THE OUTLOOK FOR PENSION CONTRIBUTIONS AND PROFITS IN THE U.S.

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Abstract

This paper addresses the relationship between defined benefit pension plans and corporate profits and examines the outlook for defined benefit plans in the wake of the bear market. Due to a soaring stock market during the extended bull market of 1982-2000, together with federal regulations and legislation that shifted funding requirements forward, pension contributions virtually disappeared as a corporate expense for much of the previous two decades.

Our analysis suggests that in the absence of the stock market boom and the regulatory and legislative changes that reduced funding, the average firm's contribution to its pension plan would have been 50 percent higher during the 1982-2001 period - 9.9 percent of payroll instead of 6.6 percent of payroll. The downturn in contributions had a significant impact on corporate profits. Lower pension contributions, all else equal, will produce a dollar- for-dollar increase in before-tax profits. Our analysis implies that corporate profits were roughly 5 percent higher than they would have been otherwise. Higher profits produce a feedback effect as they lead to further capital gains and further reductions in contributions.

Given the current bear market and an aging workforce, the feedback now goes in the opposite direction. Now that the stock market bubble has burst, our analysis suggests that contributions relative to wages would return to their pre-1982 levels of about 10 percent. This implies that – on a permanent basis – contributions would double from their current level of $40 billion to $80 billion. Assuming that investors view the increase as permanent, the feedback effect would lower the value of equities held by pension funds by $20 billion. In short, as the economy emerges from recession and the bear market draws to a close, firms and investors must be prepared to contend with a strong headwind from pension funding obligations that could slow the recovery.

Introduction

Although private pensions have seen a strong movement toward 401(k) plans over the past two decades, defined benefit plans continue to play a major role among large U.S. corporations. [1] For example, 86 of Standard and Poor's 100 largest companies had a defined benefit plan in 2001 (R.G. Associates, Inc. 2002). Among all companies with pension plans in 2000, defined benefit plans still covered about 30 percent of those participating in a pension and held about 45 percent of total private pension assets (Table 1).

Unlike 401(k) plans, in which benefits depend on contributions to the account and earnings on that account, traditional defined benefit plans promise a stated benefit at retirement. This benefit is usually provided in the form of an annuity, which provides a periodic (e.g. monthly) stream of income that lasts for life.[2] Pay-related plans, which are generally used for salaried employees, state the benefit as a percentage of the employee's pay over the entire career or over the period just prior to retirement. For example, a plan might provide 1.5 percent of final three-year average pay for each year of employment, so that an employee with 20 years of service would receive a benefit equal to 30 percent of final pay. The other type of defined benefit plan, which is common for hourly paid employees, states benefits in terms of flat dollar amounts per year of service. For example, the plan might provide $50 per month for each year of service, so that an employee with 20 years would receive a lifetime pension of $1000 per month.

The cost of funding pension benefits may vary sharply depending on such factors as employee turnover, retirement patterns, salary progression, and investment returns on plan assets. To ensure that plan participants actually receive promised benefits, Congress in 1974 introduced minimum funding standards through the enactment of the Employee Retirement Income Security Act (ERISA). ERISA allowed employers to deduct pension contributions for tax purposes up to the amount of the plan's total liabilities. In 1987, Congress lowered this maximum limit to protect the Treasury from loss of revenues.

[1] For an overview of trends in private pensions over the past two decades, see Munnell, Sundén, and Lidstone (2002).

[2] Despite the emergence of "hybrid" plans that define benefits as lump sums, 81 percent of defined benefit plans with more than 1,000 participants continue to provide benefits as annuities (Watson Wyatt 2003)

This paper begins with a description of ERISA's minimum funding requirements. Next, it explores ERISA's full funding rule. Then, the paper considers other constraints on funding that emerged during the late 1980s. These include a shift in actuarial methods, a new full funding limit, a tax on excess assets, and a cap on compensation for funding purposes. Finally, the paper presents empirical estimates of the impact of the stock market and of legislation on past contributions and concludes by discussing the implications for contributions in the wake of the market collapse and the postponed contributions.

ERISA's Minimum Funding Requirements

ERISA requires employers to put aside money each year to cover the cost of future benefits. The precise amount of money depends on how a company's actuaries allocate costs to that year. This process typically starts with a calculation of the "present value of projected benefits," that is, an estimate of the total amount that will be needed to pay future benefits, expressed in today's dollars. Box 1 provides a detailed example of how projected benefits are calculated.

Box 1: Projecting Pension Benefits

To calculate the present value of projected pension benefits, the actuary uses two types of information: factual and judgmental. The factual elements are the benefit provisions of the plan and the characteristics of current workers and retirees, such as age, sex, length of service, and current salary. The judgmental factors include the likelihood that the person will live to receive benefits, the duration of the benefit payment, the rate at which salaries will increase over the employees' work lives, the rate of employee turnover, and the interest rate used to discount future liabilities back to the present.

Figure 1 shows the present value of projected benefits for a hypothetical firm using the "projected unit credit" approach, the most widely used method for calculating benefit obligations. The firm's total liability of $100 million consists of three major components. The first ($45 million) is the accumulated benefit obligation or the value of benefits earned to date by retired employees, employees who have left the company with vested pension rights, active employees with vested pensions, and active employees with non-vested rights.

The next portion ($25 million) represents the effect of future salary increases on the value of pension rights already earned. For example, suppose that the plan

provides 1.5 percent of final salary for each year of service. In this case, an employee with 10 years of service, who currently earns $40,000, would have an accumulated vested benefit of $6,000 per year. But by retirement, this employee is projected to have a final salary of $80,000 (because of promotions and inflation), and the 15 percent benefit already earned will apply to the $80,000 rather than the $40,000. Thus, the pension associated with the employee's 10 years of service will be $12,000 annually payable at 65, not $6,000. The $6,000 is already included in the component relating to active employees' vested benefits discussed above, and the extra $6,000 is included in the component representing the effect of future salary increases on benefit rights earned to date.

The final portion of the present value of projected benefits ($30 million) represents the value of new pension rights that will be earned by current employees over the remainder of their work lives. In the example used above, this component is the additional 1.5 percent of final salary that the employee will earn each year until retirement.

Once the actuary calculates the present value of future benefits, he selects an actuarial cost method to establish contributions. These contributions consist of the "normal cost" payment to cover the costs of benefits accrued during a given year, and an installment payment to pay off the firm's unfunded liability. Box 2 describes additional funding requirements for underfunded single employer plans.

