Report to Congress
on
The Effect of the Full Funding Limit
on Pension Benefit Security

Department of the Treasury
May 1991

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DEPARTMENT OF THE TREASURY
WASHINGTON

ASSISTANT SECRETARY

May 1991

The Honorable Dan Rostenkowski
Chairman
Committee on Ways and Means
U.S. House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

Section 9301 of Public Law 100-203, the Omnibus Budget Reconciliation Act of 1987, provides that the Secretary of the Treasury or his delegate shall conduct a study of the effect of amendments made by that section to section 412(c) of the Internal Revenue Code of 1986 (concerning the full funding limitation on defined benefit plans) on pension benefit security.

Pursuant to that directive, I hereby submit "Report to Congress on The Effect of the Full Funding Limit on Pension Benefit Security."

I am sending a similar letter to Representative Bill Archer.

Sincerely,

Kenneth W. Gideon

Kenneth W. Gideon
Assistant Secretary
(Tax Policy)

Enclosure

DEPARTMENT OF THE TREASURY
WASHINGTON

SSISTANT SECRETARY

May 1991

The Honorable Lloyd Bentsen
Chairman
Committee on Finance
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

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Pursuant to that directive, I hereby submit "Report to Congress on The Effect of the Full Funding Limit on Pension Benefit Security."

I am sending a similar letter to Senator Bob Packwood.

Sincerely,

Kenneth W. Gideon

Kenneth W. Gideon
Assistant Secretary
(Tax Policy)

Enclosure

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CHAPTER 1: EXECUTIVE SUMMARY

I. BACKGROUND OF THE REPORT

A. Mandate for Study

This report was prepared in response to a Congressional mandate. Section 9301 of the Omnibus Budget Reconciliation Act of 1987 (OBRA 87) amended the full funding limitation for qualified defined benefit pension plans. The section also required that the Treasury conduct a study of the effect of the amendments on benefit security under defined benefit pension plans.

B. Pensions and Retirement Savings

Pension coverage provides employees a formal method of saving for retirement. A portion of each covered employee's compensation is contributed each year to a pension fund, and amounts in the fund are invested. When the employee retires, the accumulated contributions and investment earnings of the pension fund are used to pay pension benefits. Although employees typically save for retirement in various ways, the special features of pensions, as well as Federal tax and nontax pension policies, make pensions an important form of retirement savings for many employees.

One indication of this importance is the fact that 27 percent of retiree households receive income from a private pension or annuity.[1] This percentage for current retirees has been growing rapidly, reflecting the expansion of employee pension coverage in the 1940's and the 1950's. Currently, 46 percent of private-sector wage and salary workers are covered, compared to only 15 percent in 1940 and 25 percent in 1950.[2] As pension coverage has grown, so have the assets in pension funds, which now total $2.6 trillion, or one-fifth of total financial assets in the United States.[3] These assets include 25 percent of the value of publicly-traded corporate equity and 40 percent of the value of corporate bonds.[4]

C. Defined Benefit and Defined Contribution Plans

There are two basic forms of pension plans: defined benefit plans and defined contribution plans. In a defined benefit plan, the retirement benefit is specified ("defined") in the plan. Typically, the retirement benefit depends on the employee's length of service with the

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[1]These figures are for households with a head at least age 65 in 1986. See Piacentini (1990).

[2]The 46 percent figure is an estimate for 1987. See Warshawksy (1989).

[3]Federal Reserve Board (1990).

[4]Hoffman (1989).

employer and the employee's earnings history.[5] This benefit structure generally means that employees will receive larger benefits if they remain with one employer than if they have several employers during their working years. The other special feature of defined benefit plans is that the employer bears the risk of investments in the pension fund because the pension benefit is defined in the pension agreement and does not depend on the assets in the pension fund.

Defined contribution plans may take several forms -- money purchase, profit sharing, ESOPs, etc. -- but all have the same basic features, and these features differ fundamentally from those of defined benefit plans. In a defined contribution plan contributions are made to, or set aside in, an account maintained for each participating employee, and investment earnings are allocated to each employee's account. Benefits at retirement from a defined contribution plan depend entirely on the assets in an employee's account, which means that the investment risk is borne by the employee. Further, except in cases where some part of the contributions are made by the employer and there is a vesting period for these contributions, defined contribution assets are immediately nonforfeitable to the employee; the plans therefore typically provide no added incentive for an employee to remain with a single employer.

Currently, nearly the same percentage of workers are covered by a defined benefit plan (31 percent) as are covered by a defined contribution plan (30 percent).[6] Because this report is concerned with the full funding limit which applies only to defined benefit plans, the remainder of this section focuses on these plans.

D. Tax Rules Governing Defined Benefit Plans

If properly designed and administered, a defined benefit pension plan can qualify for special tax treatment under the Internal Revenue Code (Code). When a plan qualifies, employer contributions to the pension fund are tax deductible by the employer, but excluded from the taxable income of the employees. Investment income of the plan's pension fund is exempt from tax. Retirement benefits are not taxed to the employees until the benefits are paid. This special tax treatment of qualified plans reduces employers' and employees' long term after-tax cost of pension benefits.

Under the Code, employers' deductible pension fund contributions are subject to minimum and maximum limits. The minimum contribution limits were established to ensure that pension fund assets are large enough to secure pension liabilities against the risk of default. The maximum contribution limits were established to limit and to allocate efficiently the loss of federal tax revenue associated with the special tax treatment across qualified plans.

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[5]For example, the benefit might be defined as a specific fraction of the average earnings in the last five years in employment, multiplied by the number of total years with the employer.

[6]This figure is an estimate for 1987, from Warshawsky (1989). Note that some workers are covered by both types of plans, so that the percentage of workers covered by <u>at least</u> one plan is only 46 percent, as noted in Section B above.

As part of the maximum contribution limits, the Code imposes a "full funding limit". The full funding limit prevents employers from making deductible contributions when pension fund assets exceed a legally specified percentage of pension liability. Before the changes made by OBRA 87, the full funding limit was 100 percent of an employer's "accrued liability". Accrued liability, which can be measured in several different ways, accounts for both employee pension benefits accumulated to date and pension benefits for current employees associated with the past that are expected to accumulate in the future. Section 9301 of OBRA 87 amended the Code to create a new full funding limit equal to the lesser of the old full funding limit or 150 percent of an employer's "current liability". Current liability accounts for employee pension benefits accumulated to date, but includes no allowance for employee pension benefits associated with the past that are expected to accumulate in the future. As a result, the new full funding limit can be lower than the old full funding limit for some plans.

II. SUMMARY OF THE REPORT

This report examines the effects of the OBRA 87 change in the full funding limit on pension benefit security. The report concludes that the effects are likely to be small. The new limit can affect benefit security in two ways. First, for some plans, the new limit could increase the private cost of pension benefits by lowering the tax benefit associated with pension funding; however, the increase in private cost will be very small relative to the tax benefit associated with pension funding.

