Table 5.5 shows the distribution of these 5,670 plans' $110 billion of assets across the plans' 1,552 sponsoring firms. A comparison of tables 5.2 and 5.4, and of tables 5.3 and 5.5, shows that the result of not only consolidating subsidiaries into parent companies but also excluding all plans not sponsored by a Compustat firm (even through a subsidiary) is to shift the distribution further toward larger dollar amounts per company.[9]

5.2 Pension Funding Strategy

In the most abstract conception of the incorporated firm, the assets and liabilities of a corporation's defined-benefit pension plan(s) are just like the assets and liabilities that appear on its balance sheet. Shareholders own both sets of assets, and they are responsible (to the extent of their equity) for both sets of liabilities. Whether the firm's management acts so as to maximize the share price, to maximize expected profits, or to achieve yet some other objective, there is no need to distinguish between one pool of assets and the other or between one group of liabilities and the other.

Such an abstraction may fail to describe the world of United States corporations and their sponsored pension plans for several well-known reasons.[10] At the most practical level, the firm's flexibility on the pension liability side is usually severely limited. Conventions of labor market practice, reinforced by legal requirements and often by collective bargaining agreements, restrict the range within which a firm and its workers can divide total labor costs between current and deferred compensation. To the extent that the firm's basic pension liabilities are predetermined from the perspective of financial decision making, therefore, its choice of pension "liabilities" in this context refers only to that part of the basic actuarial liability in excess of the amount of assets committed to the pension fund. Hence decisions about pension "liabilities" in this sense are really decisions about pension assets. Moreover, the firm's flexibility is limited here, too, in that its pension funding position must meet standards specified by the Employee Retirement Income Security Act.[11]

Wholly apart from such constraints, a variety of considerations may lead the firm to see pension assets and liabilities as less than perfect substitutes for its other assets and liabilities. First, the implicit cost of "borrowing" by less than fully funding pension liabilities need not be identical, either before or after taxes, to the explicit cost of borrowing in the credit market. In the extreme, the former "source of funds" may be available at times when the latter is not. Even under ordinary circumstances, the scheduling of the "debt service" associated with the two kinds of liabilities may differ in important ways. A second distinction is

that pension liabilities, unlike the firm's other liabilities in most circumstances, are insured in a way that limits the firm's exposure. The Pension Benefit Guaranty Corporation insures corporations' pension liabilities in full but, in the event of default, has a claim on only one-third of the firm's assets. The tax treatment of pension plans provides a third reason why the simple abstraction, in which one asset or liability is just like any other, may not apply to actual corporations. Payments of funds into the pension plan are deductible from the firm's income for tax purposes, and earnings on assets held in the pension plan are excluded from taxable income. Finally—although these four factors do not exhaust the possible reasons for distinguishing pension versus other assets and liabilities—shareholders and potential shareholders may be more fully aware of that part of a firm's liabilities which actually appears on its balance sheet.[12]

For all of these familiar reasons, therefore, a corporation may not behave as if it is indifferent between pension and other assets, or between pension and other liabilities. Hence, instead of the usual net worth constraint,

$$TA - TL = NW, \tag{1}$$

where TA and TL are the firm's total assets and total liabilities, respectively, and NW is net worth (assumed to be predetermined as of any specific time), the more relevant expression is

$$PA + BA - PL - BL = NW, \tag{2}$$

where PA and PL distinguish the assets and liabilities of the firms's defined-benefit pension plan(s), while BA and BL represent the assets and liabilities that appear on the firm's balance sheet.[13]

If the firm were free to choose simultaneously each of these four quantities, subject only to the net worth constraint, then its consolidated "portfolio" behavior would take the familiar form

$$\frac{1}{NW}\begin{bmatrix} PA \\ BA \\ -PL \\ -BL \end{bmatrix} = \boldsymbol{\alpha} + B\mathbf{X}, \tag{3}$$

where $\mathbf{X}$ is a vector of external factors determining the firm's responses, $\boldsymbol{\alpha}$ is a vector of coefficients summing to unity, and B is a matrix of coefficients with zero column sums. The most familiar empirical application of this conception is in a time-series context, in which $\mathbf{X}$ would include primarily (often exclusively) the expected yields on the respective assets and liabilities. By contrast, in a cross-section context the elements of $\mathbf{X}$ are firm-specific factors that are taken to be predetermined with respect

to the firm's portfolio choice in the one time period under observation, and that (at least potentially) influence that choice. To the extent that some of the firm's portfolio choices are predetermined with respect to others, however, some of the elements within the left-hand side of (3) belong more properly on the right. If the firm decides on its pension assets and liabilities only secondarily, after deciding on its other liabilities, then PA and PL may depend on BA and BL as well as the other factors included within X.

One question that immediately arises in this context is whether firms have fixed targets for their total liabilities ($PL + BL$) so that they take on fewer pension liabilities as they have more liabilities on their balance sheets or, alternatively, whether they systematically use PL and BL together to achieve greater or smaller total leverage. Put in another way, the question is whether the firm treats pension liabilities and other liabilities as substitutes or complements, although the sense of substitutability versus complementarity involved here differs somewhat from the usual one in which vector **X** includes specific time-varying yields associated with PL and BL.

The evidence from the 1977 Form 5500 sample is consistent with complementarity of PL and BL in this sense. Estimating the cross-section regression

$$\frac{PL}{NW} = \alpha + \gamma \frac{BL}{NW} \tag{4}$$

for the sample of all consolidated Compustat firms with defined-benefit plans filing Schedule B yields $\gamma = .17$, with t-statistic 7.8 ($\bar{R}^2 = .04$).[14] For the subsample in which each firm's pension plan is sufficiently important in its overall structure that pension liabilities amount to at least 3% of the firm's total assets, the result is $\gamma = .26$, with t-statistic 6.4 ($\bar{R}^2 = .07$). For the further subsample in which $PL/TA \geq .10$, the result is $\gamma = .50$, with t-statistic 7.9 ($\bar{R}^2 = .17$).

Further analysis that controls for other influences in the spirit of (3), while maintaining the assumption that BL is predetermined with respect to PL, supports this conclusion. Table 5.6 reports estimation results for a series of regressions of the form

$$\frac{PL}{NW} = \alpha + \gamma \frac{BL}{NW} + \beta X \tag{5}$$

where X is, in turn, each of a series of variables describing the firm and its operating environment. Once again, the positive relationship between pension and other liabilities (both scaled by net worth) holds up regardless of the choice of additional controlling variables.

The specific results for the partial effects of the several controlling variables are also interesting in some cases. Neither the growth rate nor

Table 5.6 **Relationship between Pension Liabilities and Other Liabilities**

	Full Sample		$PL/TA \geq .10$ Subsample	
Control Variable	γ	β	γ	β
$\rho(EBIT)$	.17	.32	.51	−.46
	(7.5)	(0.4)	(7.6)	(−0.2)
$\sigma(EBIT)$	.17	.14	.51	1.20
	(7.5)	(0.4)	(7.9)	(1.1)
E/BA	.20	.60	.55	1.15
	(6.7)	(3.1)	(6.8)	(2.0)
$\mu(E/BA)$	.16	.17	.46	.20
	(5.6)	(0.6)	(6.0)	(0.2)
$\sigma(E/BA)$	.15	−.81	.46	−.46
	(6.1)	(−1.9)	(6.8)	(−0.3)
$\mu(T/E)$	.15	.00	.46	.06
	(6.5)	(0.4)	(6.9)	(1.0)
$\mu(L/S)$	.20	.23	.66	.21
	(5.6)	(2.0)	(5.7)	(0.6)
AGE	.15	−.44	.44	−.26
	(6.1)	(−5.6)	(6.6)	(−1.2)

Note: Results shown are estimated coefficients (and t-statistics) for the regression $PL/NW = \alpha + \gamma(BL/NW) + \beta X$, where $\rho(EBIT)$ = 10-year growth rate of earnings before interest and taxes; $\sigma(EBIT)$ = 10-year normalized standard deviation of EBIT around its growth trend; E/BA = ratio of earnings to nonpension assets; $\mu(E/BA)$ = 10-year mean of E/BA; $\sigma(E/BA)$ = 10-year standard deviation of E/BA around $\mu(E/BA)$; $\mu(T/E)$ = 5-year mean of ratio of taxes paid to before-tax earnings; $\mu(L/S)$ = 5-year mean of ratio of labor and related expenses to net sales; and AGE = ratio of pension plan participants currently employed to all plan participants.

the trend-adjusted variability of the firm's earnings had a significant effect on its pension liabilities. The 1977 rate of return on assets affected pension liabilities positively, but the mean rate of return over the past 10 years did not. The negative effect of the volatility of rate of return was marginally significant in the full sample, but not in the subsample with large pension liabilities relative to the firm's total assets. The firm's tax status had no significant effect. As would be expected, the firm's labor intensiveness affected pension liabilities positively, and the fraction of the firm's pension plan participants who were still employed affected pension liabilities negatively; but both effects were significant in the full sample only.

The failure of so many basic aspects of the firm's risk and return situation to affect its pension liabilities supports the suggestion, made above, that the firm does not actually choose PL in the usual portfolio sense. Instead, the firm may take PL as given—by labor market considerations, for example—so that its actual choice in this context is simply

how much of its pension liabilities to fund. If the firm were free to choose in this context, its portfolio problem would take the form

$$\frac{1}{NW}\begin{bmatrix} BA \\ -BL \\ -(PL-PA) \end{bmatrix} = \alpha + B\mathbf{X}. \tag{6}$$

Moreover, if the firm decides only secondarily on its unfunded pension liabilities (that is, on its pension assets in this context), then again the possibility arises that $(PL - PA)$ depends on BA and BL as well as on any or all of the other factors included within $\mathbf{X}$.

The parallel question in this context is whether firms with large amounts of debt on their balance sheet choose to have greater or smaller amounts of unfunded liabilities. In this form the question bears a direct connection to at least one prominent line of theoretical analysis of how corporations' pension funding decisions depend on their financial condition. In particular, Sharpe (1976) has suggested that an important rationale for firms to fund their pension plans less than fully is the value of the insurance provided by the Pension Benefit Guaranty Corporation (PBGC).[15] In Sharpe's analysis the insurance written by the PBGC is equivalent to a put option, and the firm's incentive is to maximize the value of the put. A major implication of this line of reasoning is that the firms for which the probability of bankruptcy is nontrivial have an incentive to underfund their pension plans. The more highly levered a firm is, therefore—that is, the larger is BL relative to NW, all other considerations equal—the greater is the firm's incentive to underfund its pension plan. In terms of the current analysis, therefore, the Sharpe hypothesis suggests that BL and $(PL - PA)$ are complements.

The evidence from the 1977 Form 5500 sample is consistent with complementarity not only of BL and PL, as in (4), but also of BL and $(PL - PA)$. Hence the data are consistent with Sharpe's analysis of the pension funding decision. Estimating the cross-section regression

$$\frac{PL-PA}{NW} = \alpha + \gamma\frac{BL}{NW} \tag{7}$$

for the full sample yields $\gamma = .14$, with t-statistic 10.1 ($\bar{R}^2 = .07$).[16] For the subsample of firms with $PL/TA \geq .03$, the corresponding results are $\gamma = .25$, with t-statistic 9.3 ($\bar{R}^2 = .13$). For the subsample with $PL/TA \geq .10$, the results are $\gamma = .44$, with t-statistic 10.8 ($\bar{R}^2 = .27$).