The unfunded liability ($10 million in the example in Figure 1) is the portion of the present value of projected benefits not covered by assets on hand or by scheduled normal cost contributions to cover future service. The unfunded liability is usually paid off over a fixed number of years like a home mortgage.

Under ERISA, a stock market boom affects the minimum required pension contribution in two ways. The most direct is an increase in the value of assets, which lowers required contributions by reducing the unfunded liability.[4] In the past two

[4] This effect would be quite gradual, however. First, the actuaries tend to smooth the value of assets by five-year averaging to moderate year-to-year fluctuations. Second, ERISA requires that a significant difference between the actual rate of return and the rate incorporated in the actuarial assumptions be classified as an actuarial gain or loss and amortized over 15 years to determine the minimum funding requirement.

decades, the booming stock and bond markets produced enormous gains in the assets of defined benefit plans, allowing companies to meet their pension obligations while keeping contributions low. Between 1982 and 2000, capital gains on equities held by defined benefit plans amounted to $1.4 trillion. For bonds, estimates indicate that capital gains amounted to $265 billion over the 1982-2000 period, due in large part to declining rates of inflation. The capital gains from both equities and bonds propelled plan assets from $444 billion in 1982 to $2.1 trillion in 2000. This is particularly striking given that pension benefits paid out to retired workers exceeded the amount of new contributions during this period (see Figure 2).

The second way in which a strong stock market affects required pension contributions is by encouraging sponsors to adopt a higher discount rate to calculate the present value of future benefits. The higher the discount rate, the less a future dollar is worth. Therefore, raising the discount rate lowers the present value of benefits, thereby reducing the required normal cost payment. The average discount rate used by final average plans increased from 5 percent in 1976 to 8 percent in 1986, where it has remained to date.[6] The conventional wisdom is that a 1-percentage point increase in the discount rate reduces the present value by 15 percent.

The impact of higher discount rates on liabilities has probably been modest. First, under ERISA, the gain from the change in liabilities is spread over 30 years. Second, in the case of final pay plans, the effect of higher interest costs can be partially offset by changes in the salary growth assumption. An equal increase in both the assumed interest rate and salary growth cuts the impact of the interest rate on the funding obligation approximately in half. Until the mid-1980s, the increase in the discount rate was less than the increase in the salary growth assumption so that the "spread" between them declined (Figure 3). Therefore, in the pre-1985 period, the overall impact of higher discount rates was relatively small. Since the mid-1980s, the spread between discount rates and assumed salary growth has increased, from 1.5 percent in 1984 to 3.0 percent in

[6] The average discount rate for plans with more than 1,000 participants was 8.1 percent in 2002 (Watson Wyatt, 2003).

2002, and has therefore had a more significant effect on the funding needed to cover pension liabilities.

In short, a stock market boom affects the minimum funding requirement in two ways – increasing asset values and reducing the present value of future benefit obligations. But given ERISA's provisions for averaging and spreading out the changes in the value of benefit obligations, the impact on minimum funding requirements would be gradual.

Box 2: Additional Funding Requirements for Underfunded Single-Employer Plans

In 1994, Congress introduced additional funding requirements for "underfunded" single-employer plans with more than 100 participants. Under the special rule, a plan is considered underfunded if the value of its assets is less than 90 percent of its current liability. The amount of the required contribution depends on a number of factors. One is whether the unfunded liability is related to benefits accrued before 1988 or 1995, or to changes in the mortality table used to determine contributions. It also depends on the extent to which the plan provides for benefits that might arise from unpredictable contingent events, such as the shutdown of a plant or reduction in the labor force. In all cases, however, the additional required contribution cannot exceed the amount needed to bring assets up to 100 percent of the current liability.

The Role of ERISA's Full Funding Rule

ERISA's full funding rule, which limits tax-deductible amounts that sponsors can contribute to overfunded plans, was designed to protect federal tax revenues. Any plan assets in excess of accrued liabilities are considered surplus and must be applied as a credit against normal cost payments. The full funding limitation generally makes it impossible for firms to make any contributions to overfunded plans. Beginning in 1987, if employers make tax-deductible contributions in excess of the permissible limits, they are subject to a 10-percent penalty tax. Whereas ERISA's minimum funding requirements work to stabilize the level of pension contributions by permitting unfunded liabilities to be paid over an extended period of time, its full-funding limitation introduces considerable volatility by immediately applying the entire surplus as a credit against allowable deductions. Table 2 demonstrates the volatility that arises once a plan becomes fully funded. First, consider an underfunded plan where the accrued liability

exceeds fund assets by $5 million and the normal cost payment is $11 million (the first column in the top panel of Table 2). In calculating the annual contribution, the $5 million deficit would be paid off over time, say at $500,000 per year. Thus, the total minimum funding contribution would be the $11 million normal cost plus the $500,000 installment on the deficit for a total of $11.5 million.

In contrast, suppose the plan were overfunded so that assets exceeded accrued liability by $5 million (the second column in the top panel of Table 2). The maximum tax-deductible contributions would be the normal cost of $11 million offset by the entire $5 million surplus, resulting in a total of $6 million. In other words, deficits are paid off over a period of years while surpluses are applied immediately in full.

A company whose plan is overfunded will be more sensitive to changes in market value of pension assets than a company with an underfunded plan.[7] Consider the effect of a $5 million increase in market value in the two situations described above (the bottom panel in Table 2). In the case of the underfunded plan, where the full funding limitation does not apply, the change would, initially, have only a minor effect on annual contributions. If the $5 million were subject to five–year averaging, the increase in asset value would reduce the level of underfunding from $5 million to $4 million and the annual installment payment on the unfunded liability from $500,000 to $400,000. This would mean that the total contribution would decrease from $11.5 million to $11.4 million. That is, a $5 million increase in asset prices in a given year would reduce annual contributions by only $100,000 in the first year, gradually increasing to $500,000 in the fifth year.

In the case of an overfunded plan, where the full funding limitation is applicable, the impact of the capital gain on the contribution is significantly greater[8]. When the actuarial value of plan assets is below the market value, it becomes the relevant figure,

[7] The degree of sensitivity will depend on how rapidly capital gains are incorporated into asset values. In applying the full funding limitation, assets are determined by the lesser of market value or the actuarially smoothed value.