Second, for some plans, the new limit will decrease the level of pension fund assets relative to pension liability. A lower level of pension fund assets could increase the risk of default on pension benefits. The increase in risk would be borne both by plan participants and by the Pension Benefit Guaranty Corporation, which insures the pension benefits of most private defined benefit plans up to specified benefit levels. However, the OBRA 87 change in the full funding limit will only decrease the funding levels of well-funded plans and, even then, only slightly. The change in the limit is therefore likely to have an insignificant effect on the risk of pension benefit default.

The remainder of the report is divided into three chapters. Chapter 2 uses a pension model to analyze pension funding and the effects of the special tax treatment on pension cost for qualified defined benefit plans. Chapter 2 also analyzes the potential effects the OBRA 87 change in the full funding limit on employer contributions, levels of pension funding, and the long-term private cost of pension benefits. Chapter 3 uses 1989 pension data to analyze the actual effects of the OBRA 87 change in the full funding limit. Chapter 4 presents policy options for further consideration and analysis.

A. Pension Funding and the OBRA 87 Limit

In typical situations, the special tax treatment accorded to pensions can reduce the long term after-tax private cost of a defined benefit pension by more than 40 percent.[7] More rapid pension funding results in greater tax benefits and lower private cost. The OBRA 87 change in the full funding limit reduces the maximum speed of funding and therefore reduces the maximum potential tax benefits. For affected plans, contributions are decreased in the short run but increased in the long run. The net result is to slightly decrease the tax benefit and increase the long term after-tax private cost for the affected plans. As shown in Chapter 2, the change under OBRA 87 could increase the long term cost of a pension by as much as four percent, although this is an extreme possibility. The effect on cost is likely to be much smaller for most plans.

The analysis in Chapter 2 indicates that the effects of the OBRA 87 change in the full funding limit, although small, are likely to differ substantially across plans. Many plans are unlikely to be affected. Plans with the following characteristics are most likely to be affected:

- Plans that use optional actuarial methods that fund at a faster rate than other plans;
- Plans established by relatively new firms that cover younger than average populations of employees;
- Plans funded under lower than average discount rate assumptions;
- Plans that annuitize benefits by purchasing private insurance annuity contracts.

B. Evidence from the Data

Actual pension plan data for 1989 show that about 49 percent of earnings-based single employer defined benefit plans have been affected by the OBRA 87 change in the full funding limit.[8] Such plans are affected because their OBRA 87 full funding limit is lower than their old full funding limit. The other 51 percent of earnings-based plans are not affected because their OBRA 87 full funding limit equals the old full funding limit.

The data show the degree to which plans are affected by the OBRA 87 change in the full funding limit. They also show how the actuarial and demographic factors examined in Chapter 2

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[7]"Long term after-tax cost" refers here to the after-tax present value of all future contributions to the pension fund. See Section II of Chapter 2 for examples demonstrating the cost savings to pensions due to special tax treatment.

[8]These percentages are weighted by current liability. The corresponding unweighted percentage was 59 percent of plans.

determine which plans are affected. The factors matter even when they are varied one at a time. The data show that about 37 percent of earnings-based plans have been affected by the OBRA 87 full funding limit because they are funded under "level funding" methods. This group of plans would not have been affected by the OBRA 87 change if they had been funded under the typically slower "projected unit-credit" method. About 20 percent of earnings-based plans have been affected by OBRA 87 because they are funded under discount rate assumptions that are lower than average relative to projected salary growth rates. About 6 percent of earnings-based plans have been affected by OBRA 87 because they cover active employee populations that are younger than average. Although the ages of active employees are found to be less important than the funding method and discount rate in determining whether or not plans are affected by the OBRA 87 limit, employee ages are found to be the most important determinant of the magnitude of the effect. The data also show that about 4 percent of earnings-based plans have been affected by OBRA 87 because their active employees account for a higher than average percentage of current liability.[9]

Further, the analysis presented in the last section of Chapter 3 shows that the OBRA 87 change in the full funding limit is likely to result in about a six percent decrease in average funding levels of earnings-based plans. However, the analysis shows that OBRA 87 will only decrease the funding levels of the best funded plans and, even then, usually only slightly. The results therefore imply that the OBRA 87 change in the full funding limit is likely to have a relatively insignificant effect on employees' pension risk. Overall, the OBRA 87 change in the full funding limit appears to have had a very small effect on benefit security.

C. Policy Options

Three full funding limit options are presented for further consideration and analysis.

1. Maintain current law.

2. Allow election of projected liability limit, and reduce current liability limit. Under this option, taxpayers would be allowed to make a one-time election to compute their full funding limit each year as the lesser of accrued liability or 100 percent of projected liability. Projected liability would be computed under the method used to calculate the Projected Benefit Obligation (PBO) under the rules of the "Statement of Financial Accounting Standards No. 87."[10] Both the assumed discount rate and salary growth rates used to calculate projected liability would be subject to restrictions. To maintain the revenue neutrality of this

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[9]The sum of the percentages noted in this paragraph exceeds 49 percent because the factors are varied one at a time in order to measure their relative importance independently of their correlation with each other.

[10]Financial Accounting Standards Board, 1985. This is essentially the projected unit-credit method.

option, the limit on current liability would be reduced from 150 percent to 147 percent. Taxpayers who did not make the one-time election would therefore be subject to a full funding limit of the lesser of accrued liability and 147 percent of current liability.

3. Allow election of projected liability limit with no reduction in current liability limit. This option is the same as option 2, except that the current 150 percent limit on current liability would be retained. Thus, taxpayers could make a one-time election to compute their full funding limit each year as the lesser of accrued liability or 100 percent of projected liability; if no election were made, the limit each year would be the lesser of accrued liability and 150 percent of current liability. This option is estimated to lose approximately $600 million over five years and would require an appropriate revenue offset.

CHAPTER 2: PENSION FUNDING AND THE OBRA 87 LIMIT

I. INTRODUCTION

A. Tax Treatment of Defined Benefit Plans

If properly designed and administered, a defined benefit pension plan can qualify for special tax treatment under the Internal Revenue Code (Code). First, contributions to pension funds are deductible by the employer, but excluded from employees' current income for both income and social security tax purposes. Second, investment earnings of a pension fund are fully exempt from tax at the pension fund level, and are also not currently taxable to employees. Third, although pension benefits are subject to tax when they are received, such taxation can be deferred. This includes the opportunity to transfer certain pension benefit payments into an Individual Retirement Account (IRA) or another employer's qualified plan as well as other favorable distribution options which can reduce the tax owed on a "lump sum" pension benefit payment. Finally, an individual's tax rate in the years when the benefits are received may be lower than the individual's tax rate during the employment years when the pension benefits were promised or pension contributions were made.[1]

B. Pension Funding Limits

Because there is risk that the employer's business may terminate before all benefits are paid, employers who sponsor defined benefit plans establish pension funds to secure future retirement benefits. Under the Internal Revenue Code and the Employee Retirement Income Security Act of 1974 (ERISA), a private employer who sponsors a defined benefit pension is required to fund the pension liabilities. An employer is required to pay an excise tax if the employer's annual pension fund contributions fall below minimum funding requirements unless a waiver is granted by the IRS. If the pension fund is too small relative to pension liabilities, the employer is required to pay higher insurance premiums to the PBGC.