Table 5.7 shows estimation results, comparable to those in table 5.6, for a parallel series of regressions

$$\frac{PL-PA}{NW} = \alpha + \gamma\frac{BL}{NW} + \beta X \tag{8}$$

Table 5.7 **Relationship between Unfunded Pension Liabilities and Other Liabilities**

	Full Sample		$PL/TA \geq .10$ Subsample	
Control Variable	γ	β	γ	β
$\rho(EBIT)$	.14	.13	.45	−.82
	(9.6)	(0.3)	(10.2)	(−0.4)
$\sigma(EBIT)$	.14	.17	.45	1.05
	(9.7)	(0.8)	(10.8)	(1.3)
E/BA	.15	.35	.48	.88
	(7.3)	(2.7)	(8.1)	(2.1)
$\mu(E/BA)$	.12	.12	.42	.25
	(6.5)	(0.7)	(7.5)	(0.4)
$\sigma(E/BA)$	.12	−.32	.41	.11
	(7.0)	(−1.1)	(8.4)	(0.1)
$\mu(T/E)$	.11	.00	.39	.05
	(7.2)	(0.4)	(8.2)	(1.1)
$\mu(L/S)$	.16	.16	.53	.30
	(7.4)	(2.1)	(8.0)	(1.1)
AGE	.12	−.31	.39	−.37
	(7.1)	(−6.0)	(8.1)	(−2.4)

Note: Results shown are estimated coefficients (and t-statistics) for the regression $(PL - PA)/NW = \alpha + \gamma(BL/NW) + \beta X$. See table 5.6 for definitions of variable symbols.

that differ only in the assumption that the firm's choice variable is unfunded pension liabilities rather than total pension liabilities. Here Sharpe's analysis implies that aspects of the firm's operating environment that affect its probability of bankruptcy—variability of earnings, for example—should also increase the firm's incentive to underfund its pension. Once again, the strong positive relationship between (unfunded) pension liabilities and the firm's other liabilities holds up regardless of the controlling variable. The results for the effects of the individual controlling variables are again about as in table 5.6. In particular, neither volatility of earnings nor volatility of rate of return exhibits the significant positive effect that would be consistent with Sharpe's hypothesis.

Finally, the form of both (7) and (8) assumes not only that the firm takes its pension liabilities as given in deciding on pension funding but also that the firm takes decisions solely on the difference $(PL - PA)$ irrespective of either individual amount. In other words, (7) and (8) are equivalent, respectively, to

$$\frac{PA}{NW} = \alpha + \delta\frac{PL}{NW} + \gamma\frac{BL}{NW} \tag{9}$$

and

$$(10) \qquad \frac{PA}{NW} = \alpha + \delta\frac{PL}{NW} + \gamma\frac{BL}{NW} + \beta X$$

subject to the constraint $\delta = 1$. The data consistently reject this constraint, however. Estimating (9) for the full sample yields $\delta = .60$ and $\gamma = -.06$, with respective t-statistics 42.8 and -4.9 ($\bar{R}^2 = .59$).[17] For the subsample with $PL/TA \geq .03$, the corresponding results are $\delta = .63$ and $\gamma = -.09$, with respective t-statistics 32.8 and -4.4 ($\bar{R}^2 = .66$). For the subsample with $PL/TA \geq .10$, the results are $\delta = .66$ and $\gamma = -.16$, with respective *t*-statistics 22.6 and -4.7 ($\bar{R}^2 = .64$). The results of estimating (10) with any of the control variables shown in tables 5.6 and 5.7 indicate similar values for δ and γ, and β values that are again consistent with those found in estimating (5) and (8).

Hence the firm-to-firm variation in pension funding does not simply reflect individual firms' decisions strictly about their unfunded liabilities. At the margin, with other factors equal, a firm with an additional \$1 of pension liabilities typically funds only about 60¢ more in pension assets. This marginal funding rate—marginal from one firm to the next, that is, rather than for one firm over time—is also just equal to the average funding ratio (.62) for all firms in the sample. In addition, the consistent finding of a negative γ value in (9) and (10) indicates that firms with greater amounts of nonpension liabilities fund their pension liabilities less fully, to the extent of about a 10¢ reduction in pension funding for each \$1 of additional nonpension liabilities. This result is again consistent with Sharpe's analysis of the pension funding decision in the context of the value of the put to the PBGC.

The main conclusions that emerge from this consideration of the firm's choice of pension liabilities and funding, on the assumption that the asset and liability totals on the firm's balance sheet are predetermined with respect to its pension decisions, are (1) that pension liabilities, either in total or in excess of funding, depend positively on the firm's other liabilities; (2) that firms do not make decisions simply with respect to their unfunded pension liabilities, but instead fund pension liabilities less than one-for-one at the margin; (3) that funding of the firm's pension liabilities depends negatively on its other liabilities; and (4) that, apart from labor-specific characteristics like the firm's labor intensiveness and the working-retired status of its labor force, basic aspects of the firm's risk and return position have no apparent effect on its choice of either total or unfunded pension liabilities.

5.3 The Earnings-Smoothing Hypothesis

The discussion of pension funding strategy in Section 5.2 focuses on fundamental aspects of portfolio behavior: substitutability versus complementarity of pension and other liabilities, the degree to which pension

assets offset pension liabilities, and the role of other measures of risk and return confronting the firm. From the perspective of any familiar theory of corporate financial behavior, these considerations and others like them are the principal determinants of the firm's pension decisions.

By contrast, discussions of pension funding strategy by corporate practitioners often emphasize different factors. In particular, in seeking to explain why so many firms underfund their pension plans despite apparent tax incentives to fund fully, corporate financial officers and other financial market participants frequently cite the "hidden" nature of pension liabilities. Because the pension plan is off the balance sheet, shareholders and others may be at least partly unaware of the associated liabilities. The most obvious implication of this assertion is that a firm may be able to raise its share price by substituting pension liabilities for liabilities that appear on the balance sheet, but recent research on the relationship between stock prices and pension liabilities has provided evidence that typically warrants rejecting this proposition.[18]

A further implication of the idea that pension assets and liabilities are hidden is that shareholders and other interested persons may judge the firm's performance by its reported earnings rather than by more comprehensive flow measures. Because contributions to a firm's pension plan reduce its reported earnings in the same way as any other expense item, control over the timing of pension contributions enables firms to influence the time path of reported earnings. To the extent that the management seeks to report smoothly growing earnings over time, therefore, it may want to increase pension contributions when business is strong and reduce them when business is weak. Such actions need not change the total amount contributed to the pension plan over time. Indeed, in the broader context that consolidates the firm's pension assets and liabilities with its other assets and liabilities, such actions change nothing at all. They have a purpose only if some constituency, whose actions matter to the corporation, focuses on the time path of reported earnings.

This earnings-smoothing hypothesis provides a potential explanation for the pension underfunding puzzle to the extent that firms with unfunded pension liabilities have more flexibility to adjust the timing of their pension contributions than do firms with fully funded pensions. Restrictions on prefunding unaccrued pension liabilities prevent a firm with a fully funded pension from making extraordinary increases in contributions, and firms that simply decide to fund fully choose thereby to forgo using the potential flexibility in the opposite direction.

Data from the 1977 Form 5500 sample provide evidence indicating that firms typically do manage earnings in this way. For the entire sample of firms with defined-benefit plans, 70.0% had before-tax reported earnings streams that were smoother, as measured by the normalized 10-year standard deviation around trend, than the corresponding consolidated

earnings including pension contributions. On an after-tax basis, with the included pension contributions adjusted for additional taxes that the firm would otherwise have paid, 70.5% of firms had smoother reported earnings than consolidated earnings.

Nevertheless, the data provide almost no support for the claim that firms with underfunded pension liabilities are more likely to manage their reported earnings in this way. Table 5.8 shows the percentages of firms with smoother reported than consolidated earnings, comparable to the percentages reported above, for a breakdown of the full sample according to the ratio of pension assets to pension liabilities. If anything, these distributions seem to indicate that firms with underfunded pension liabilities are *less* likely to engage in smoothing their reported earnings by managing their pension contributions. Only for the two extreme subsamples—with funding ratios below .10 or above .90—does the relationship go in the hypothesized direction.

A more systematic examination of the data confirms this impression. Estimating the regression

$$(11) \qquad \frac{\sigma(E)}{\sigma(E + PC)} = \alpha + \beta \frac{PA}{PL},$$

where $\sigma(E)$ and $\sigma(E + PC)$ are the normalized 10-year standard deviations of reported earnings and consolidated earnings, respectively, yields a value of β which is positive, as hypothesized, but negligibly small and with t-statistic less than 0.1. The results for the relationship based on after-tax earnings are analogous.

In sum, the evidence does show substantial prevalence of the timing of pension contributions so as to smooth reported earnings, but it does not support the hypothesis that this practice is related to the funding status of

Table 5.8 Relationship between Earnings Smoothing and Pension Funding

	Percentage Showing Smoother Reported than Consolidated Earnings	
Funding Ratio	Before Tax	After Tax
0–.1	64.3	78.6
.1–.2	50.0	66.7
.2–.3	53.3	53.3
.3–.4	69.0	66.7
.4–.5	77.6	77.6
.5–.6	73.6	75.7
.6–.7	71.0	70.2
.7–.8	69.8	70.6
.8–.9	77.1	72.9
.9–1.0	58.6	60.6

firms' pensions. The explanation for the underfunding puzzle apparently lies elsewhere.

5.4 Pension Asset Allocations

Private pension plans invest their assets in a way unlike any other major category of institutional investors. For the aggregate of all pension plans, nearly two-thirds of all assets held are corporate equities. Among other major investor groups (apart from mutual funds), the corresponding fractions are about one-fifth equities for the public pension plans sponsored by state and local governments, one-sixth equities for fire and casualty insurance companies, and one-ninth equities for life insurance companies (even including some "separate accounts").[19] Clearly there is something unique about the investment choices made by private pension plans.

To the extent that the assets in a corporation's defined-benefit pension plan "belong" to the sponsoring firm's shareholders, in the sense that they and not the plan's beneficiaries stand to gain or lose according to the assets' return, the heavy concentration of private pension assets in equities is not surprising.[20] By holding the corporation's shares in the first place, shareholders have already expressed the desire for an equity investment. Because of the pension plan(s) that the firm sponsors, however, each such investment represents ownership in two pools of assets. If the firm's pension plan holds debt securities instead of equities, then the shareholder's investment is no longer a pure (or even levered) equity but a mixture of debt and equity claims.