[8] In the case where the market value is below the actuarial value, capital gains have an even more dramatic effect. Market value becomes the relevant figure, so the $5 million increase in asset values is not subject to five-year averaging. The gain immediately raises the surplus to $10 million, lowering the annual contribution from $6 million to $1 million. In short, in situations where the full-funding limitation is applicable, an increase in the market value of assets increases the plan's surplus somewhere between 20 cents on the dollar and dollar for dollar, lowering contributions by the same amount.

and the gain is typically subject to five-year averaging. So, in this example, a $5 million capital gain would appear as $1 million per year. However, in contrast to the example of the underfunded plan, the full $1 million would be offset against the normal cost, so that the pension contribution would decline from $6 million to $5 million. That is, a $5 million capital gain would lead to a $1 million decline in annual contributions, 10 times the effect on the underfunded plan in the first year.[9]

Other Funding Constraints

In addition to ERISA's maximum funding limitation, four other developments have limited funding in defined benefit plans. These include an accounting rule that led to changes in funding methods, new maximum funding limits, an excise tax on "reversions," and a cap on compensation for funding purposes. As a result of these developments, plan sponsors would be likely to see an increase in required pension contributions even if the stock market had not collapsed.

The Impact of Reporting Requirements

In 1985, the Financial Standards Accounting Board (FASB) issued rules requiring sponsors to account for accruing pension liabilities by a method known as the "projected unit credit actuarial cost" method. Technically, the Statement of Financial Accounting Standards No. 87, *Employers' Accounting for Pensions*, mandated the use of the projected unit credit only for reporting purposes, and firms could continue to use any of the six actuarial methods authorized under ERISA for funding. In fact, sponsors appear to have either interpreted the FASB standard as an endorsement of the projected unit credit for funding as well as reporting or simply found it more convenient to use the same method for funding and reporting. In 1981, before the introduction of the projected unit credit method, 53 percent of large pension plans used "entry age normal" and the rest used other methods. In 1991, 54 percent of large plans had switched to the projected unit credit approach, with only 31 percent using the entry age normal method. By 2002, this

[9] This disparity would diminish over the course of the five-year period as the impact on the underfunded plan would increase to $500,000 while the effect on the overfunded plan would remain at $1million.

gap had widened further, with 69 percent of plans using projected unit credit and 25 percent using entry age normal (Table 3).

The shift from entry-age normal cost to the projected unit credit method results in lower costs early in a worker's career and higher costs later. The reason is as follows. Under the entry age normal cost method, the actuary projects the contributions needed each year to finance an employee's benefits and then levels those contributions (either in absolute dollar amounts or as a percent of pay) over the entire period the employee is expected to participate in the plan. Under the projected unit credit method, contributions are made as benefits accrue, so they start low and increase each year (Figure 4). In addition, because the projected unit credit method allocates a larger portion of the required future contributions to normal cost than does the entry-age normal method, it usually yields a substantially smaller unfunded liability. This will reduce the minimum required installment payments on the liability (See Box 3 for further details).

Box 3: Normal Cost and Unfunded Liability under Different Actuarial Methods

A numerical example may help clarify the meaning of normal cost and unfunded liability under the two methods. Suppose an actuary calculates that the plan sponsor needs to contribute $15,000 for a particular employee over the next five years. Under the projected unit credit method, the sponsor would fund pension payments as they accrue – say, $1,000 in the first year, $2,000 in the second year, $3,000 in the third year, $4,000 in the fourth year, and $5,000 in the fifth year. Under the entry-age normal method, the actuary would level the contributions over the five-year period so that the sponsor would pay a normal cost of $3,000 per year.

To determine the unfunded liability under the two methods, consider the status of the plans after two years of funding. Under the projected unit credit method, future normal cost payments would be $3,000, $4,000, and $5,000 for a total of $12,000. Since a total of $15,000 will be needed and $12,000 will come from normal cost contributions, a $3,000 fund would be adequate to ensure future payments. If the fund were $4,000, the actuary would declare a $1,000 surplus. Under the entry-age normal method, the scheduled normal cost contributions of $3,000 per year for the next three years would provide $9,000. Since $15,000 is required and $9,000 will come from normal cost contributions, $6,000 should be in the fund after two years. If the fund had only $4,000, the actuary would declare an unfunded liability of $2,000. Since the projected unit credit method allocates a larger portion of required future contributions to normal costs than the entry-age normal method, it usually yields a smaller actuarial unfunded liability.[10]

[10] This example assumes a zero interest rate and is based on Ezra (1980).

The reason that the shift in actuarial methods had such a significant impact on funding is that it occurred during the time when the baby boom generation (those born between 1946 and 1964) were young workers (age 20 to 40). The immediate effect was to reduce funding for this very large group, and shift the required contributions to later in their careers. As the baby boomers age, funding contributions will be higher than they would have been under the entry-age normal cost method.

Reduction in Full Funding Limits

The second factor that reduced funding was the lowering of funding limits, under the Omnibus Reconciliation Act of 1987 (OBRA 87), from 100 percent of projected plan liability to the lesser of that value or 150 percent of current liability. Since 1987, the limit has been raised several times and is now slated for elimination in 2004, so that full funding will revert to the original ERISA definition of assets in excess of projected actuarial liability (Table 4).

During the late 1980s and 1990s, the introduction of the "150 percent of current liability" funding limit had a significant impact. Current liability is less than the projected plan liability because it does not include the effect of future salary increases on the value of pension rights already earned. In terms of the example discussed earlier, if a plan provides 1.5 percent of final salary for each year of service, the employee with 10 years of service who currently earns $40,000 would have an accumulated vested benefit of $6,000 per year. But by retirement, this employee is projected to have a final salary of $80,000, and will be eligible for $12,000 annually (based on credits for the first 10 years of service). The additional $6,000 is included in the projected liability but not in the current liability.

OBRA 87 pushed many plans into an overfunded position. Under the new limit, they were prohibited from making any further tax-deductible contributions to the plan until their liabilities caught up with their assets. The fact that assets continued to grow extended the contribution holiday for a significant period of time. The difficulty is that when they are required to contribute again, they will see a sudden and significant jump in their costs. The upshot of the shift in funding methods and the OBRA 87 funding limit is

that, even without the downturn in the stock market, the aging of the workforce would require plan sponsors to put considerably more into their plans than they contributed in the 1980s and 1990s.