The Internal Revenue Code and ERISA impose minimum and maximum limits on the funding of future defined benefit pension liabilities. Minimum funding rules were established to lower the risk of default on future benefit payments to employees directly, and to lower the insurance risk exposure of the PBGC. Maximum funding limits were established to control the loss of federal tax revenue due to the special tax treatment of defined benefit plans. The Omnibus Budget Reconciliation Act of 1987 (OBRA 87) imposed a new, sometimes stricter upper limit on pension funding. When the new OBRA 87 limit is lower than the old upper funding limit, the new limit lowers the maximum speed at which pension liabilities can be funded.

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[1]See Appendix A for a more complete description of the tax treatment afforded pensions.

II. PENSION FUNDING

The effects of the OBRA 87 funding limit depend on the speed of pension funding. This section begins by showing how the favorable tax treatment of pension funds compares to the tax treatment of a regular savings account. Additional considerations are then added to show the relation among the tax benefit received by pensions, the speed of pension funding, and the demographic characteristics of each employer's population of pension plan participants.[2]

A. The Nature of the Tax Benefit

The nature of the tax benefit received by defined benefit pensions and its relation to the speed of pension funding can be illustrated by a simple savings account example. Suppose that a 30 year old individual decides to accumulate $559 (the savings target) by age 65 in a regular savings account that pays 7 percent annual interest. Suppose, also, that the individual is always taxed at a rate of 28 percent. Under normal income tax treatment, contributions to the savings account would come from the individual's after-tax income. Further, the interest income would be taxed as it accrues so that the after-tax annual yield would be 5.04 percent (=7%-.28*7%). Because both contributions and earnings would be taxed currently, withdrawals from the savings account would be free of tax.

The present discounted value of the individual's contributions to the account, discounted to age 30 at the after-tax rate of 5.04 percent, would be $100, which is also the present value of $559. In other words, in present value terms at age 30, each dollar of savings for age 65 "costs" a dollar of contributions. Further, this equivalence of cost to value would be true regardless of the age at which savings account contributions are made. For example, for a single contribution to be enough, the individual would have to contribute $100 at age 30, $164 at age 40, or $267 at age 50. Regardless of the age, the present value of contributions would be $100 when discounted to age 30 and the total would equal $559 at age 65.

Now suppose that the savings account, unlike a regular savings account, is granted special tax treatment like that granted to pensions. The contributions are tax deductible, the interest income is tax exempt, and the final savings account withdrawal at age 65 is fully taxable. Unlike under normal tax treatment, the $559 after-tax savings at age 65 would cost the individual less than its present value of $100. For example, under the special tax treatment, the individual could contribute $73 at age 30, which would appreciate at 7 percent for 35 years and be worth $776 (before tax) at age 65. At age 65, the individual would pay $217 in taxes and receive $559 after tax, which would have a present value at age 30 of $100, just as under the normal tax treatment. However, the employee would only contribute $73 at age 30. Because the $73 contribution at age 30 would be deductible, it would only cost the individual only $52 after tax. In other words, the present value of each $1 of final payment at age 65 would cost

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[2]The use of actuarial terminology is minimized. The glossary on page 75 provides a summary description of actuarial terms used in the report.

the individual $0.52 if the contribution is made at age 30. The tax benefit would be $0.48 per dollar of final savings. Alternatively stated, the special tax treatment would reduce the cost by 48 percent when compared to saving in an ordinary savings account.

Furthermore, unlike an ordinary savings account, the after-tax cost would now depend upon the age at which contributions were made. Working through the same calculations, a single contribution of $143 would be sufficient at age 40. Because the contribution would be tax deductible, the individual would only give up an after-tax amount of $103 at age 40. The present value of the target savings amount, i.e., $559, discounted from age 65 to age 40 would be $164. Therefore, if a single contribution is made at age 40 instead of age 30, the cost per-dollar of final saving would be $0.63 (=$103/$164) and the tax benefit would only be $0.37 (=$1.00-$0.63) rather than $0.48.

The results of similar calculations for other ages of contribution are shown in Figure 2.1. The figure shows that the longer the individual waits to make contributions to the tax-favored savings account, the greater the cost, and the less the tax benefit. In the extreme, there is no tax benefit at all if contributions are made immediately before the funds are withdrawn at age 65.[3]

Normally, savings would be spread out over an individual's lifetime. But the relation between the timing of contributions and the size of the tax benefit would be the same: For a fixed amount of final savings, i.e., a savings target, a faster contribution "speed" (contributing more at early ages and less at later ages) would lower the private cost of the target savings and increase the tax benefit.

B. The Tax Benefit of Pension Funding

The relation between the speed of saving and the tax benefit illustrated in the special savings account example above in Section II.A extends to the funding of defined benefit pension obligations. For a defined benefit pension plan, like the special savings account example, there is a targeted amount that an employer tries to fund by the time employees retire and begin receiving pension benefits. With the help of an actuary, an employer decides on a funding method that determines an expected path of future contributions. Each funding method is designed to reach the future funding target by spreading contributions over time. Different