In the simplest abstraction like that used to motivate the discussion in section 5.2, a corporation would not hold its pension assets in any form other than the ordinary assets of its business—that is, in its own stock. Legal restrictions preclude holding pension assets entirely in this form, however, and also impose "prudence" standards that many firms interpret to preclude investing pension assets entirely in equity securities even on a fully diversified basis. Once again, therefore, the extreme simplification does not adequately describe the behavior of actual corporations and the pension plans that they sponsor. In addition, tax considerations appear to favor holding equity assets outside the pension plan and debt assets in the plan.[21]

The discussion in section 5.2 emphasizes the role of the firm's pension assets and liabilities, along with the assets and liabilities on its balance sheet, in determining its overall risk and return posture. The allocation of the pension assets among alternative investment vehicles is a further element in this calculus. For example, borrowing in the credit market to finance additional (tax-deduction augmented) pension contributions has essentially no risk implications for the firm if the pension plan then invests

these funds in debt securities, but such an action increases the firm's risk if the pension plan invests in equities.[22]

The dependence of the firm's risk and return posture on the allocation of its pension assets raises in turn the possibility that these allocations may depend on the firm's asset-liability structure in the sense of either (1) or (2) above, or on other characteristics of the firm's business and financial situation as introduced in (3), or on both. Sharpe's analysis described in section 5.2, for example, suggests that firms with nontrivial probability of bankruptcy have an incentive to maximize the value of the effective put to the PBGC. In the context of pension asset allocation decisions, therefore, the Sharpe hypothesis is that firms bearing greater overall risk will tend to invest their pension assets more in equities. Hence the more highly levered a firm is (as measured by debt on the balance sheet or by unfunded pension liabilities), or the greater is its risk exposure in other regards, the greater is the firm's incentive to invest its pension assets in equities.

In the simple context of (3), the question of pension asset allocation represents simply a disaggregation within the pension asset total PA. By contrast, if the total amount of pension assets is predetermined with respect to the allocation—as seems plausible in the context of most corporations' decision procedures—then PA is the constraining variable and the portfolio choice problem is of the form

$$\frac{1}{PA}\begin{bmatrix} PA_1 \\ PA_2 \\ \vdots \\ PA_N \end{bmatrix} = \alpha + B\mathbf{X}, \tag{12}$$

where the PA_i are specific forms of pension assets and α and B are again as in (3). Table 5.9 presents the results of estimating this relationship, for the sample of all Compustat firms sponsoring defined benefit plans, in the somewhat different form

$$\frac{1}{BA}\begin{bmatrix} PAE \\ PAD \\ PAO \end{bmatrix} = \alpha + \gamma\frac{PA}{BA} + \beta X, \tag{13}$$

where PAE, PAD, and PAO are pension assets in defined-benefit plans, held in equities, debt securities, and other investment vehicles, repectively, α is a vector of coefficients summing to zero, and γ is a vector of coefficients summing to unity.

The one result that stands out in table 5.9 is the negative relationship between the allocation of pension assets to equities and the variability of

Table 5.9 **Determinants of Pension Portfolio Allocation**

Control Variable	PAE/BA		PAD/BA		PAO/BA	
	γ	β	γ	β	γ	β
$\rho(EBIT)$	.31	−.18	.37	.11	.32	.07
	(58.1)	(−0.6)	(51.7)	(0.3)	(41.3)	(0.2)
$\sigma(EBIT)$	.31	−.29	.37	.05	.32	.24
	(58.3)	(−2.5)	(51.6)	(0.3)	(41.2)	(1.4)
$\mu(T/E)$	.30	.00	.37	.00	.33	−.00
	(55.1)	(0.3)	(49.8)	(0.2)	(39.8)	(−0.4)
AGE	.31	−.01	.37	.02	.32	−.00
	(58.1)	(−0.5)	(51.7)	(0.5)	(41.4)	(−0.1)
PA/PL	.30	.00	.41	.00	.29	−.00
	(39.3)	(0.3)	(41.6)	(0.1)	(28.8)	(−0.3)

Note: Results shown are estimated coefficients (and *t*-statistics) for the regression $PA_i/BA = \alpha + \gamma(PA/BA) + \beta X$. See table 5.6 for definitions of variable symbols.

the firm's earnings relative to trend—a result that is directly counter to the implication of Sharpe's hypothesis. Moreover, this result holds regardless of the definition of earnings used (before tax, after tax, with or without consolidation of pension contributions, etc.), and it also holds for subsamples limited according to the importance of pension assets in the firm's overall asset structure.[23] Hence firms with greater business risk, as measured by greater volatility of earnings, systematically seek to offset at least part of that risk by investing their pension assets in instruments *other* than equities.

It is interesting that several measures included in table 5.9 do not appear to affect pension asset allocations. Despite the incentives for taxable firms to hold high-yield assets in their pension plans and low-yield assets on their balance sheets, as emphasized by Black (1980) and Tepper (1981), the firm's tax status over the past 5 years has no apparent impact at this level. Similarly, although the age and related structure of the pension plan's beneficiary population affects the time profile of liabilities under the plan, the current employment ratio also has no effect. Finally, the firm's overall pension funding ratio has no noticeable effect either—again in apparent contradiction of Sharpe's analysis.

It is also useful to note how two specific aspects of the results shown in table 5.9 carry over to the larger sample including Compustat firms' defined-contribution plans as well as their defined-benefit plans. First, the negative relationship between earnings volatility and the equity allocation is smaller in absolute magnitude, but statistically more significant, in the broader sample.[24] With $\sigma(EBIT)$ as the control variable in (13), the estimated value of β in the equity equation is −.11, with

t-statistic -4.0 ($\bar{R}^2 = .60$). Second, although the current employment ratio of the beneficiary population does not matter in the defined-benefit-only sample, it does in the broader sample. With AGE as the control variable, the estimated value of β in the equity equation is .014, with t-statistic 2.1 ($\bar{R}^2 = .60$).[25] Because a large AGE ratio typically reflects a younger beneficiary population, a positive β value means that plans with younger workers are typically more heavily invested in equities. Hence pension plans in which the beneficiaries stand to gain or lose according to the return on the plan's invested assets do take account of the beneficiary population's age structure in making asset allocation decisions, even though plans in which the firm's shareholders stand to gain or lose from the assets' return do not.[26]

The pension asset allocation and the pension funding ratio are two major determinants of prospective risk and return for many firms. A third important element in the risk and return structure, of course, is the debt on the firm's balance sheet. The relationship among these several components raises the possibility, therefore, that the firm's allocation of its pension assets may also depend on its basic leverage. A relationship consistent with the risk-offsetting strategy reported above, for example, would be for highly levered firms to offset some of their leverage by holding debt securities in their defined-benefit pension plans.[27] Alternatively, under either Sharpe's PBGC put hypothesis or some form of "general aggressiveness" hypothesis, firms content to have a more leveraged position, as indicated by the liabilities on their balance sheets, might further extend that risk posture by investing their pension assets in equities.

Table 5.10 presents the results of an attempt to examine this question in compact form by estimating the regression

$$(14) \qquad \frac{PAD}{PAD + PAE} = \alpha + \gamma \frac{BL}{BL + BEQ} + \beta X,$$

where BEQ is the book value of equity on the firm's balance sheet, and all other variables are as before. The estimated value of γ is consistently positive, in contradiction to either the Sharpe hypothesis or a "general aggressiveness" hypothesis, indicating instead that firms with more highly levered balance sheets have some tendency to offset that leverage by investing more of their pension assets in debt securities.[28] Somewhat surprisingly, however, this positive relationship is statistically significant (and larger) in the broader sample including defined-contribution plans but not in the sample limited to defined-benefit plans.

The estimated β values shown in table 5.10 support and extend the findings shown in table 5.9 in several ways. First, the allocation of pension assets to debt securities is positively related to any measure of the variability of earnings. It is interesting that this effect, too, is always

Table 5.10 **Relationship between Pension Asset Allocation and Firm Leverage**

Control Variable	Defined Benefit Only		All Pension Plans	
	γ	β	γ	β
$\rho(EBIT)$	.05	−.23	.09	.07
	(0.9)	(−0.3)	(1.9)	(0.1)
$\sigma(EBIT)$	.05	1.31	.09	1.86
	(1.1)	(3.6)	(2.0)	(5.7)
$\mu(E/BA)$	.02	−.25	.02	−.55
	(0.4)	(−0.8)	(0.4)	(−1.9)
$\sigma(E/BA)$	.05	1.77	.09	2.96
	(1.1)	(3.8)	(2.0)	(6.9)
$\mu(E/EQ)$	.04	−.08	.07	−.11
	(0.7)	(−2.1)	(1.5)	(−2.6)
$\sigma(E/EQ)$	.04	.03	.07	.04
	(0.8)	(1.9)	(1.6)	(2.3)
$\mu(T/E)$	.10	.00	.17	.00
	(2.0)	(0.5)	(3.8)	(0.4)
AGE	.05	.22	.08	.14
	(1.0)	(2.6)	(1.9)	(1.8)

Note: Results shown are estimated coefficients (and *t*-statistics) for the regression $PAD/(PAD + PAE) = \alpha + \gamma[BL/(BL + BEQ)] + \beta X$, where E/EQ = ratio of earnings to book value of equity; $\mu(E/EQ)$ = 10-year mean of E/EQ; and $\sigma(E/EQ)$ = 10-year standard deviation of E/EQ around $\mu(E/EQ)$. See table 5.6 for definitions of other variable symbols.

larger and more highly significant in the broader sample. Second, firms with high rates of return (to either assets or book equity) tend to invest their pension assets more in equities and less in debt securities. Third, the firm's tax status apparently has no independent impact on pension asset allocation, although allowing for it about doubles the estimated magnitude of the effect of balance sheet leverage. Fourth, after allowance for balance sheet leverage, firms with younger pension beneficiary populations tend to invest more in debt securities and less in equities, although the estimated effect is smaller (as would be expected) and statistically insignificant in the broader sample including defined-contribution plans.

The main conclusions of this analysis of the allocation of pension assets, on the assumption that not only the pension asset total but also the other principal elements of the firm's asset and liability structure are predetermined with respect to that allocation choice, are (1) that firms with more volatile earnings invest pension assets so as to offset their ordinary business risk by holding less equity and more debt securities in the pension; (2) that firms with more highly leveraged balance sheets

invest pension assets so as to offset this risk too, again by holding less equity and more debt securities in the pension; (3) that firms earning high rates of return adopt the opposite allocation strategy, investing pension assets more in equities and less in debt securities; and (4) that firms' pension asset allocation decisions also depend on the current employment status of the pension beneficiary population, with employed (hence presumably younger) beneficiaries leading firms with defined-benefit plans to invest pension assets less in equity and more in debt securities but with just the opposite effect for defined-contribution plans.

5.5 The Corporate Balance Sheet

The empirical analysis undertaken in sections 5.2 and 5.4 considers first the firm's pension funding strategy, and then its pension asset allocation, on the assumption that the amount and nature of assets and liabilities on the firm's balance sheet are predetermined with respect to decisions about the firm's pension. Such a secondary role for pension decisions in corporate financial structures may be plausible when the sums involved are small in relation to the sponsoring firm's ordinary business assets and liabilities. In an increasing number of corporations, however, pension liabilities (and pension assets too, if the liabilities are fully funded) are large in comparison to the assets and liabilities that appear on the firm's balance sheet. Moreover, pensions are continuing to grow more rapidly than general corporate assets or liabilities. The larger pensions become, the more likely it is that firms make decisions about their pension assets and liabilities and their other assets and liabilities jointly.