"Reversion Tax"

A third factor discouraging contributions was an excise tax, first introduced in 1986, on "reversions." Reversions are any excess assets that exist after a pension plan is terminated. Up until 1986, any reversion was simply included in an employer's taxable income in the year it was received. The 1986 legislation introduced a 10-percent excise tax on reversions to discourage plan sponsors from shutting down their plans in order to grab the excess money. Congress subsequently raised the rate to 15 percent in 1988 and to 50 percent in 1990.[11] While the reversion tax was not intended to limit contributions, some economists contend that it has severely restricted funding (Ippolito 2001).

The notion behind this view is that projected liability consists of two parts – current liability and contingent benefits. The benefits are contingent on the plan staying in existence so that participants would have their existing credits applied to their salary at retirement rather than their current salary. Prior to 1986, the firm could accumulate assets to cover both current liability and the contingent benefits, yet retain the option of not paying the contingent benefits by terminating the plan and reclaiming the "excess assets." After the reversion tax legislation, the firm could continue to fund both liabilities, but the payoff to canceling the contingent liability was severely restricted. To the extent that the firm funded the contingent benefits, it transformed a contingent liability into a fixed commitment. Only by not funding the contingent benefits could the firm reduce its pension liabilities by the full amount. Of course, by not funding, the firm passes up the opportunity to make a tax-deductible contribution.

One study estimated that the reversion tax legislation cut excess assets by about $240 billion as of 1995 (Ippolito 2001). If correct, this is an enormous reduction given that total defined benefit assets in 1995 were $1,402 billion. Thus, legislation that was

[11] Under the Omnibus Budget Reconciliation Act of 1990, the excise tax is lowered to 20 percent if part of the surplus is used to provide qualified pension benefits to participants. The 20-percent rate applies if the plan transfers 25 percent of the surplus to a qualified replacement plan or if at least 20 percent of the surplus is used to increase the benefits of participants in the plan before it is terminated.

designed to protect pension promises by stopping the terminations and reversions that occurred during the takeover activity in the 1980s appears to have encouraged sponsors to shed the excess asset cushion it was designed to maintain.

Cap on Compensation for Funding Purposes

Another constraint on private pension plans imposed by Congress, in an effort to limit the revenue losses from contributions, is a cap on employee compensation that can be considered in funding and contributing to tax qualified plans. The Tax Reform Act of 1986 set the limit at $200,000 indexed for inflation. In 1993, when the limit had risen to $235,840 due to adjustments for inflation, Congress in the Omnibus Reconciliation Act of 1993 (OBRA 93) cut back the limit to $150,000 beginning in 1994. Again, the limit was indexed for inflation. Although the legislation was designed to reduce benefits for the highly paid, it had the effect of limiting funding across the board. The reason is that, for funding purposes, the legislation does not permit sponsors to include anticipated increases in the compensation limit due to inflation adjustments.

The following example illustrates the broad impact of the inability to consider future inflation adjustments. For example, with projected salary growth of 4.5 percent, a 35-year-old earning $45,000 would be expected to have a salary of $168,538 at age 65. This salary exceeded the 1994 cap of $150,000 by $18,538, so the sponsor was required to reduce the funding below the amount required under current law. The reduction would be greater for those with higher salaries, and in periods of higher inflation.

In 2001, Congress increased the compensation limit for funding purposes to $200,000 beginning in 2002. Again, while the limit is indexed for inflation, the expected adjustments cannot be taken into account for funding purposes.

Overall Impact

The implication of the shift from the entry-age normal method to the projected unit credit method for funding defined benefit plans; the OBRA87 funding limit; the reversion tax; and the cap on compensation for funding purposes is that defined benefit plans in 2002 are very lean in terms of funding their ongoing pension commitments. In

addition, the growing popularity of cash balance plans may be another factor that affects funding (see Box 4 for details).

Box 4: The Shift to Cash Balance Plans Also Affects Funding

In recent years, a number of large companies have transformed their traditional defined benefit plans to cash balance plans. Although these plans are legally defined benefit, they look like a defined contribution plan to the employees. The employer typically contributes 4 or 5 percent of the worker's pay to a "notional" account and provides an interest credit (generally at some specific rate such as that on Treasury securities) on the balances. Employees receive regular statements and generally withdraw the balance as a lump sum when they retire or terminate employment.

The key difference in terms of funding between cash balance plans and final earnings defined benefit plans is that employees accrue benefits as a constant percentage of salary over their worklives rather than earning the bulk of benefits as they approach retirement. This difference in accrual rates affects the funding limitations of plans. Because benefits are accrued earlier in the employee's careers, the gap between current and projected liability, especially for young workers, is much smaller than under final earnings plans. As a result, sponsor of cash balance plans will be subject to less constraining full funding limitations. On the other hand, with a higher current liability, firms offering a cash balance plan will be subject to higher minimum funding requirements. The combination of these two effects will allow firms under cash balance plans to fund pensions more aggressively than those under traditional defined benefit plans.

In the transition, assuming cash balance plans are not adopted solely to cut back on promised benefits, the growing popularity of cash balance plans constitutes another factor that will put pressure on the level of contributions.

Unfortunately, data are not available on funding as a percent of projected liability. Consistent data are available from 1979 through 2002 on the percentage of large plans in which assets exceed current liability (Figure 5). The pattern reflects the story told above. In the wake of ERISA, funding improved steadily until the late 1980s. After the reversion tax and the full funding limit kicked in, the percent of plans with assets in excess of current liability leveled off until the mid-1990s, then declined sharply in the 1993-1997 period. After 1997, the ratio rose once again presumably because of the enormous increase in stock prices. When the stock market bubble burst in 2000, the percent of plans with assets in excess of current liability quickly plummeted to 48 percent

in 2002, a level not seen since 1981. The drop means that 52 percent of large plans do not have sufficient assets to cover even the current liability for their promised benefits if they were to terminate. Remember that current liability is only part of the projected liability, since it does not account for the impact of future salary increases on benefits earned to date.

Measuring the Impact of Capital Gains and Regulation on Contributions

This section describes results from a simple empirical model to figure out the relative importance of capital gains and funding limitations on contributions to defined benefit plans. The model explains the ratio of contributions to wages for workers covered by defined benefit plans. Limiting the analysis to the covered population addresses the decline in importance of defined benefit plans over the last 20 years.

The key variables in the model are capital gains on equities (KGE) and bonds (KGB) as a percent of total assets (A) held by defined benefit plans, an indicator variable to reflect the impact of ERISA's minimum funding standards, an indicator variable to reflect all the constraints on funding that emerged around 1987, and the percent of the workforce aged 20 to 45.[12] The labor force variable reflects the fact that the limits on funding introduced around 1987 had a particularly large effect because they deferred contributions from the first half of the work life to the second at a time when the large baby boom cohort was under age 45.