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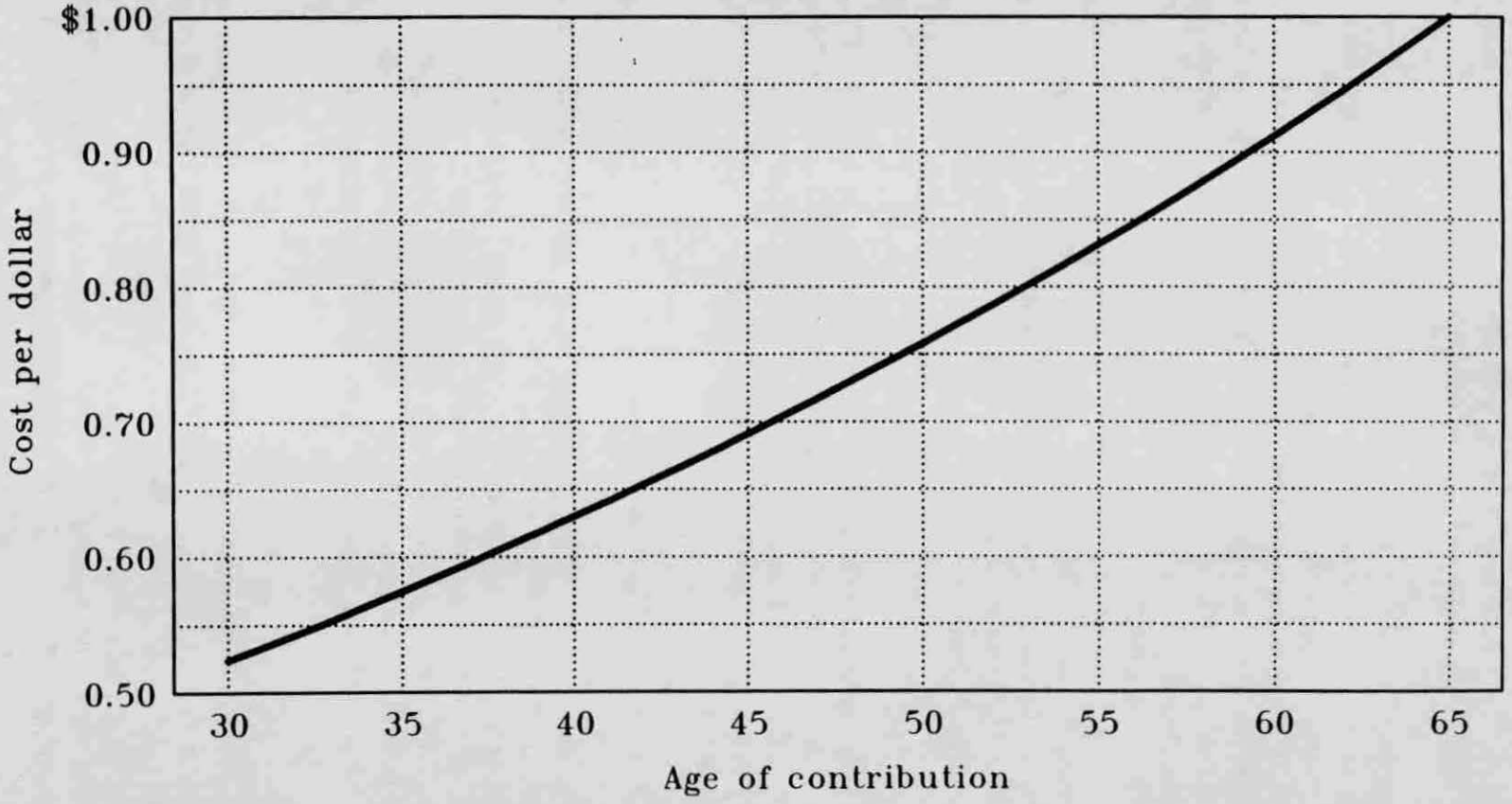
[3]Such an age effect on the tax benefit results from a combination of two factors: the deferral of taxes until age 65 and the exemption from tax of interest income as it is earned in in the special savings account. These two factors combined are equivalent to not allowing deductions for contributions to the special savings account, but never taxing the interest income, i.e., where interest would be exempt from tax when earned and withdrawals from the account would be free of tax. The benefit of the tax exemption would therefore be compounded over time so that contributions made at an earlier age would yield larger tax benefits and lower cost than contributions at a later age.

Figure 2.1

Effect of Special Tax Treatment on the
Cost Per Dollar of Payment at Age 65



Note:
All terms expressed as after tax present values
Interest rate = 7%, Tax rate = 28%

methods spread contributions at different speeds than others. Further, like the special savings account in Section II.A, the employer's cost can be decreased and the tax benefit of pension funding can be increased by choosing a funding method that accelerates contributions.

The most important elements of this process can be illustrated by an example of a plan offered by an employer to a group of employees, all aged 30 and all hired at the same time, i.e., a single "cohort".[4] The pension plan promises these employees a retirement annuity that starts at age 65 and pays a fixed annual amount that continues for the remainder of each employee's life. The annual amount is determined by multiplying the employee's completed years of service at age 65 by the employee's average annual salary in the final five years of active employment, and multiplying the result by 1.5 percent. Such a plan is often called a "final pay" plan, which is the most common type of defined benefit plan for medium and large plans.

To illustrate how the benefit under the final pay plan in the example would be calculated, suppose that an employee was hired at age 30 and retires after 35 years at age 65. Suppose, also, that the employee's annual salary averaged $30,000 in the last five years of employment. Then this employee's annual retirement benefit would be $15,750 (=35*$30,000*.015).

The Internal Revenue Code and associated regulations permit the employer to choose from a number of different funding methods. The alternative methods generate different answers in terms of the current year contribution requirement and the pattern of the contributions in future years. In order to illustrate the difference the choice of funding method can make for the model plan, four funding methods are illustrated in the example.

Figure 2.2 shows the time paths over which the employer's expected future pension liabilities might be funded under each funding method.[5] The actuary uses assumptions about employee turnover rates, employee mortality, salary growth, and expected investment earnings of the pension fund to determine the amount of assets which whould be accumulated in the fund in order to provide for the benefits that begin at age 65. Under each method shown, there should be no further contributions required after age 65. Each actuarial method defines a unique pattern of asset growth towards the target accumulation at age 65 over the years prior to retirement. The curves in Figure 2.2 show the ratio of the total pension fund assets, for each age from 30 to 65, to the expected present value of the projected age 65 accumulation.

Under funding method 1, the fastest method shown, the annual contribution made on behalf of each active employee is held at a constant dollar amount over all years until the employee separates from active service or retires at age 65. This method is not commonly used