As the discussion in section 5.2 already emphasizes, the combination of legal requirements and established labor market practices sharply restricts many firms' flexibility with respect to their pension liabilities. In considering possible interrelationships by which the firm's pension assets and liabilities affect its ordinary business decisions, therefore, a useful place to begin is the possibility that the direction of influence in (4) and (5) above is backward. Estimating the reverse relationship, in which the firm takes its pension liabilities as given in deciding how much to borrow on its balance sheet,

$$\frac{BL}{NW} = \alpha + \gamma \frac{PL}{NW} \tag{15}$$

yields $\gamma = .26$, with t-statistic 7.8 ($\bar{R}^2 = .04$), for the sample of all Compustat firms sponsoring defined-benefit plans, and $\gamma = .34$, with t-statistic 7.9 ($\bar{R}^2 = .17$), for the subsample in which each firm's pension liabilities equal at least one-tenth of its total assets.[29]

That estimating (4) in the reverse order (15) again leads to a significant positive relationship is hardly surprising. What is more interesting is that

the positive partial relationship between pension liabilities and other liabilities—that is, the relationship after allowance for other controlling variables—also holds up on reversal of the ordering. Table 5.11 presents results, analogous to those in table 5.6, of estimating the reverse of (5),

$$(16) \qquad \frac{BL}{NW} = a + \gamma \frac{PL}{NW} + \beta X,$$

for the full sample and the sample with $PL/TA \geq .10$. Once again, the strong positive value of γ appears regardless of the choice of controlling variable.

Although the focus of this chapter is not on corporations' debt issuance, except in its relation to their sponsored pension plans, it is interesting nevertheless to notice several of the β values in table 5.11. First, the growth of earnings had no effect on pension liabilities in (5), but earnings growth negatively affects other liabilities in (16). This result also holds for other definitions of earnings. Second, the mean rate of return either on assets or on equity (not shown in the table) had no effect on pension liabilities in (5), but mean returns negatively affect other liabili-

Table 5.11 **Relationship between Balance Sheet Liabilities and Pension Liabilities**

Control Variable	Full Sample		PL/TA ≥ .10 Subsample	
	γ	β	γ	β
$\rho(EBIT)$	.25	−5.62	.32	−8.45
	(7.5)	(−6.5)	(7.6)	(−4.0)
$\sigma(EBIT)$	.26	.40	.34	−.92
	(7.5)	(1.0)	(7.9)	(−1.0)
E/BA	.22	−3.52	.28	−3.77
	(6.9)	(−20.6)	(6.8)	(−11.1)
$\mu(E/BA)$	.20	−4.11	.27	−4.66
	(5.6)	(−15.5)	(6.0)	(−8.6)
$\sigma(E/BA)$	.24	1.20	.34	1.54
	(6.1)	(2.3)	(6.8)	(1.1)
$\mu(T/E)$	.24	.00	.33	−.02
	(6.5)	(0.1)	(6.9)	(−0.5)
$\mu(L/S)$	.28	−.33	.30	−.63
	(5.6)	(−2.4)	(5.7)	(−2.5)
AGE	.24	.12	.33	−.28
	(6.1)	(1.2)	(6.6)	(−1.5)

Note: Results shown are estimated coefficients (and t-statistics) for the regression $BL/NW = \alpha + \gamma(PL/NW) + \beta X$. See table 5.6 for definitions of variable symbols.

ties in (16). Third, the variability of the firm's rate of return affected pension liabilities negatively in (5), but return variability affects other liabilities positively in (16), at least in the full sample.[30] Fourth, labor intensity affected pension liabilities positively in (5), at least in the full sample, but labor intensity affects other liabilities negatively in (16). Each of these influences is familiar in the literature on corporate choice of capital structures, and these results would perhaps be of interest in an investigation of that subject. In the context of this chapter's focus on pensions, the main point is simply that the positive partial relationship between pension liabilities and other liabilities holds up after allowance for any of these separate effects.

Similar conclusions follow from reversing the order of (7) and (8), which treat not total pension liabilities but only the unfunded portion as the relevant measure. Estimating the reverse relationship

$$\frac{BL}{NW} = \alpha + \gamma \frac{PL - PA}{NW} \tag{17}$$

yields $\gamma = .50$, with t-statistic 10.1 ($\bar{R}^2 = .07$), for the full sample and $\gamma = .61$, with t-statistic 10.8 ($\bar{R}^2 = .27$), for the $PL/TA \geq .10$ subsample.[31] Controlling for additional influences by estimating the regression

$$\frac{BL}{NW} = \alpha + \gamma \frac{PL - PA}{NW} + \beta X \tag{18}$$

also yields consistently positive γ values, and β values roughly in line with those shown in table 5.11 and discussed above.

Once again, it is useful to examine whether pension liabilities and assets matter separately in this context, or whether what matters is only the difference, as in (17) and (18). Estimating the regression

$$\frac{BL}{NW} = \alpha + \gamma \frac{PL}{NW} + \delta \frac{PA}{NW} \tag{19}$$

for the full sample yields $\gamma = .49$ and $\delta = -.51$, with respective t-statistics 4.8 and -2.7 ($\bar{R}^2 = .05$). For the $PL/TA \geq .10$ sample, the corresponding results are $\gamma = .58$ and $\delta = -.54$, with respective t-statistics 6.1 and -3.1 ($\bar{R}^2 = .17$). To the extent that firms make borrowing decisions in light of their pension assets and liabilities, therefore, what matters is just the unfunded pension liabilities.[32] Moreover, these results too hold up in the presence of other controlling variables like those included in table 5.10.

Finally, if firms decide on their pension assets and liabilities and on their other assets and liabilities in a fully joint way, then neither the direction of influence assumed in the regressions presented in section 5.2 nor that assumed in (15)–(19) is strictly correct. Instead, a fully simultaneous portfolio choice like that in (3)—or, if only unfunded pension liabilities matter, (6)—would be the correct way to view the firm's deci-

sion process. Table 5.12 presents results (values of β) for estimating (3) directly, using one independent variable at a time. These results add little to the analysis above, however. With the somewhat marginal exception of the earnings volatility measure, the estimation of the full portfolio choice model does not reveal influences that affect both the pension and the balance sheet.[33]

The main conclusions of this analysis of the relationship between the firm's borrowing decisions and its pension assets and liabilities are (1) that the amount of liabilities on the firm's balance sheet is positively related to the firm's pension liabilities and (2) that what matters for the determination of balance sheet liabilities in this context is just the firm's unfunded pension liabilities rather than its pension assets and liabilities separately.

5.6 Concluding Remarks

The final paragraph in each of sections 5.2–5.5 summarizes in capsule form the principal specific empirical findings of this chapter, and there is no need to restate each one here. The unifying overall conclusion from the data is that United States corporations do not manage the pension plans which they sponsor as if these plans had nothing to do with the corporation. Different responses appear to characterize firms' behavior in different contexts, but the evidence persistently indicates clear relationships between decisions about pension assets and liabilities and decisions about the other assets and liabilities of the firm. At the same time, the pattern of these relationships is, more often than not, inconsistent with familiar hypotheses that have emerged thus far in the theoretical literature analyzing pension aspects of corporate finance.

At least three caveats are important, however. The most significant is that the measurement of pension liabilities is hardly uniform across firms. To the extent that each corporation's management believes that the value it reports for liabilities on Form 5500 Schedule B is the best available measure of the firm's actual commitment or exposure, firm-to-firm variation in actuarial assumptions need not affect the analysis here. If managements make allowance for the differing actuarial assumptions, however, then this analysis neglects a potentially important element.[34] Further potential problems of a related nature also arise in connection with the date and the method chosen for Schedule B valuation of pension assets.

The second major caveat stems from the use in this chapter of fully consolidated firm data, incorporating all wholly owned subsidiaries, whenever possible. No doubt many parent corporations do adopt a consolidated approach to financial management. Even so, the possibility remains that many firms handle such matters as pension decisions in a decentralized way, or that some of the parent-subsidiary relationships

Table 5.12 **Full Portfolio Treatment of the Pension and Balance Sheet**

Control Variable	*BL/NW*	*BA/NW*	*PL/NW*	*PA/NW*
$\rho(EBIT)$	−7.32	−8.26	−1.15	−.21
	(−5.5)	(−5.2)	(−1.0)	(−0.3)
$\sigma(EBIT)$	.91	1.63	1.45	.72
	(1.6)	(2.5)	(2.9)	(2.7)
E/BA	−4.10	−4.42	−0.23	0.08
	(−16.8)	(−14.0)	(−0.8)	(0.5)
$\mu(E/BA)$	−4.94	−5.42	−.62	−.14
	(−12.7)	(−11.1)	(−1.5)	(−0.6)
$\sigma(E/BA)$	2.21	−2.16	−.46	−.41
	(2.8)	(−2.2)	(−0.6)	(−1.0)
$\mu(T/E)$	−.01	−.01	−.00	−.00
	(−0.5)	(−0.4)	(−0.1)	(−0.2)
$\mu(L/S)$	−.08	.22	.74	.45
	(−0.4)	(1.0)	(4.7)	(5.1)
AGE	.13	−.28	−.68	−.28
	(0.9)	(−1.6)	(−5.2)	(−3.8)

Note: Results shown are estimated coefficients (and *t*-statistics) for the regression

$$\frac{1}{NW}\begin{bmatrix} BL \\ BA \\ PL \\ PA \end{bmatrix} = \alpha + X\beta .$$

See table 5.6 for definitions of variable symbols.

consolidated here were then (and may still be) too recent to have had much impact on the structure of the subsidiaries' pension assets and liabilities.

The third reason for caution in interpreting the results presented here is simply that they reflect evidence from a cross section of firms (a quite comprehensive cross section, to be sure) in one year only. Despite its portfolio-theoretic approach, therefore, the analysis entirely omits any account of effects due to changing yield relationships over time. For the same reason, the analysis is also subject to all of the usual problems associated with observing only one point in time. Was 1977 a "typical" year in any or all of the many senses that matter here? It is never possible to answer such a question adequately. At the least, however, the Employee Retirement Income Security Act and the Pension Benefit Guaranty Corporation were both very recent as of 1977, and neither may yet have had its full impact on corporations' behavior.

Each of these three reservations about the analysis presented in this

chapter points to potentially fruitful directions for further empirical research. Taking account of cross-firm variation in pension actuarial decisions, more carefully treating the range of possible parent-subsidiary relationships, and working with additional data as they become available would all be major extensions of this work which could importantly alter the conclusions reached. No doubt additional lines of investigation would provide new insights also. This chapter only begins to analyze the interrelationships connecting private pensions and corporate finance. As private pensions continue to grow, in both absolute and relative terms, those interrelationships will almost surely become more powerful and more important for understanding financial behavior.

Appendix

Form **5500**
Department of the Treasury
Internal Revenue Service
Department of Labor
Pension and Welfare Benefit Programs
Pension Benefit Guaranty Corporation

Annual Return/Report of Employee Benefit Plan (With 100 or more participants)

This form is required to be filed under sections 104 and 4065 of the Employee Retirement Income Security Act of 1974 and sections 6057(b) and 6058(a) of the Internal Revenue Code, referred to as the Code.

1977
This Form is Open to Public Inspection

For the calendar plan year 1977 or fiscal plan year beginning , 1977 and ending , 19

File original of this form, including schedules and attachments, completed in ink or type.