To make the model consistent with the theory about the full funding limitation, the capital gains variables were multiplied by a variable reflecting the funding status of the plans. Incorporating the interaction between the funding status and capital gains variables attempts to get at the contention that capital gains have only a small impact on contributions when plans are underfunded and a large impact once they hit the full funding limit.

The regression results for the period 1954-2001 are as follows:

C/W = .138 - .458 (KGE/A)*FF – .687 (KGB/A)*FF + .068 ERISA - .030 1987LIMITS - .192 Age20-45
(.035) (.140) (.417) (.010) (.007) (.086)

Adj. R-squared = .82

[12] Since the actuarial value of assets is generally calculated by averaging market values over a five-year period, the capital gains figures were included as five-year averages.

The coefficients have the expected signs and reasonable magnitudes, and the standard errors indicate that the variables are generally statistically significant. The only exception is capital gains on bonds, which could be expected since some firms value bonds at par for funding purposes. The equation implies that in the absence of the boom in the stock market and the limits on funding, defined benefit contributions over the period 1982-2000 would have averaged 9.9 percent rather than 6.6 percent of payrolls (Figure 6).

The step down in contributions has a myriad of implications but the one of most interest here is its impact on corporate profits. Lower pension contributions, all else equal, will produce a dollar-for-dollar increase in before-tax profits. Subtracting the reduction in defined benefit contributions from reported profits reveals that corporate profits were roughly 5 percent higher than they would have been otherwise (Figure 7).

Higher corporate profits lead to further capital gains and further reductions in contributions. The reduced contributions, in turn, boost corporate profits and the cycle repeats. Using the equation estimated earlier, the feedback would work as follows:

$$\Delta(C/W) = -.458\,(KGE/A)*FF$$

$$\Delta KGE = \Delta C*(1-t)*(P/E)*(Sdb/St)$$

That is, an increase in the rate of return on equities held by pension funds will produce a .458*FF/A reduction in ratio of contributions to defined benefit plans over wages. The change in contributions multiplied by one minus the corporate tax rate (1-t) yields the change in after tax earnings. This change in after tax earnings feeds through a corporate valuation model to produce a change in equity prices (P/E) for the economy as a whole. Multiplying the economy-wide capital gain by the share of equities held in defined benefit plans (Sdb/St) yields the capital gains on equities held by defined benefit funds. The gain on pension equities then causes a further reduction in pension contributions and the process repeats.

A key factor in quantifying the magnitude of the feedback effect is the extent to which the change in earnings is capitalized into changes in stock prices. This will depend to a large degree on the perceived permanence of the earnings changes. A one-time gain would have very little effect on the capitalized value of the firm; the change in price would roughly equal the change in earnings. On the other hand, if the earnings increase were perceived as permanent and the price-earnings ratio were 10, the earnings increase would raise the price tenfold. With a corporate tax rate of 35 percent and equities in defined benefit plans equal to about 8 percent of total equities, an additional percentage point of capital gains would produce an additional .012 percentage points of gains through the feedback mechanism. This is equivalent to $1.1 billion under the current market valuation. In contrast, if the initial gain is viewed as temporary so that the firm's price-earnings ratio turns out to be one, the feedback would be one-tenth of the effect. The correct answer lies somewhere between these two extremes.

The feedback model proposed in this paper implies that financial markets respond more to the timing of contributions than to changes in the level of pension obligations. Recent research by Coronado and Sharpe (2003) suggests that investors might value pension flows over the funding status of pension funds. They find that investors overlook the net asset position of pension funds and instead focus on pension earnings to determine stock prices.

How much will corporate contributions have to increase now that the stock market bubble has burst? Based on the simulation presented in Figure 6, contributions relative to wages must return to their pre-1982 levels of about 10 percent. This implies that – on a permanent basis – contributions would double from their current level of $40 billion to $80 billion. This projected increase is consistent with simulation results presented by Goldman Sachs using a completely different approach.[15] Assuming that

[15] Goldman Sachs' central estimate is that contributions will have to increase by $80 billion per year, but this estimate is based on an assumed nominal rate of return on assets of 6 percent. The report also provides estimated increases for other rates of return. At an assumed return of 7.5 percent, the Goldman Sachs study shows that contributions would have to increase by $40 billion. We believe that 7.5 is the more realistic return for a blended portfolio, now that the bubble has burst (Goldman Sachs, 2002).

investors view this increase in contributions as permanent, the feedback effect would lower the value of equities held by pension funds by $20 billion.

In short we believe that once the stock market boom began in 1982, the feedback effect of contributions on corporate earnings and stock prices tended to reinforce the general upward movement in the market. Now that the bull market is over the effect will reverse, and the increase of contributions going forward will put downward pressure on corporate earnings and stock prices.

Conclusion

ERISA significantly improved the funding status of defined benefit pension plans. The improved funding status means that, when financial markets are performing well, large numbers of plans will be subject to ERISA's full funding limit. Each dollar of capital gains will increase surplus assets somewhere between 20 cents and a dollar. Under the full funding limit, this increased surplus will be applied immediately to reduce tax-deductible normal cost payments. Hence, the stock market boom between 1982 and 2000 had an enormous negative impact on pension contributions. In addition to capital gains, a host of regulatory changes occurred in the mid-1980s that also severely limited contributions, generally by shifting them from early in employees' careers to later. The evidence suggests that this shift reduced the contribution rate from 9.9 to 6.6 percent.

What does this analysis imply about the impact of the bursting of the equity bubble? It suggests that firms have now entered a period where their pension contributions will have to increase substantially to maintain compliance with ERISA's funding requirements. Increased contributions will restrain growth in earnings, which presumably will have a dampening effect on stock prices. In short, as the economy emerges from recession and the bear market draws to a close, firms and investors must be prepared to contend with a strong headwind from pension funding obligations that could slow the recovery.