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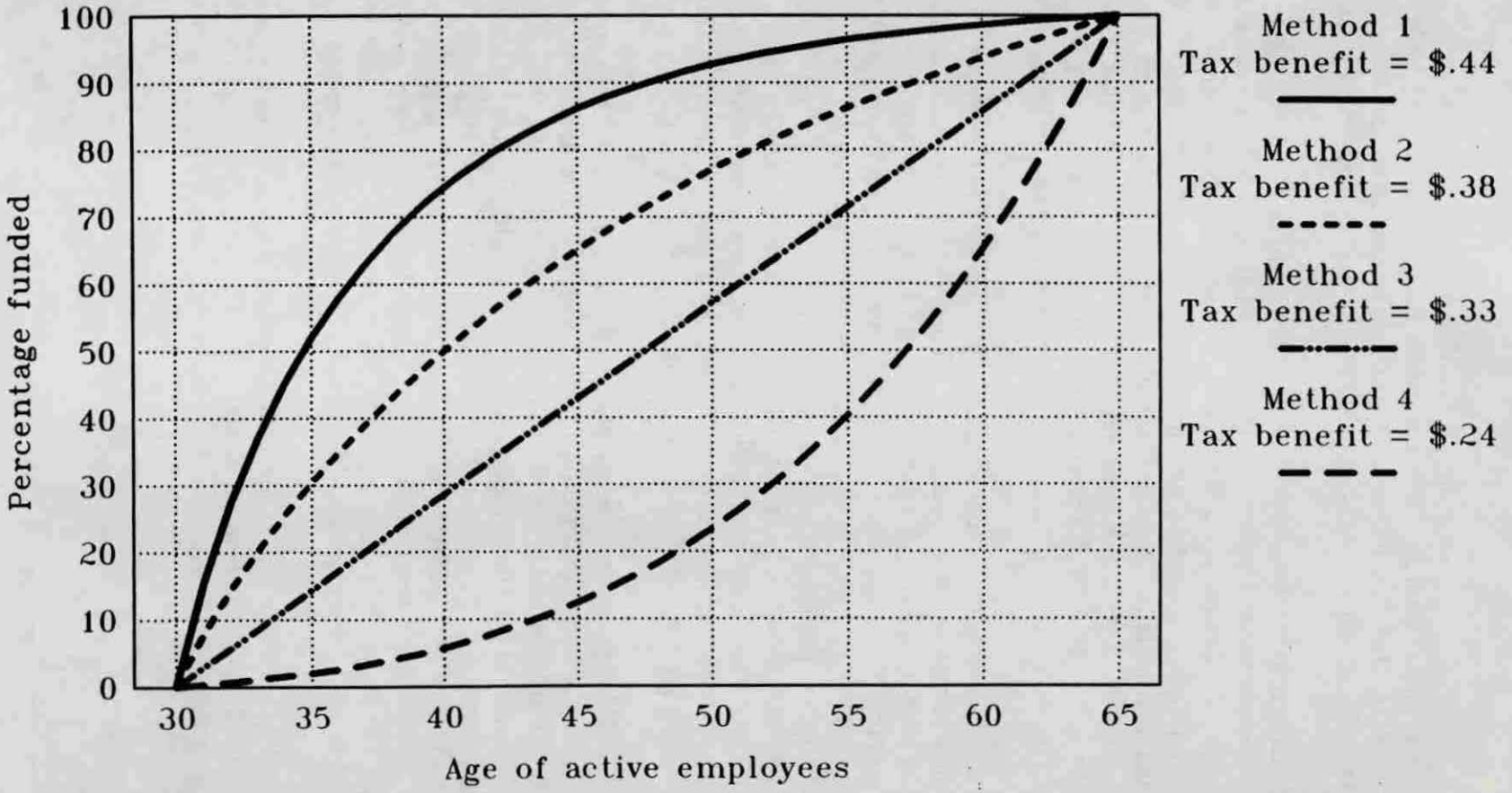
[4]This example is based on Winklevoss (1977).

[5]A summary description of these methods is contained in the Glossary on page 75.

Figure 2.2

Pension Funding: Assets as Percentages of the Present Value of Future Benefits at each Age



for funding final average pay plans, but has been included in the model because it demonstrates an extreme pattern of funding and would be allowed under the Code for the example plan.[6]

Under funding method 2, contributions are held at a fixed proportion to annual salary payments, which increase over time. This method is popular with employers, partly because it allows them to budget pension contributions as a percentage of cash compensation. Both methods 1 and 2 are called level funding methods, which do not attempt to match the funding pattern with the pattern that employees "accrue" pension benefits.

In contrast, funding methods 3 and 4 in Figure 2.2 are often called "accrued methods" because they are based on the rate at which employees accrue future pension benefits. Under method 4, the slowest funding method, contributions equal the rate at which employees accrue benefits according to the plan agreement, without accounting for expected future salary increases. The pattern of funding under method 4 therefore reflects the pattern of benefit accrual under the plan agreement, which begins slowly and then accelerates. Method 3 is like method 4, except that it accounts for expected future salary increases in a way that holds each employee's benefit accrual rate constant over all years of service. Method 3 therefore smoothes the pattern of fund growth relative to the pattern of benefit accrual.

Contributions under methods 1, 2, and 3 all depend on projected future benefit accruals of current employees under assumptions about future salary growth, employee mortality, and employee turnover, whereas contributions under method 4 do not depend on projected future benefit accruals of current employees.

Contributions to the pension fund are not included in the taxable income of employees just as contributions were deductible in the special savings account example. Similarly, the pension fund is tax exempt on its investment income and pension benefits are fully taxed when they are paid. For these reasons, as in the special savings account example, faster rates of funding entail a larger tax benefit or, equivalently, a lower private cost of providing future retirement benefits. For example, Figure 2.2 shows that at an interest rate of 7 percent and a tax rate of 25 percent, the per-dollar tax benefit amount ranges from $0.24 under method 4, the

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[6]For technical reasons, method 1 is not always faster than method 3. For example, if a plan is designed so that the plan formula can count no more than 30 years of service, method 3 would fund the projected future benefits for a 25-year-old employee over 30 years, whereas method 1 would fund the employee's projected future benefits over 40 years. It is possible that the difference in amortization periods would reverse the relative funding speeds of methods 1 and 3 shown in the example. Similarly, differences in accounting for Code Section 415 limits, which limit benefits under defined benefit plans, may affect the relative speeds of funding under the methods. Nevertheless, such additional considerations would unecessarily complicate the example and would distract from the central points of this chapter. Further, such considerations would be exceptions to, rather than central characteristics of, the illustrated methods and their relative speeds of funding.

Table 2.1
A Pension Population Over Time

Population statistics	Year 1	10	25	40
Active Employees				
Number	10,000	16,400	20,000	20,000
Average age	35.0	36.7	39.5	40.4
Average service (years)	4.8	6.4	9.2	10.3
Inactive participants				
Retired	30	525	2,000	3,620
Vested terminated	70	1,164	4,580	7,760
Disabled	0	33	220	440
Surviving spouses	0	16	120	320

Source: Simulations based on Winklevoss (1977)

slowest method, to $0.44 under method 1, the fastest method shown.[7] That is, the special tax treatment reduces the present value of future pension fund contributions relative to what contributions would have been under normal tax treatment by as much as 44 percent under the illustrated funding methods. Faster funding methods can thus entail substantially larger tax benefits and lower private pension costs.

C. A Complete Pension Population

Actual pension plans are a bit more complicated, but many aspects of pension funding can be readily illustrated in terms of the example of one cohort of employees discussed above. This is because actuarial methods of pension funding were developed by recognizing that the population covered by a pension plan is actually a collection of cohorts hired at different ages and at different points in time. The methods and concepts developed for a single cohort therefore generally extend to funding a pension plan for a complete population. However, to aid in the examination of the effects of the OBRA 87 funding limit in later sections of this chapter, this section introduces an example of a more complete population. The basic intuitions behind the relation between the speed of funding and the size of the tax benefit, however, are most readily seen in the simpler examples described above.