▶ Keogh (H.R. 10) plans with fewer than 100 participants and with at least one owner-employee participant do not file this form. File Form 5500–K instead.
▶ Other pension benefit plans and certain welfare benefit plans with fewer than 100 participants do not file this form. File Form 5500–C instead.
▶ Welfare benefit plans with 100 or more participants complete only items 1 through 16 and item 22.
▶ Pension benefit plans, unless otherwise excepted, complete all items. Annuity arrangements of certain exempt organizations and individual retirement account trusts of employers complete only items 1 through 6, 9 and 10.
▶ Government plans and church plans (not electing coverage under section 410(d) of the Code) complete only items 1 through 7, 9, 10(a), (b), (c), (d), 11 and 17.
▶ Plan number—Your 3 digit plan number must be entered in item 5(c); see instruction 5(c) for explanation of "plan number."
▶ If any item does not apply, enter "N/A."

1 (a) Name of plan sponsor (employer if for a single employer plan)

Address (number and street)

City or town, State and ZIP code

1 (b) Employer identification number

1 (c) Telephone number of sponsor ( )

1 (d) Employer taxable year ends Month Day Year 19

2 (a) Name of plan administrator (if other than plan sponsor)

Address (number and street)

City or town, State and ZIP code

1 (e) Business code number

2 (b) Administrator's employer identification no.

2 (c) Telephone number of administrator ( )

3 Name, address and identification number of ☐ plan sponsor and/or ☐ plan administrator as they appeared on the last return/report filed for this plan if not the same as in 1 or 2 above ▶

4 Check appropriate box to indicate the type of plan entity (check only one box):

(a) ☐ Single-employer plan **(c)** ☐ Multiemployer plan **(e)** ☐ Multiple-employer plan (other)
(b) ☐ Plan of controlled group of corporations or common control employers **(d)** ☐ Multiple-employer-collectively-bargained plan **(f)** ☐ Group insurance arrangement (of welfare plans)

5 (a) *(i)* Name of plan

(ii) ☐ Check if changed since last return/report

5 (b) Effective date of plan

5 (c) Enter three digit plan number ▶

6 Check at least one item in (a) or (b) and applicable items in (c). Item (d) on page 2 must be completed:

(a) Welfare benefit plan: *(i)* ☐ Health insurance *(ii)* ☐ Life insurance *(iii)* ☐ Supplemental unemployment
(iv) ☐ Other (specify) ▶

(b) Pension benefit plan:
(i) Defined benefit plan—(Indicate type of defined benefit plan below):
(A) ☐ Fixed benefit (B) ☐ Unit benefit (C) ☐ Flat benefit (D) ☐ Other (specify) ▶
(ii) Defined contribution plan—(indicate type of defined contribution plan below):
(A) ☐ Profit-sharing (B) ☐ Stock bonus (C) ☐ Target benefit (D) ☐ Other money purchase
(E) ☐ Other (specify) ▶
(iii) ☐ Defined benefit plan with benefits based partly on balance of separate account of participant (section 414(k) of the Code)
(iv) ☐ Annuity arrangement of a certain exempt organization (section 403(b)(1) of the Code)
(v) ☐ Custodial account for regulated investment company stock (section 403(b)(7) of the Code)
(vi) ☐ Trust treated as an individual retirement account (section 408(c) of the Code)
(vii) ☐ Employee stock ownership plan not part of a qualified plan (section 301(d) of the Tax Reduction Act of 1975)
(viii) ☐ Other (specify) ▶

Under penalties of perjury and other penalties set forth in the instructions, I declare that I have examined this report, including accompanying schedules and statements, and to the best of my knowledge and belief, it is true, correct, and complete.

Date ▶ Signature of employer/plan sponsor ▶

Date ▶ Signature of plan administrator ▶

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(c) Other plan features: (i) ☐ Thrift-savings (ii) ☐ Keogh (H.R. 10) plan
(iii) ☐ Employee stock ownership as part of a qualified plan (check only if you checked a box in (b)(ii) above)

(d) Is this a defined benefit plan covered under the Pension Benefit Guaranty Corporation termination insurance program? . . . . . ☐ Yes ☐ No ☐ Not determined

7 Number of participants as of the end of the plan year (welfare plans complete only (a)(iv), (b), (c) and (d)):

(a) Active participants (employed or carried as active) (i) Number fully vested . .
(ii) Number partially vested .
(iii) Number nonvested . . .
(iv) Total . . . . . .

(b) Retired or separated participants receiving benefits . . . . . .
(c) Retired or separated participants entitled to future benefits . . . . . .
(d) Subtotal, sum of (a), (b) and (c) . . . . . .
(e) Deceased participants whose beneficiaries are receiving or are entitled to receive benefits . . . .
(f) Total, (d) plus (e) . . . . . .

	Yes	No
(g) During the plan year, was any participant(s) separated from service with a deferred vested benefit? If "Yes," see instructions. . . .		

8 Plan amendment information (welfare plans complete only (a), (b)(i) and (c)):

(a) Was any amendment to this plan adopted in this plan year?		
(b) If "Yes," (i) And if a material modification, has a summary description of this modification—		
(A) Been sent to plan participants?		
(B) Been filed with DOL?		
(ii) Does any such amendment result in the reduction of the accrued benefit of any participant under the plan? . .		
(iii) Will amendment result in a reduction of current or future benefits?		
(iv) Has a determination letter been requested from IRS with respect to such amendment?		
(c) Enter the date the most recent amendment was adopted . . ▶ Month Day Year		

9 Plan termination information (welfare plans complete only (a), (b), (c) and (f)):

(a) Was this plan terminated during this plan year or any prior plan year?		
(b) If "Yes," were all trust assets distributed to participants or beneficiaries or transferred to another plan? . .		
(c) Was a resolution to terminate this plan adopted during this plan year or any prior plan year?		
(d) If (a) or (c) is "Yes," have you received a favorable determination letter from IRS with respect to such termination?		
(e) If (d) is "No," has a determination letter been requested from IRS?		
(f) If (a) or (c) is "Yes," have participants and beneficiaries been notified of the termination or the proposed termination?		

10 (a) In this plan year, was this plan merged or consolidated into another plan or were assets or liabilities transferred to another plan? . .

If "Yes," identify other plan(s):	(c) Employer identification number(s)	(d) Plan number(s)
(b) Name of plan(s) ▶		

(e) Has Form 5310 been filed with IRS? . . . . . ☐ Yes ☐ No

11 Indicate funding arrangement:

(a) ☐ Trust (benefits provided in whole from trust funds)
(b) ☐ Trust or arrangement providing benefits partially through insurance and/or annuity contracts
(c) ☐ Trust or arrangement providing benefits exclusively through insurance and/or annuity contracts
(d) ☐ Custodial account described in section 401(f) of the Code and not included in (c) above
(e) ☐ Other (specify) ▶
(f) If (b) or (c) is checked, enter the number of Schedule A's (Form 5500) which are attached . . . . . ▶

12 Did any person who rendered services to the plan receive, directly or indirectly, compensation from the plan in the plan year? . . ☐ Yes ☐ No
If "Yes," furnish the following information:

a. Name	b. Official plan position	c. Relationship to employer, employee organization or person known to be a party-in-interest	d. Gross salary or allowances paid by plan	e. Fees and commissions paid by plan	f. Nature of service code (see instructions)

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13 Plan assets and liabilities at the beginning and the end of the plan year (list all assets and liabilities at current value). If plan is **funded entirely by allocated insurance contracts for which no trust is involved, check box and do not complete this item** . . [ ]

Note: *Include all plan assets and liabilities of a trust or separately maintained fund. (If more than one trust/fund, report on a combined basis.) Include unallocated, but not allocated, insurance contracts. Round off amounts to nearest dollar.*

	a. Beginning of year	b. End of year
Assets		
(a) Cash: *(i)* On hand		
(ii) In bank: (A) Certificates of deposit		
(B) Other interest bearing		
(C) Noninterest bearing		
(iii) Total cash		
(b) Receivables: *(i)* Employer contributions		
(ii) Employee contributions		
(iii) Other		
(iv) Reserve for doubtful accounts		
(v) Net receivables, sum of (i), (ii) and (iii) minus (iv)		
(c) General investments other than party-in-interest investments:		
(i) U.S. Government securities:		
(A) Long term		
(B) Short term		
(ii) State and municipal securities		
(iii) Corporate debt instruments:		
(A) Long term		
(B) Short term		
(iv) Corporate stocks: (A) Preferred		
(B) Common		
(v) Shares of a registered investment company		
(vi) Real estate		
(vii) Mortgages		
(viii) Loans other than mortgages		
(ix) Value of interest in pooled fund(s)		
(x) Other investments		
(xi) Total general investments, sum of (i) through (x)		
(d) Party-in-interest investments:		
(i) Corporate debt instruments		
(ii) Corporate stocks: (A) Preferred		
(B) Common		
(iii) Real estate		
(iv) Mortgages		
(v) Loans other than mortgages		
(vi) Other investments		
(vii) Total party-in-interest investments, sum of (i) through (vi)		
(e) Buildings and other depreciable property		
(f) Value of unallocated insurance contracts:		
(i) Separate accounts		
(ii) Other		
(iii) Total, (i) plus (ii)		
(g) Other assets		
(h) Total assets, sum of (a)(iii), (b)(v), (c)(xi), (d)(vii), (e), (f)(iii) and (g)		
Liabilities		
(i) Payables: *(i)* Plan claims		
(ii) Other payables		
(iii) Total payables, (i) plus (ii)		
(j) Acquisition indebtedness		
(k) Other liabilities		
(l) Total liabilities, sum of (i)(iii), (j) and (k)		
(m) Net assets, (h) less (l)		
(n) During the plan year what were the:		
(i) **Total cost of acquisitions for common stock?**		
(ii) Total proceeds from dispositions of common stock?		