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Table 1. Defined Benefit (DB) and Defined Contribution (DC) Pension Plans, 1981-2000

Year	Number of Plans			Active Participants (Millions)			Assets (Billions)		
	DB	DC	Total	DB	DC	Total	DB	DC	Total
1981	167,293	378,318	545,611	30.0	20.7	50.8	444.3	184.5	628.9
1985	170,172	461,963	632,138	29.0	33.2	62.3	826.1	426.6	1252.7
1990	113,062	599,245	712,308	26.3	35.5	61.8	961.9	712.2	1674.1
1995	69,492	623,912	693,404	23.5	42.7	66.2	1402.1	1321.7	2723.7
1998	56,405	673,626	730,031	23.0	50.3	73.3	1936.6	2085.2	4021.8
2000e	52,500	698,000	750,500	22.7	54.5	77.2	2010.1	2427.0	4437.8

Source: Data for 1981 through 1998 from Form 5500 Reports (US Department of Labor 1985-1998). Asset projections for 2000 based on change in assets in the Flow of Funds Accounts (Board of Governors of the Federal Reserve System 2003) from 1998 to 2000. Number of plans and participant are authors' estimates.

Table 2. Effect of ERISA's Full Funding Limitation on Annual Pension Contributions

Item	Underfunded Plan	Overfunded Plan*
Annual Pension Contribution	(Millions)	
Assets less Accrued Liability	$ -5.0	$ 5.0
Normal Costs	11.0	11.0
Amortization of Unfunded Liability	0.5	0
(10 years)		
Full Funding Credit	--	5.0
Total Contribution	11.5	6.0
Effect of $5 million Capital Gain		
Assets less Accrued Liability	-4.0	6.0
Normal Costs	11.0	11.0
Amortization of Unfunded Liability	0.4	0
(10 years)		
Full Funding Credit	--	6.0
Total Contribution	11.4	5.0

Source: Authors' calculations

*Note: Assumes market value exceeds actuarial value.

Table 3. Percent of Large Pension Plans Using Alternative Actuarial Methods, 1976-2002

Actuarial Cost Method	1976	1981	1986	1991	1996	2002
Projected Unit Credit	--	--	28	54	66	69
Entry Age Normal	57	53	40	31	24	25
Other	43	47	32	15	10	6

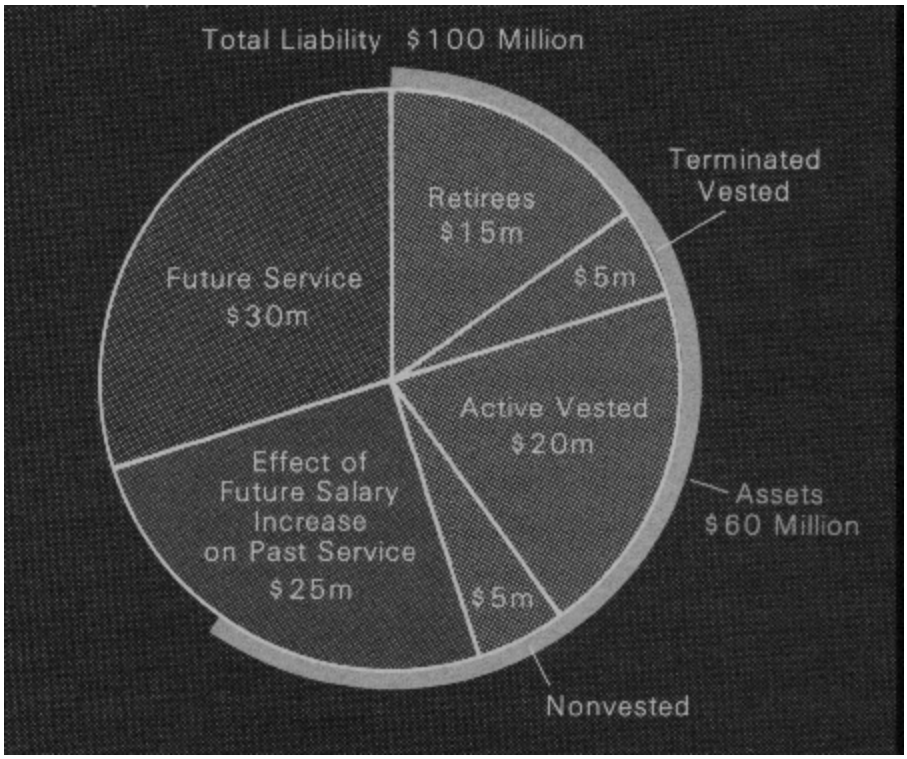
Source: Watson Wyatt Worldwide. 2003, 1998, 1992, 1986. *Survey of Actuarial Assumptions and Funding: Pension Plans with 1,000 or More Participants*.

Table 4. Evolution of the Full Funding Limit, 1987-2004

Year	Limit (percent)	Legislation
1987	150	OBRA 1987 established full funding limit
1994	150	Retirement Protection Act of 1994 further restricted interest and mortality assumptions
1998	150	
1999	155	Taxpayer Relief Act of 1997 gradually raised percentage limit beginning in 1999
2001	160	
2002	165	EGTRRA of 2001 raised limit for 2 years before eliminating it in 2004
2003	170	
2004	No Limit	