A typical defined benefit pension plan covers a population that includes active employees who are currently accruing or earning pension benefits but are not yet retired. The population also includes other people, mostly ex-employees who are inactive and are no longer accruing benefits. The inactive group would typically include those who have retired and are currently receiving benefits. In addition, the inactive group would include those vested workers who have separated from service to the employer and who expect to receive benefits based on past years of employment service when they retire. Other inactive members of the population might include surviving spouses who receive benefits as part of a joint employee/spouse annuity as well as disabled employees.

Table 2.1 shows how such a population might develop over time. At the end of year 1, when the employer's firm and the pension plan are relatively new, the population is made up almost entirely of active employees because there has been little time for the other population groups to develop. As years pass, however, the inactive populations grow. Also, the table shows how the average age and years of service would increase over time for the population of active employees. Often when a new firm is growing rapidly and many of its employees have been recently hired, the active employees as a group will tend to be relatively young. Eventually, through many years of slower growth or no growth, the active employees tend to age faster than new, younger employees are hired. As a result, the average age of active workers tends to increase over time and eventually stabilize. Such a growth pattern is shown in Table 2.1 and is used in the pension plan example throughout the rest of this chapter.

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[7]A 25 percent tax rate was chosen because it is the average marginal tax rate on corporate income.

For such a population growth pattern, Figure 2.3 shows how the active employees' ages would be distributed after 25 years. The area under the solid curve shows how current ages would be distributed in the active employee population. The area inside each rectangular grid under the curve equals 2.5 percent of all active employees. Thus, for example, because there are about 8.5 rectangular grids under the solid curve between the 20-year and 30-year marks on the horizontal axis, the figure shows that about 21 percent (=8.5*2.5%) of the active employees would currently be less than age 30. In contrast, following the same reasoning, the dashed distribution of ages hired shows that about 45 percent of the currently active employees would have been hired when they were age 30 or younger. As illustrated below in Section II.D, the nature of these age distributions can heavily influence observed levels of pension funding.

D. Pension Funding for a Complete Population

Observed levels of pension funding (defined below) and the size of the tax benefit associated with funding both depend on the actuarial method of funding and the ages, length of service, and other demographic characteristics of an employer's covered population. Understanding these interactions is fundamental to understanding the effects of the OBRA 87 funding limit. This section explains how such interactions work.

Under ideal conditions, with no uncertainty about interest rates, salary growth, turnover rates, etc., each part of a pension population could be associated with its own level of funding. The level of funding associated with the plan as a whole, then, would be determined by how the different parts of the population are mixed together.

To show how this works, "funding level" must first be defined. Throughout the remainder of this chapter, "funding level" and "funding ratio" are used interchangeably. Both terms refer here to the ratio of pension assets to the pension's current liability, expressed as a percentage. "Current liability" is defined here as the expected present value of future benefits accrued in years of employment service up to the current date, ignoring future accrual that is expected to result from employees' future years of active service and future salary increases. Further, this definition of current liability treats all active employees as being fully vested in their accrued retirement benefits, even though some recently hired employees may not be fully vested under the plan. Under this definition, current liability is essentially a measure of termination liability, which is the current value of benefits that the employer would owe to plan participants if the employer chose to immediately terminate the pension plan.[8] For the inactive parts of a covered population, such as the retirees, all benefits have already been accrued. For this part of the population, the current liability would equal the expected present value of future benefits. Under standard pension funding methods, therefore, the accumulated fund assets for

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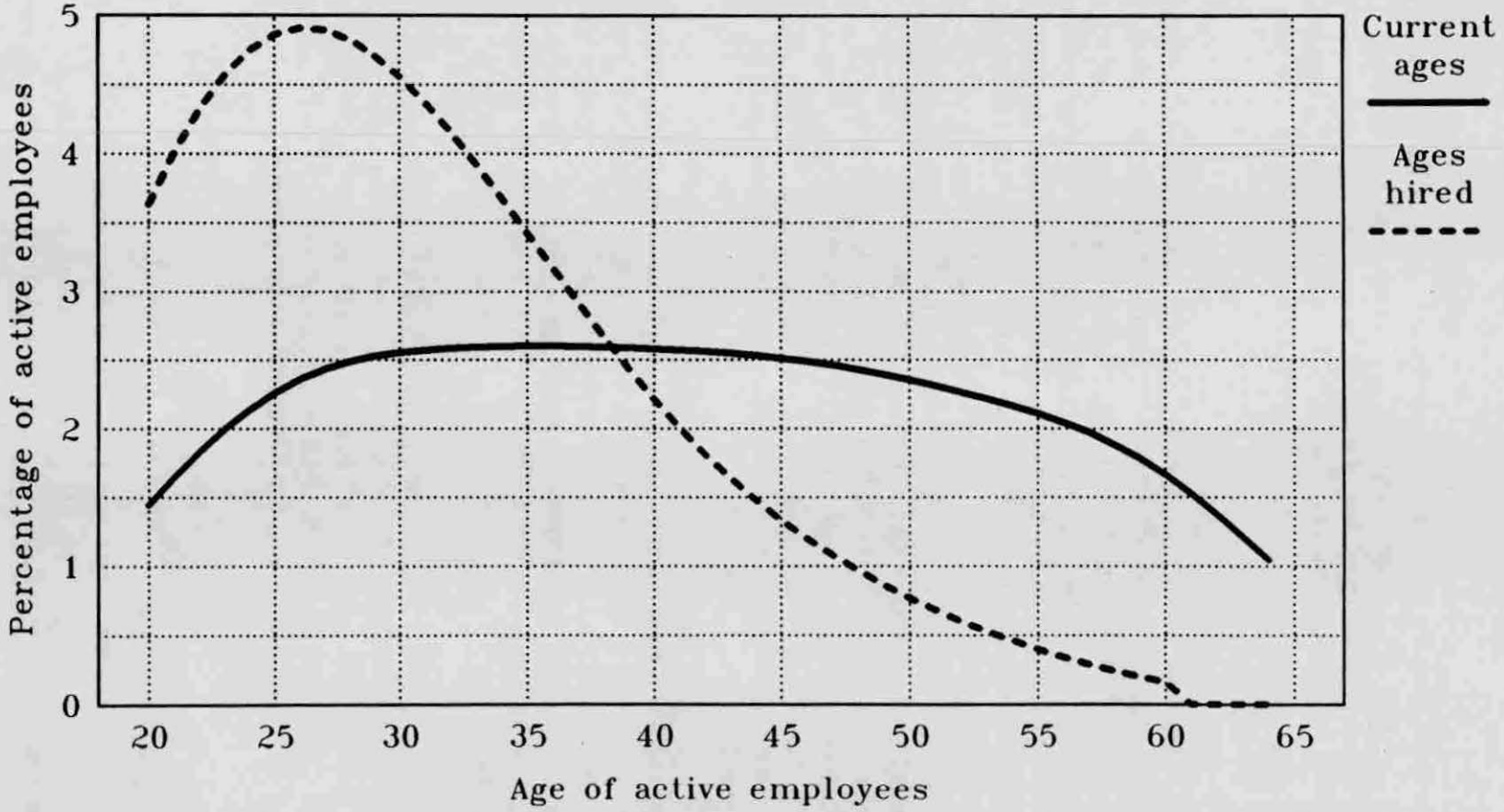
[8]There may be differences between this definition of current liability and termination liability for other types of plans and under conditions that differ from the assumptions of the examples in this chapter. Further, this definition of current liability may differ in technical ways from the way that current liability is defined under the Internal Revenue Code.