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14 Plan income, expenses and changes in net assets for the plan year:

Note: *Include all income and* expenses of a *trust(s)* or *separately maintained fund(s). Round off amounts to nearest dollar.*

Income	a. Amount	b. Total
(a) Contributions received or receivable in cash from—		
(i) Employer(s) (including contributions on behalf of self-employed individuals)		
(ii) Employees		
(iii) Others		
(b) Noncash contributions (specify nature and by whom made) ▶		
(c) Total contributions, sum of (a) and (b)		
(d) Earnings from investments—		
(i) Interest		
(ii) Dividends		
(iii) Rents		
(iv) Royalties		
(e) Net realized gain (loss) on sale or exchange of assets—		
(i) Aggregate proceeds		
(ii) Aggregate costs		
(f) Other income (specify) ▶		
(g) Total income, sum of (c) through (f)		

Expenses	a. Amount	b. Total
(h) Distribution of benefits and payments to provide benefits—		
(i) Directly to participants or their beneficiaries		
(ii) To insurance carrier or similar organization for provision of benefits		
(iii) To other organizations or individuals providing welfare benefits		
(i) Interest expense		
(j) Administrative expenses—		
(i) Salaries and allowances		
(ii) Fees and commissions		
(iii) Insurance premiums for Pension Benefit Guaranty Corporation		
(iv) Insurance premiums for fiduciary insurance other than bonding		
(v) Other administrative expenses		
(k) Other expenses (specify) ▶		
(l) Total expenses, sum of (h) through (k)		
(m) Net income (expenses), (g) minus (l)		

	a. Amount	b. Total
(n) Change in net assets—		
(i) Unrealized appreciation (depreciation) of assets		
(ii) Other changes (specify) ▶		
(o) Net increase (decrease) in net assets for the year, (m) plus (n)		
(p) Net assets at beginning of year, line 13(m), column a		
(q) Net assets at end of year, (o) plus (p) (equals line 13(m), column b)		

15 Has there been any change since the last report in the appointment of any trustee, accountant, insurance carrier, enrolled actuary, administrator, investment manager or custodian? Yes ☐ No ☐

If "Yes," explain and include the name, position, address and telephone number of the individual who left or was removed by the plan ▶

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	Yes	No
16 Bonding:		
(a) Was the plan insured by a fidelity bond against losses through fraud or dishonesty?		
(b) If "Yes," enter the maximum amount of loss recoverable ▶		
(c) Enter the name of the surety company ▶		
(d) Does the plan, or a known party-in-interest with respect to the plan, have any control or significant financial interest, direct or indirect, in the surety company or its agents or brokers?		
(e) If the plan is not insured by a fidelity bond, explain why not ▶		
(f) In the current plan year was any loss to the plan caused by the fraud or dishonesty of any plan official or employee of the plan or of other person handling funds of the plan? If "Yes," see specific instructions.		

17 Information about employees of employer at end of the plan year (Plans not purporting to satisfy the percentage tests of section 410(b)(1)(A) of the Code complete only (a) below and see specific instructions):

(a) Total number of employees

(b) Number of employees excluded under the plan—

(i) Minimum age or years of service

(ii) Employees on whose behalf retirement benefits were the subject of collective bargaining

(iii) Nonresident aliens who receive no earned income from United States sources

(iv) Total excluded. sum of (i), (ii) and (iii)

(c) Total number of employees not excluded, (a) less (b)(iv)

(d) Employees ineligible (specify reason) ▶

(e) Employees eligible to participate, (c) less (d)

(f) Employees eligible but not participating

(g) Employees participating, (e) less (f)

	Yes	No
18 Is this plan an adoption of a: **(a)** ☐ Master/prototype, **(b)** ☐ Field prototype, **(c)** ☐ Pattern or **(d)** ☐ Model plan? If "Yes," enter the four or eight digit IRS serial number (see instructions) ▶		
19 (a) Is it intended that this plan qualify under section 401(a) or 405 of the Code?		
(b) Have you requested or received a determination letter from the IRS for this plan?		
20 If plan is integrated, check appropriate box: **(a)** ☐ Social security **(b)** ☐ Railroad retirement **(c)** ☐ Other		
21 (a) Is this a defined benefit plan subject to the minimum funding standards for this plan year? If "Yes," attach Schedule B (Form 5500).		
(b) Is this a defined contribution plan, i.e., money purchase or target benefit, subject to the minimum funding standards? (If a waiver was granted, see instructions.)		
If "Yes," complete (i), (ii) and (iii) below:		
(i) Amount of employer contribution required for the plan year under section 412 of the Code		
(ii) Amount of contribution paid by the employer for the plan year		
Enter date of last payment by employer ▶ Month ..... Day ..... Year		
(iii) Funding deficiency, excess. if any, of (i) over (ii)		

	Yes	No
22 The following questions relate to the plan year. If (a)(i), (ii), (iii), (iv) or (v) is checked "Yes," schedules of such items in the format set forth in the instructions are required to be attached to this form.		
(a) *(i)* Did the plan have assets held for investment?		
(ii) Did any non-exempt transaction involving plan assets involve a party known to be a party-in-interest?		
(iii) Were any loans by the plan or fixed income obligations due the plan in default as of the close of the plan year or classified during the year as uncollectable?		
(iv) Were any leases to which the plan was a party in default or classified during the year as uncollectable?		
(v) Were any plan transactions or series of transactions in excess of 3% of the current value of plan assets?		
(b) The accountant's opinion is ☐ not required or ☐ required, attached to this form, and is—		
(i) ☐ Unqualified		
(ii) ☐ Qualified		
(iii) ☐ Adverse		
(iv) ☐ Other (explain)		

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23 Complete this item only if you answered "Yes," to Item 6(d)	Yes	No
Did one or more of the reportable events or other events requiring notice to the Pension Benefit Guaranty Corporation occur during this plan year?		
If "Yes," complete (a) through (h) below.		
(a) Notification by the Internal Revenue Service that the plan has ceased to be a plan as described in Section 4021(a)(2) of ERISA or a determination by the Secretary of Labor of non-compliance with Title I of ERISA		
(b) A decrease in active participants to the extent specified in the instructions		
(c) A determination by the Internal Revenue Service that there has been a termination or partial termination of the plan within the meaning of Section 411(d)(3) of the Code		
(d) An inability to pay benefits when due		
(e) A distribution to a Substantial Owner to the extent specified in the instructions		
(f) An alternative method of compliance has been prescribed for this plan by the Secretary of Labor under Section 110 of ERISA		
(g) A cessation of operations at a facility to the extent specified in the instructions		
(h) A withdrawal of a substantial employer		

If additional space is required for any item, attach additional sheets the same size as this form.

SCHEDULE B (Form 5500)
Department of the Treasury
Internal Revenue Service
Department of Labor
Pension and Welfare Benefit Programs
Pension Benefit Guaranty Corporation

Actuarial Information

This schedule is required to be filed under section 104 of the Employee Retirement Income Security Act of 1974, referred to as ERISA, and section 6059(a) of the Internal Revenue Code, referred to as the Code.

▶ Attach to Forms 5500, 5500–C and 5500–K if applicable.

1977

This Form is Open to Public Inspection

For plan year beginning , 1977 and ending , 19

▶ Please complete every applicable item on this form. If an item does not apply, enter "N/A."

▶ Round off amounts to nearest dollar.

Name of plan sponsor as shown on line 1(a) of Form 5500, 5500–C or 5500–K | Employer identification number

Name of plan | Enter three digit plan number ▶ | Yes | No

1 Has a waiver of a funding deficiency for the current plan year been approved by the IRS? . . . . . .
If "Yes," attach a copy of the IRS approval letter.

2 Is a waived funding deficiency of a prior plan year being amortized in the current year? . . . . . .

3 Have any of the periods of amortization for charges described in section 412(b)(2)(B) of the Code been extended by DOL? . . . . .
If "Yes," attach a copy of the DOL approval of extension letter.

4 (a) Has the shortfall funding method been used? . . . . . .

(b) (*i*) If (a) is "Yes," has the deferral of the amortization of the shortfall gain (loss), beyond the plan year following the year in which the shortfall gain (loss) arose, been elected? . . . . . .

(*ii*) If (a) is "Yes," has the deferral of the amortization of the actuarial gain (loss), beyond the first plan year after valuation, been elected? . . . . . .

5 Actuarial method and operational information: (a) Enter most recent actuarial valuation date ▶

(b) Enter date(s) and amount of contributions received this plan year for prior plan years and not previously reported:
Date(s) ▶ , Amount ▶

(c) Accumulated funding deficiency at end of plan year (amount of contribution certified by the actuary as necessary to reduce the funding deficiency to zero), from 7(m) or 8(g) . . . . . .

(d) (*i*) Accrued liabilities as of (enter date) ▶

(*ii*) Value of assets as determined for funding standard account . . . . . .

(*iii*) Unfunded accrued liability . . . . . .

(e) Value of vested benefits (if calculated) . . . . . .

(f) Current value of the assets accumulated in the plan as of (enter date) ▶

(g) Number of persons covered (included in the most recent actuarial valuation): (*i*) Active participants . .

(*ii*) Terminated participants with vested benefits . . . . . .

(*iii*) Retired participants and beneficiaries of deceased participants . . . . . .

(h) (*i*) Actuarial gains or (losses) for period ending ▶

(*ii*) Shortfall gains or (losses) for period ending ▶

(i) Attach a statement of actuarial assumptions and methods used to determine (*i*) the normal cost and liabilities shown on lines 7(b) or 8(b) and 5(d)(*i*), and (*ii*) the value of assets shown on line 5(d)(*ii*). The statement is to include a summary of the principal eligibility and benefit provisions upon which the valuation was based, an identification of benefits not included in the calculation, and other facts, such as, any change in actuarial assumptions or cost methods and justifications for any such change. Include also such other information, if any, needed to fully and fairly disclose the actuarial position of the plan.

6 Contributions made to the plan for the plan year by employer(s) and employees:

(a) Month Year	(b) Amount paid by employer	(c) Amount paid by employees	(a) Month Year	(b) Amount paid by employer	(c) Amount paid by employees
			Total		

Statement by enrolled actuary (see instructions before signing):

To the best of my knowledge, the information supplied in this schedule and on the accompanying statement, if any, is complete and accurate, and in my opinion the assumptions used in the aggregate (a) are reasonably related to the experience of the plan and to reasonable expectations, and (b) represent my best estimate of anticipated experience under the plan.

Signature of actuary — Date

Print or type name of actuary — Enrollment number

Address — Telephone number (including area code)

Schedule B (Form 5500) 1977 Page 2

7 Funding standard account statement for plan year ending ▶ .....

Charges to funding standard account:

(a) Prior year funding deficiency, if any . . . . . .

(b) Employer's normal cost for plan year . . . . . .

(c) Amortization charges (outstanding balance at beginning of plan year ▶ $ .....) . . . . .

(d) Interest on (a), (b) and (c) . . . . . .

(e) Total charge, sum of (a) through (d) . . . . . .

Credits to funding standard account:

(f) Prior year credit balance, if any . . . . . .

(g) (*i*) Employer contributions (total from column (b) of item 6) . . . . . .

(*ii*) Employer contributions received this plan year for prior plan years and not previously reported . . .

(h) Amortization credits (outstanding balance at beginning of plan year ▶ $ .....) . . . .

(i) Interest on (f), (g) and (h) . . . . . .

(j) Other (specify) ▶ .....

(k) Total credits, sum of (f) through (j) . . . . . .

Balance:

(l) Credit balance, excess, if any, of (k) over (e) . . . . . .

(m) Funding deficiency, excess, if any, of (e) over (k) . . . . . .

8 Alternative minimum funding standard account (omit if not used):

(a) Was the entry age normal cost method used to determine entries in item 7 above? . . . . . ☐ Yes ☐ No

If "No," omit (b) through (g) below.

(b) Normal cost . . . . . .

(c) Excess, if any, of value of accrued benefits over market value of assets . . . . . .

(d) Interest on (b) and (c) . . . . . .

(e) Employer contributions (total from column (b) of item 6) . . . . . .

(f) Interest on (e) . . . . . .

(g) Funding deficiency, excess, if any, of the sum of (b) through (d) over the sum of (e) and (f) . . . . .

Instructions

Who Must File.—The employer or plan administrator of a defined benefit plan that is subject to the minimum funding standards (see section 412 of the Code and Part 3 of Title I of ERISA) must file this schedule as an attachment to the annual return/report filed for plan years beginning on or after January 1, 1976. Plans maintained on January 1, 1974, pursuant to one or more collective bargaining agreements entered into before September 2, 1974, are not subject to the minimum funding standards for plan years beginning before the earlier of the termination of the collective bargaining agreement(s) or January 1, 1981.