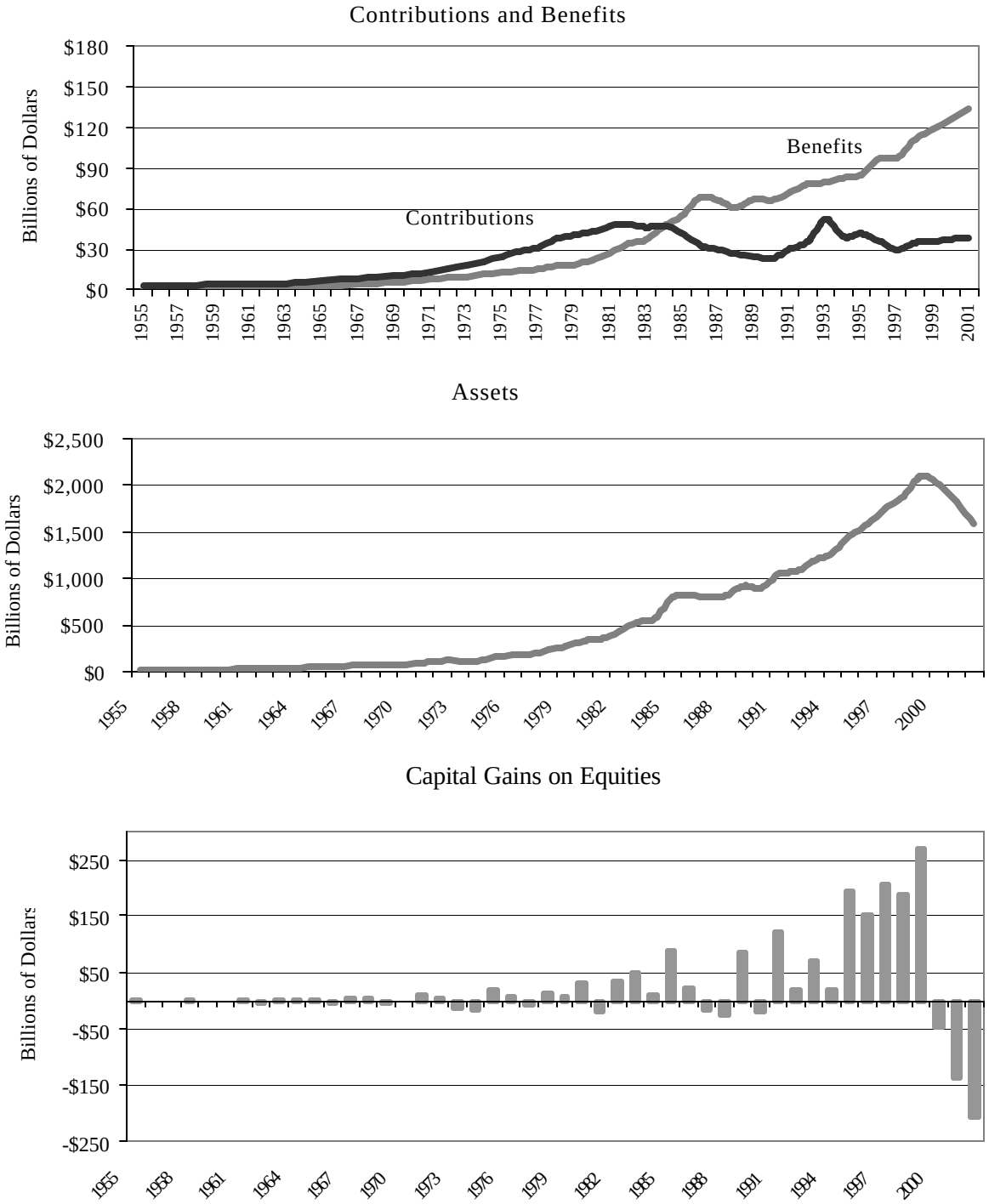
Source: Representative John F. Tierney. www.house.gov/tierney/portman.htm August 2002.

Figure 1. Present Value of Projected Pension Liability of a Firm



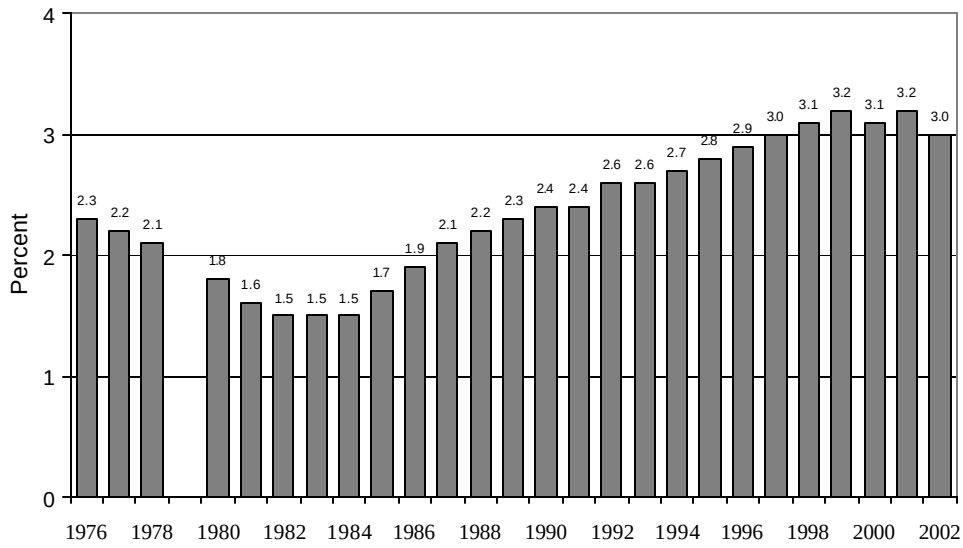
Source: Authors' calculations.

Figure 2. Defined Benefit Plans 1955-2002



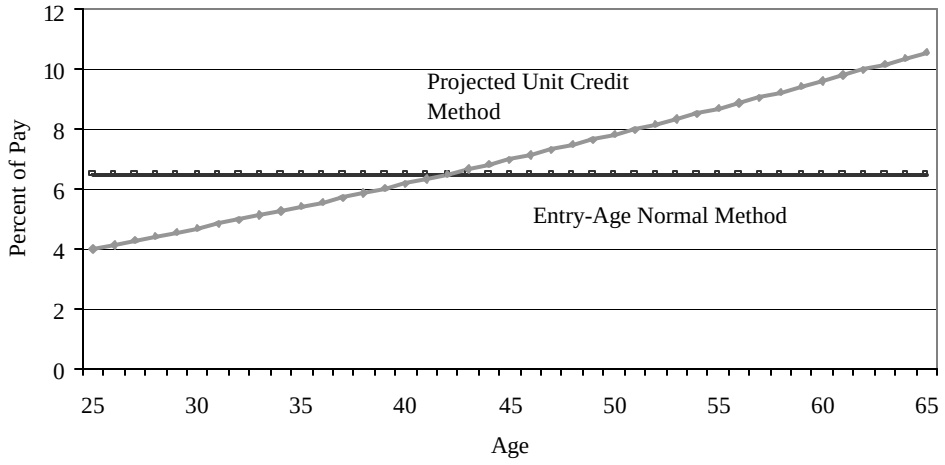
Source: DOL Private Pension Plan Bulletin Tables E.11, E.14 and E. 17 (1985-1998). 1955-1975 and 1999-2002 imputed from the Board of Governors of the Federal Reserve System, Flow of Funds Accounts, tables L.119, and U.S. Department of Commerce National Income and Product Accounts, table 6.11.