Figure 2.3

Distributions of Current Ages and Ages Hired For Active Employees After 25 Years



the inactive part of the covered population would normally be expected to equal the current liability. No future fund contributions for this group would be expected to be necessary. In contrast, for the population of active employees, current liability would normally be much smaller than the expected present value of future benefits. This is because the latter measure accounts for all expected future benefit accruals whereas current liabilities only account for benefits accrued to date.

Comparison of Figures 2.2 and 2.4 demonstrates the potential importance of the distinction between current liabilities and projected benefits for active employees. Recall that Figure 2.2 shows how a fund would be expected to accumulate under four different standard funding methods for a pension that covers a single cohort of active employees. The fund asset values at each age in Figure 2.2 are expressed as percentages of the expected present value of future benefits. Under all four methods, contributions to the fund are spread out over the entire 35 years of active employment, but the methods are all expected to reach the same target of 100 percent by age 65. As Figure 2.2 demonstrates, the fund is always smaller than the expected value of future benefits until age 65. In contrast, Figure 2.4 shows what happens when the same assets are instead compared to current liabilities. Although, as shown in Figure 2.2, assets are small relative to the expected present value of projected future benefits at early ages, Figure 2.4 shows that the assets are quite large relative to current liabilities under the first three methods. This is because current liabilities only measure the liabilities associated with benefits accrued up to the current date.[9]

The patterns shown in Figure 2.4 for a single cohort show why funding ratios for a whole pension population would depend heavily on the age distribution of active employees. As shown in the figure, the funding levels associated with young employees, who have few years of service, tend to be very high under the first three funding methods that take into account expected future service and salary increases. For any method that depends on expected future accrual, younger active worker populations tend to be associated with higher funding ratios.

Figure 2.5(a) shows a 50-year history of funding ratios for a plan that covers the whole population described by Table 2.1. The funding levels are expressed as ratios (percentages) of total plan assets to total current liabilities. Like the example of a single cohort, the funding ratios are highest under the fastest funding methods. Further, even though the ratios exceed 100 percent of current liability, future contributions are expected to be necessary under all four methods.[10]

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[9]The fourth method yields funding ratios below 100 percent of current liabilities in Figure 2.4 because the plan under all four methods in the single cohort example is assumed not to vest employees, whereas current liability is measured as if employees are immediately vested.

[10]Funding ratios that exceed 100 percent of current liability only imply that the assets would be more than enough to pay future benefits accrued to date if, for example, the pension plan was immediately terminated and active employees stopped accruing future retirement benefits.

Figure 2.4

Funding Ratios: Assets over Current Liabilities,
Single Cohort of Employees Hired at Age 30