For split-funded plans, the costs and contributions reported on Schedule B should include those relating to both trust funds and insurance carriers.

Specific Instructions

(References are to line items on the form.)

4(a) A collectively bargained plan only may elect the shortfall funding method (see regulations under section 412 of the Code). Advance approval from the IRS of the election of the shortfall method of funding is NOT required if it is first adopted on or before the later of (i) the first plan year to which section 412 of the Code applies or (ii) the last plan year commencing before December 31, 1980. However, advance approval from IRS is required, if adopted at a later time or if discontinued.

4(b) Advance approval from IRS of the election to defer the amortization of the shortfall gain (loss) and/or the amortization of the actuarial gain (loss) is required for a plan year, subsequent to the first plan year to which the shortfall method applies. Advance approval from IRS is required for discontinuance.

5(a) The valuation for a plan year may be as of any date in the year, including the first and last. Valuations must be performed within the period specified by section 103(d) of ERISA and section 6059(a) of the Code.

5(b) Not applicable to the first plan year to which the minimum funding standards apply.

5(c) Insert amount from item 7(m). However, if the alternative method is elected, and item 8(g) is smaller than item 7(m), enter the amount from item 8(g). File Form 5330 with the Internal Revenue Service to pay the 5% excise tax on the funding deficiency.

5(d) Amounts in 5(d) should all be as of the same date which should be the date of the end of the plan year or date as of which the most recent actuarial valuation was made. If amounts are not as of the date of the most recent actuarial valuation, indicate in the statement of actuarial assumptions and methods (as required by 5(i)) how the amounts in 5(d) were determined. Liabilities fully funded by annuity and insurance contracts other than any contract funds not allocated to individuals may be omitted from both items 5(d)(i) and 5(d)(ii).

5(d)(i) If the aggregate cost or frozen initial liability method is used, enter "N/A."

5(d)(ii) Determine the value of assets in accordance with section 412(c)(2) of the Code or 302(c)(2) of ERISA.

5(d)(iii) If the aggregate cost or frozen initial liability method is used, enter "N/A."

5(f) This should be as of the same date as 5(d) or, if not, the method of adjustment between the two dates should be indicated in 5(i).

5(h)(i) If the aggregate cost or frozen initial liability method is used, enter "N/A."

5(h)(ii) For the methods to be used to determine the shortfall gain (loss) see the regulations under section 412 of the Code.

5(i) A summary of one page or less of plan provisions will ordinarily be adequate. For the first year for which Schedule B is required to be filed, no change in the actuarial method or assumptions needs to be noted or justified. In subsequent years, a change in actuarial method or plan year requires IRS approval. Actuarial methods should be described in accordance with section 3(31) of ERISA as accrued benefit cost (or unit credit), entry age normal cost, individual level premium, aggregate cost, attained age normal cost or frozen initial liability, where those terms are applicable. If the shortfall method of funding is used, all pertinent facts relating to funding peculiar to this method should be included in the statement.

6 Show all employer and employee contributions for the plan year, and employer contributions made not later than 2½ months (or such later date allowed under section 412(c)(10) of the Code and section 302(c)(10) of ERISA) after the end of the plan year.

Statement by enrolled actuary.—In lieu of signing the statement, an enrolled actuary may attach a signed statement containing the name, address, enrollment number, telephone number and the actuary's opinion that the assumptions used in preparing Schedule B are in the aggregate reasonably related to the experience of the plan and to reasonable expectations, and represent his or her best estimate of anticipated experience under the plan and to the best of his or her knowledge the report is complete and accurate. In addition, the actuary may offer any other comments related to the information contained in Schedule B.

7 Under the shortfall method of funding, the Normal Cost in the funding standard account, is the charge per unit of production (or per unit of service) multiplied by the actual number of units of production (or units of service) which occurred during the plan year. Each amortization installment in the funding standard account is similarly calculated. For a plan maintained by more than one employer, the amortization of the shortfall gain (loss) and the actuarial gain (loss) may be deferred. See regulations under section 412 of the Code.

7(b) If no valuation was made for the current year, enter the normal cost calculated in the most recent actuarial valuation, or the estimated cost for the current year based on such valuation. If amounts are not as of the date of the most recent actuarial valuation, indicate in the statement of actuarial assumptions and methods (as required by 5(i)) how the amounts shown were determined.

8(a) If the entry age normal cost method was not used to determine the entries in item 7, the alternative minimum funding standard account may not be used.

8(c) The value of accrued benefits should exclude benefits accrued for the current plan year. The market value of assets should be reduced by the amount of any contributions for the current plan year.

Notes

1. The 1977 "plan year" for purposes of Form 5500 is either the 1977 calendar year or the plan's fiscal year beginning in 1977. The plan sponsor has until 7 months after the plan year ends to file the return.

2. A one-by-one inspection of the 384 plans reporting over $100 million in assets suggested few obvious omissions among large corporate sponsors.

3. By contrast, the Federal Reserve System's flow-of-funds accounts reported total assets of private pension funds as $178 billion at year end 1977 and $198 billion at year end 1978. The Form 5500 data therefore confirm the widely acknowledged underreporting in the flow-of-funds sample.

4. The largest single plan, sponsored by General Electric, reported assets of $3.8 billion.

5. The great majority of companies sponsor five or fewer plans. The largest number of plans sponsored by any one company (excluding subsidiaries) was 63.

6. The computer program that searches for Compustat matches was developed by Clint Cummins; I am grateful to him for making the program available.

7. The key to this part of the matching process was the *Directory of Corporate Affiliations 1978* (Skokie, Ill.: National Register Publishing Co., 1978). It would be difficult to overestimate the amount of painstaking effort devoted to this task by Arturo Estrella and Joyce Manchester.

8. Of the 1,836 consolidated plan sponsors, 1,571 sponsored defined-benefit plans.

9. The pension sponsor with the largest amount of pension assets on a consolidated basis was American Telephone and Telegraph, with $18.4 billion in assets held in three plans sponsored by the parent company and 26 plans sponsored by subsidiaries.

10. See, for example, the work of Sharpe (1976), Oldfield (1977), Black (1980), Feldstein and Seligman (1981), Scholes (1981), and Tepper (1981).

11. In many situations, a corporation's principal means of flexibility in this regard is its ability to choose what assumptions (interest rate, inflation rate, etc.) to use in calculating the actuarial value of the liabilities to be funded. See, for example, Tepper and Affleck (1974). A careful empirical study of corporations' behavior in this regard represents a potentially fruitful line of research, but one that lies beyond the scope of this chapter; see sec. 5.6 below.

12. United States corporations must report, as a footnote to the balance sheet, the difference between vested pension liabilities and the level of pension funding. Neither total need be stated individually, nor need the corporation report its nonvested liabilities at all (except on Form 5500 Schedule B).

13. Whatever off-balance-sheet assets and liabilities the firm has, apart from PA and PL, are included in BA and BL for purposes of this chapter. See also note 34 below on the definition of PL.

14. The sample for this regression, and those reported in the following discussion, omits 13 firms for which net worth is sufficiently small that either PL/NW or FL/NW exceeds 3.0. The result of a significant positive relationship also appears (although with smaller γ values) when VL, the firm's vested pension liabilities only, is used in place of total pension liabilities PL. (The simple correlation between VL and PL within the total sample is .89.) It is interesting to note that regressions of the form (4) and also (5) below, estimated with BA instead of NW as the scale variable, typically show a small *negative* value of γ which is marginally significant at the .05 level. By contrast, most of the results reported in this chapter are essentially invariant to the choice of NW or BA as the scale variable; see note 16 below for the one other case in which this choice makes a substantive difference.

15. See also the chapter by Harrison and Sharpe in this volume.

16. Defined-benefit plans report total assets explicitly on Form 5500 and implicitly (as the difference between liabilities and unfunded liabilities) on Schedule B. The two asset measures need not coincide. For the 1977 sample, the simple correlation between the two is

.92 in the disaggregated sample and .95 in the aggregated sample. The results reported here and below rely on the asset measure implicit in Schedule B because it is more likely to be consistent with the liability measure. Here, as in (4), using vested liabilities VL in place of PL also consistently results in a significant positive relationship but with smaller γ values. In the regressions of the form (7) as well as (8) below, replacing NW by BA as the scale variable typically leads to small (in absolute value) values of γ, of either sign, that are not statistically significant; see 14 above.

17. The t-statistic associated with the explicit test of the null hypothesis $\delta = 1$ is 28.2, easily warranting rejection at any plausible confidence level. For the two subsample regressions described immediately below, the analogous t-statistics are 19.2 and 11.9, respectively.

18. See esp. Oldfield (1977) and Feldstein and Seligman (1981), as well as the chapter by Feldstein and Mørck in this volume. It is always possible, of course, that managements make decisions on the basis of believing that they can affect the share price in this way even if that belief is false.

19. These aggregate data are from the Federal Reserve System's flow-of-funds accounts for year end 1980. Although the proportions vary over time, primarily as a result of fluctuations in equity prices, the 1980 values are not atypical.

20. See Pesando (1981) for evidence on beneficiaries' implicit sharing in these returns, however.

21. See Black (1980) and Tepper (1981).

22. This statement abstracts from such factors as risk and maturity differences between the debt issued and the debt held.

23. For the subsample of firms with $PA/BA \geq .03$, the β value for $\sigma(EBIT)$ in the equity equation is $-.37$, with t-statistic -2.5; for the subsample with $PA/BA \geq .10$, it is $-.75$, with t-statistic -2.2.

24. Again this result carries over to all measures of earnings.

25. The corresponding β values in the PAD and PAO equations are both negative, though not statistically significant.

26. This distinction between equity investment in the accumulation and the annuity phases of defined-contribution pension plans corresponds to what many participants in TIAA-CREF voluntarily elect when they switch their pension reserves from CREF to TIAA at or near the time of retirement.

27. If the observations in the sample corresponded to different dates for the same firm, then a positive relationship between balance sheet leverage and pension asset allocations to debt securities would be evidence that firms behaved over time as Black (1980) and Tepper (1981) have suggested that they should for tax reasons. In a cross-section sample, however, no such inference would be warranted. At most, a positive cross-section relationship would indicate differences among firms in their extent of implementation of Black and Tepper's advice.

28. This positive relationship is opposite to what I found in earlier work based on a limited sample of Form 5500 and related data for plan year 1976.

29. Using vested liabilities VL in place of PL in (15) does not substantially affect the estimated γ values but does reduce the associated t-statistics; for the two samples reported above the results based on VL are, respectively, $\gamma = .31$, with t-statistic 6.4 ($\bar{R}^2 = .03$), and $\gamma = .26$, with t-statistic 5.0 ($\bar{R}^2 = .07$).

30. The variability of the rate of return on equity affects other liabilities negatively in both the full sample and the $PL/TA \geq .10$ subsample.

31. Using vested liabilities VL in place of PL in (17) also consistently results in a significant positive relationship but with smaller γ values.