Figure 3. Spread for Final Average Pay Defined Benefit Plans, 1976-2002



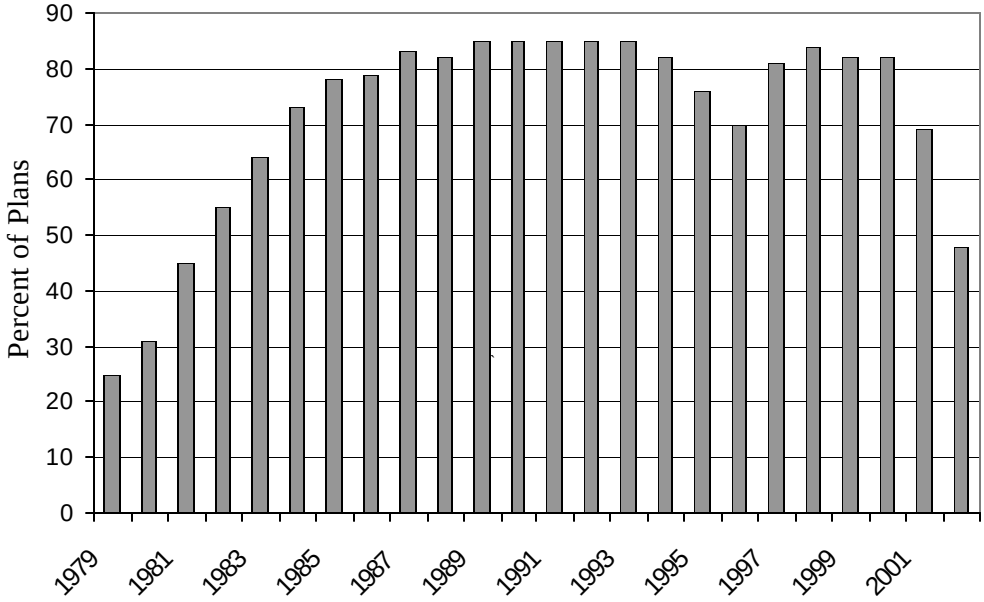
Note: Spread is the difference between the interest rate and salary growth assumptions.
Source: Watson Wyatt Worldwide. 2003, 1998, 1992, 1986. *Survey of Actuarial Assumptions and Funding: Pension Plans with 1,000 or More Participants*.

Figure 4. Pension Costs under Projected Unit Credit versus Entry-Age Normal Method



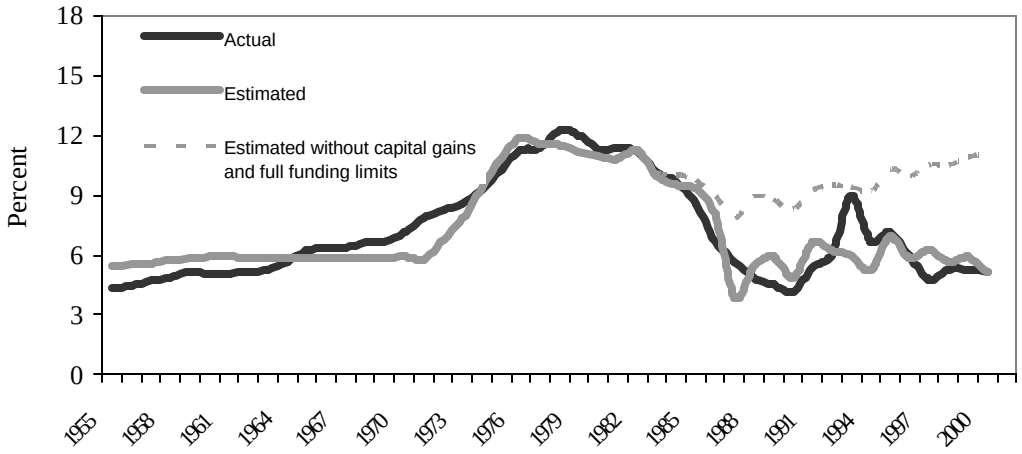
Source: Dan M. McGill, Kyle N. Brown, John J. Haley, and Sylvester Schieber. 1996. *Fundamentals of Private Pensions.* Philadelphia, PA: University of Pennsylvania Press.

Figure 5. Funding Status of Large Pension Plans: Percent with Assets Greater than Accrued Benefit Liability (1979-2002)



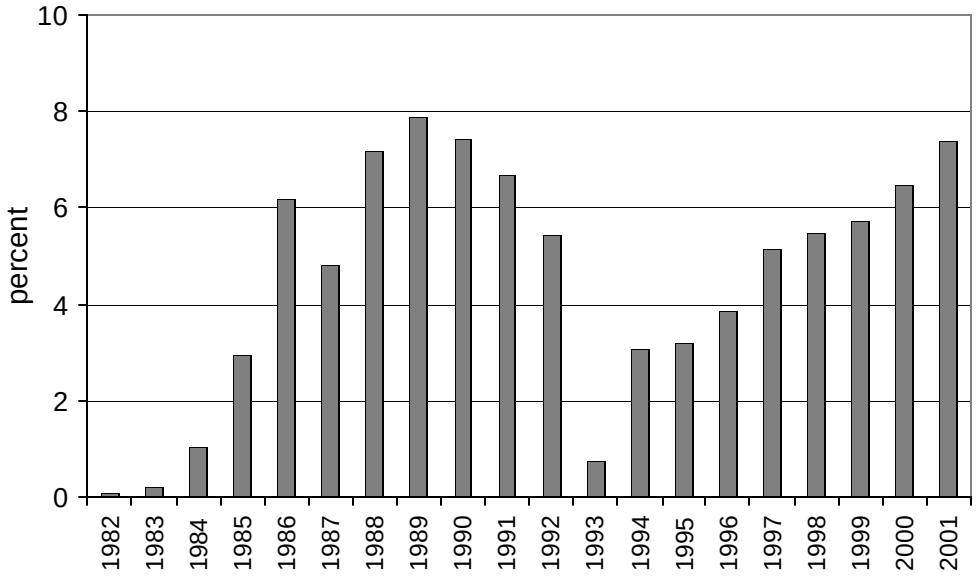
Source: Watson Wyatt Worldwide. 2003, 2001, 1998, 1992, 1986.

Figure 6. Contributions to Defined Benefit Plans as a Percentage of Wages and Salaries



Source: Authors' calculations.
Note: Over one-third of 1993 total contributions were made to the GM Hourly Plan ($16.3 billion) and the Chrysler Hourly Plan ($2.3 billion). (Private Pension Plan Bulletin, Abstract of 1993 Form 5500 Annual Reports.)

Figure 7. Difference between Estimated Contributions and Actual Contributions as a Percentage of Corporate Profits



Source: Authors' calculations.