32. These results apply to the Schedule B value of assets. For the Form 5500 asset totals, which need not have the same date as the liabilities reported in Schedule B, the corresponding results are $\gamma = .46$ and $\delta = -.32$, with respective t-statistics 8.9 and -4.9 ($\bar{R}^2 = .06$) for

the full sample, and $\gamma = .58$ and $\delta = -.40$, with respective t-statistics 8.7 and -4.7 ($\bar{R}^2 = .23$) for the subsample.

33. The results for estimating (6) are comparable.

34. As Jay O. Light points out in his discussion in this volume, there is also a problem if managements use differing actuarial concepts in defining pension "liabilities"—or, even if a single concept is used, if that concept differs importantly from that assumed here. The concept of pension liabilities used here (as in all of the previous literature cited above) is the actuarial present discounted value of accrued obligations for future benefit payments. This concept is identical to the notion of "actuarial present value of accumulated plan benefits" as defined by the Financial Accounting Standards Board (FASB) in its *Statement No. 35*, adopted March 1980 (see esp. pp. 6–9). What matters here, however, is what concepts managements used at the time they submitted their companies' reports for the 1977 plan year. On the basis of a close reading of the pension handbooks and texts available at that time, as well as the few available surveys of pension actuarial practice, it is not possible to determine whether—or to what extent—managements relied on the concept used here, which was later formalized by FASB-35, or the different net concept suggested by Light, or yet some other interpretation. The question does bear importantly on the empirical work in this chapter, as well as in all other empirical studies involving pension liability data before FASB-35.

Comment Jay O. Light

First, I would like to congratulate Benjamin M. Friedman for a difficult empirical task well done. I hesitate to imagine just how many man-months were absorbed in preparing the basic data, but they must have been quite a few. The resultant data base has already furnished useful insights in Friedman's chapter, and I trust that it will continue to do so.

Friedman's chapter is a first exploratory trip through the data, searching for important relationships among corporate pension funding policy, the allocation of pension fund assets, corporate capital structure, and the characteristics of the underlying firms. It is the most thorough attempt I know to find such relationships using the detailed Form 5500 data, and as such it is an important work.

I propose to comment on several of what I think are the most interesting sections of the chapter. For each section, I will state the empirical results that might have been predicted on the basis of extant pension theories and the actual empirical results that were obtained. I will then tell some stories that might help to rationalize some of the observed empirical phenomena.

Before embarking on these tasks, let me first urge the reader to be cautious of Friedman's results and, perhaps more important, of my own comments. The financial decisions being investigated (funding policy, pension investment policy, and capital structure policy) are all, in princi-

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ple at least, simultaneous decisions. Causality is therefore very unclear, and the same cross-sectional results can be rationalized by a variety of quite different stories. More important, in this area our principal theoretical insights seem to point toward extremal policies (see, for example, the Harrison and Sharpe chapter in this volume). Interpreting cross-sectional regression results in the light of these extremal hypotheses is particularly difficult.

The Asset Allocation Results

With these words of caution, let me discuss what I find to be Friedman's most interesting results: the relationship of the pension fund's asset mix to other variables.

As a first step, let us speculate about what empirical relationships we would have expected to find on the basis of extant theory. The most convincing piece of theory is the tax-based argument (Black 1980; Tepper 1981), which essentially maintains that 100% of the fund's investments should be in the most heavily taxed asset, in this case presumably bonds. Note that this theory tells us only that the asset allocation should be an extreme choice. It does not predict what the *cross-sectional* empirical results presented in Friedman's chapter should look like. Indeed, we do not need cross-sectional results to test the tax-based theory. We know that very few firms invest their pension funds exclusively in bonds. To the contrary, most firms maintain a mixed portfolio, often weighted somewhat more heavily toward equities. Thus, very simple and well-known evidence shows that tax-based theories do not explain actual pension fund allocations.

To structure a theory-based hypothesis for the cross-sectional results, we must construct an augmented theory which states why firms might depart from the tax-based all-bonds strategy. The most likely candidate for such an augmented theory is the joint consideration of tax factors and the value of the put to the PBGC. (Friedman calls this latter effect the "Sharpe hypothesis.") For example, we might hypothesize that firms for whom the PBGC *put* is more valuable (that is, more in the money) will hold more of the most volatile asset, presumably common stocks, and vice versa.[1] The PBGC put is likely to be more valuable for underfunded plans, for unprofitable companies or companies with high profit variability, or for companies with more debt. We would thus expect the following kinds of companies to hold more common stocks in their pension portfolios: companies with underfunded pension plans, less profitable companies, companies with higher earnings variability, and companies with more debt.

Unfortunately, the actual empirical results confirm none of these hypotheses, as Friedman's excellent discussion points out. Surprisingly, there is no significant correlation between the funding of a plan and the

allocation of assets within the fund.[2] There was a significant correlation of asset allocation with the other variables, but the opposite of that hypothesized above. In short, less profitable companies with more debt and higher earnings variability tended to hold somewhat less common stock in their pension funds, not more.

Why is that? The empirical results are consistent with a "risk-offsetting story," rather than with the theory discussed above. Corporations seem to manage their pension fund asset allocations to counterbalance the risks stemming from product markets or financial structure, so as to more nearly equalize total risk across firms at any given point in time. To some extent, this large sample result merely confirms anecdotal advice that can often be overheard from pension officers; namely, the riskier the company, the safer the pension fund should be. It is not at all clear, however, whether it is risk to the company, or to the pension beneficiaries, or to the agents themselves (i.e., the pension officers) that decision makers endeavor to offset, though these are all affected by the asset choice. Nonetheless, this empirical study demonstrates that risk offsetting appears to be a central feature of asset allocation.

Pension Funding and Capital Structure

The other results I will discuss here are the observed relationships between the degree of pension funding, capital structure, and other attributes of the firm. I have two small but nagging concerns about this set of results.

First, the measures of funding that are used are derived from the item "Accrued Liabilities" reported on Schedule B, Form 5500, entitled "Actuarial Information." It is not clear to me that this definition of pension liabilities is really measuring what one might first imagine, and the labels and definitions here can be quite misleading. The structure of Schedule B suggests that this "accrued liabilities" item is the calculation used in determining the actual funding contributions for the plan, rather than, for example, the "actuarial present value of accumulated plan benefits" currently required by FASB 35. More particularly, "accrued liabilities" in the language of the actuary is often used to mean the *present value* of what past contributions should have been had the current actuarial method, actuarial assumptions, and benefit levels been in effect during all past time periods. "Accrued liabilities" in this sense, when compared to the value of the fund's assets, determine the "unfunded liability," the measure of the extent to which the fund's assets are such that the pension fund is on the "funding trajectory" specified by the particular funding method. Unfortunately, however, this definition of "accrued liabilities" is dependent on the funding method selected by the firm, as well as on the actuarial assumptions used (such as discount rate). Thus, two firms in the identical economic position vis-à-vis their projected benefits may report

substantially different "accrued liabilities," and vice versa, introducing a source of possible distortion in the data. Unfortunately, we do not know for sure what firms recorded under the item "accrued liabilities" on the Form 5500. The pension liability information currently being reported for more recent years since introduction of the new FASB 35 will allow us to be more confident that we have a cross-sectionally consistent measure of pension liabilities.

Second, several of the empirical results reported by Friedman stem from regressions where net worth is used as the scale (or deflating) variable. Clearly, because firms are quite different in size, some scaling is necessary. However, net worth is a relatively troublesome choice for this scale variable, for it is a residual quantity which can become quite small.[3] It thus could possibly introduce some spurious correlation into the regression results. Friedman's note 14 suggests that he was sensitive to this potential problem and omitted some observations to attempt to limit its effect. Nonetheless, several of the key empirical results would have reversed sign had another scale variable, other than net worth, been used (see Friedman's notes 14 and 16). Given some misgivings about net worth on a priori grounds, the sensitivity of results to the choice of scale variable is a little troubling.

Having raised these two concerns, let me discuss the actual funding results. As to theory, the tax-based arguments would suggest that pension funds should always be as fully funded as possible, consistent of course with IRS regulations. But to interpret cross-sectional tests, we once again need an augmented theory which allows us to hypothesize why firms might depart from policy of full funding. The most likely candidate, as Friedman points out, is the put to the PBGC. A hypothesis stemming from this conjecture would be that riskier firms should have bigger unfunded liabilities. Firms with low profitability, or variable profitability, might well be thought of as riskier firms, and we might expect them to have bigger unfunded liabilities. Unfortunately, the empirical results (see, for example, table 5.7) suggest that this is not the case. Indeed, the results, while generally not statistically significant, have the opposite sign.

There is, however, one rather intriguing result here: the more debt a company has on its balance sheet, the larger its unfunded liabilities are. And there are several alternative explanations of this result. First, and most simply, we can think of unfunded liabilities as merely another form of corporate borrowing. When a company needs to borrow, we might argue, it tends to borrow in two ways: from the capital markets, which is shown on the balance sheet, and from its pension fund, which is shown as unfunded pension liabilities.

Second, this result could be interpreted, as Friedman suggests, as empirical support for the Sharpe hypothesis about the value of the PBGC put. Finally, I might offer the following agency explanation. When a

company has more debt, it tends to be managed somewhat more in the interests of current (and possibly future) creditors. Stepping back from the problem for a moment, the tax-based arguments (Black 1980; Tepper 1981) really just maintain that the interests of pension beneficiaries and shareholders are collinear. Ignoring the put to the PBGC, both of these groups want the pension fund fully funded and invested in bonds, the beneficiaries to maximize their collateral, and the shareholders to maximize their tax benefits. In whose interests, however, would it be to underfund the plan? Who are the losers when we fully fund? The creditors are the most important set of apparent losers. By funding the pension liabilities, we collateralize these liabilities to the detriment of liabilities of the company. Consequently, if creditors could dictate corporate pension policy, they would clearly be interested in underfunding the plan but investing the pension fund in bonds. Interestingly, what we observe in the empirical data is that the more debt a company has, the bigger its unfunded liabilities (table 5.7 and [17]) and the more bonds it holds in the pension fund (table 5.10). It is possible that we are observing an agency phenomenon here, reflecting the influence and interests of creditors on the financial policies of highly leveraged companies.

Conclusion

Benjamin Friedman's chapter in this volume has expanded our knowledge of how companies actually manage their pension policies and is therefore an important contribution. We hope that future studies will pursue this same goal.

For the present, however, we are left in a somewhat unsatisfactory state. The tax-based arguments of Black (1980) and Tepper (1981) suggest that firms should fully fund their pensions and invest the accumulated pension funds solely in bonds. Unfortunately, they do not. The Sharpe hypothesis suggests a rational economic reason why firms might be departing from these extremal policies: the value of the put to the PBGC. Unfortunately, while several of the cross-sectional regressions reported in this chapter are consistent with this hypothesis, others are not. In short, our evolving theories of pension policy and our evolving understanding of reality are at odds with one another in several important respects.

Notes

1. This is an empirically testable proposition using cross-sectional regressions if firms adopt extremal asset allocations (as suggested by Harrison and Sharpe) or if they adopt interior mixed allocations—as, in fact, we know they actually do.

2. See my later discussion of the funding variable used in the data base.

3. "Net worth," as defined by Friedman, is not only net of corporate debt but net of unfunded pension liabilities as well (see eq. [2]), so it can become quite small—indeed, conceivably negative.

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