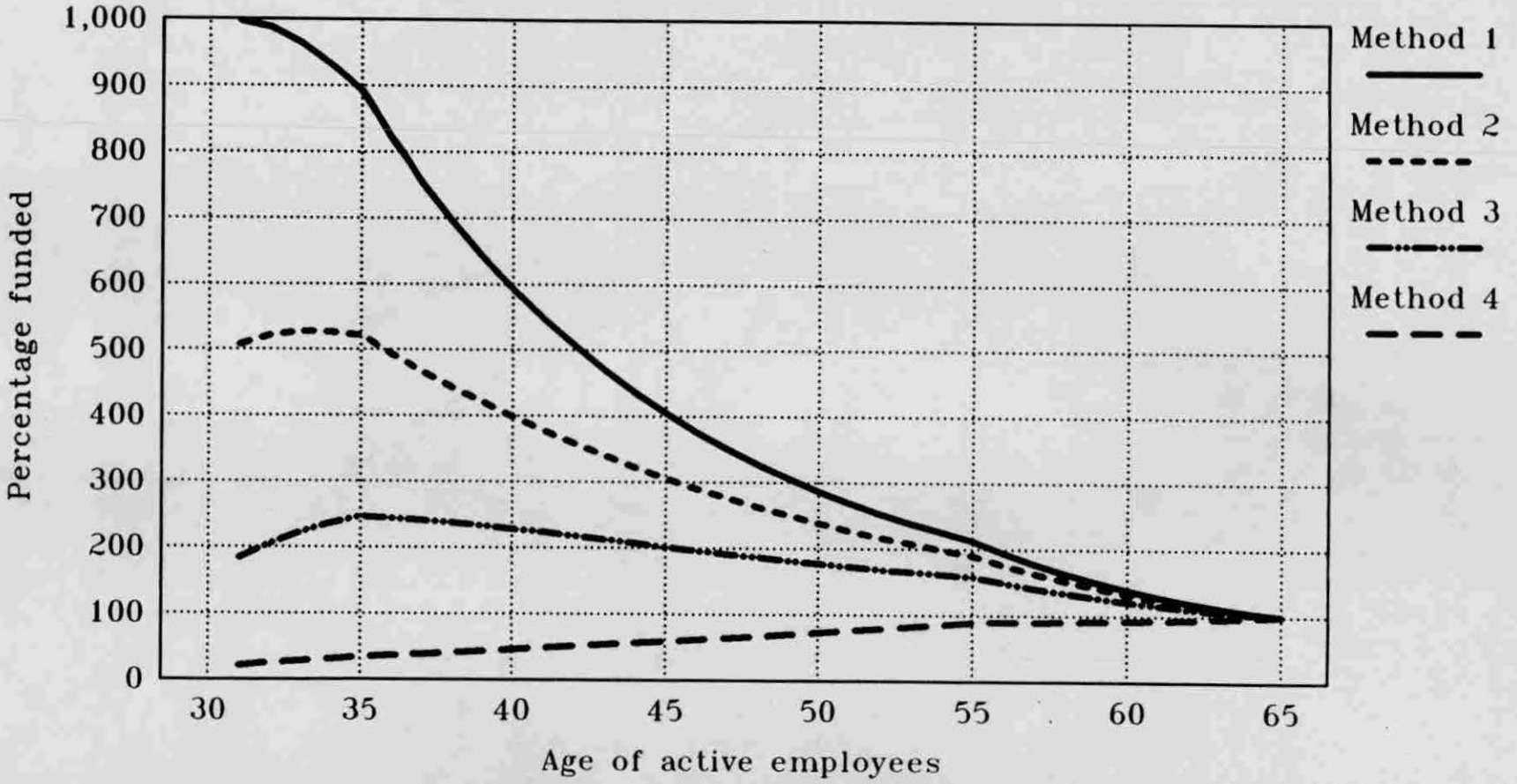
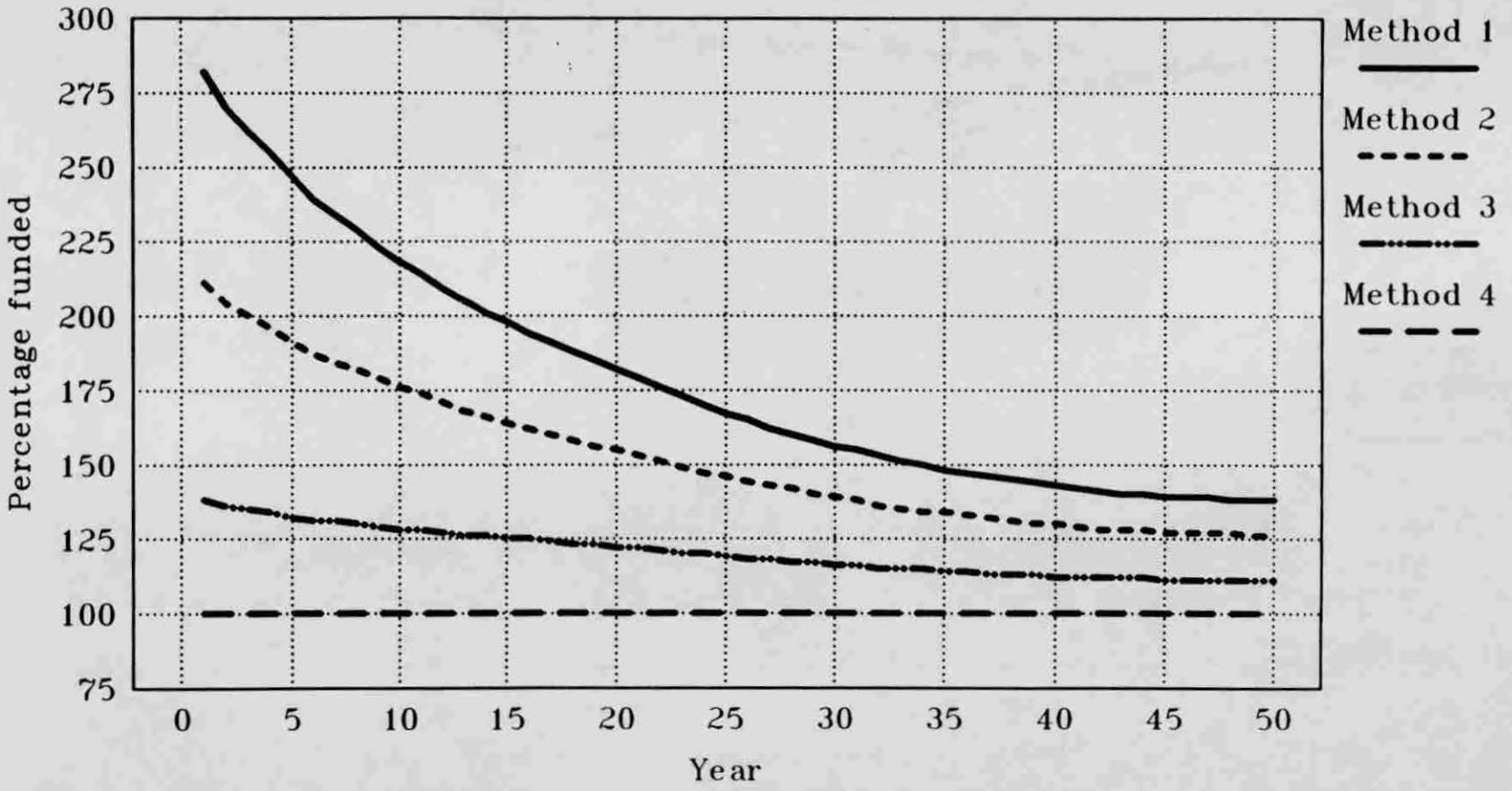


Figure 2.5(a)

Funding Ratios: Assets over Current Liabilities
Complete Plan Population



The funding levels shown in Figure 2.5(a) are higher in earlier years of the plan's history for two reasons. First, the employees are younger (see Table 2.1). Further, as shown earlier in Figure 2.4, such a preponderance of young active employees would tend to drive funding ratios higher for any funding method that accounts for projected future service and salary increases.[11]

Second, funding levels shown in Figure 2.5(a) are also higher in early years of the plan's history because the inactive parts of the plan population are relatively small in the early years. This pattern occurs because the funding ratio for the entire population is a weighted average of funding ratios associated with the active and inactive parts of the population. Under ideal conditions, the inactive parts of the population would be expected to be funded at exactly 100 percent of current liability, whereas the active worker part of current liability would tend to be funded at levels exceeding 100 percent. Therefore, as the inactive population grows in size relative to the active employee population, funding ratios tend to approach 100 percent of current liability for the pension population as a whole.

E. Tax Benefits for a Complete Population

Conceptually, the tax benefit of pension funding works the same for the complete plan as it does in the special savings account and single employee cohort examples. For the same reasons as in those examples, faster funding methods lead to larger tax benefits and lower long term employer cost because accelerated contributions benefit from compounding over more years from the deferral of taxes on contributions and the tax exemption of pension fund investment income.

Figure 2.5(b) shows how faster funding would affect contributions over a 50-year history of the complete pension population. Figure 2.5(b) shows contributions under methods 1, 2, and 3 as percentages of contributions that would have been made under method 3. As shown in the figure, the funding methods that require the largest contributions in the early years require the smallest contributions in later years. Further, because of the special tax treatment, the employer's present value of all contributions would be lower under the faster funding methods. For example, the present value of all future contributions under method 1, discounted at the after-tax interest rate, would be 11 percent lower than the present value of all future contributions made under method 3. This implies that the employer could decrease long term pension cost by 11 percent by choosing method 1 instead of method 3.

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[11]Plans are often started when the covered employees already have some active service. Often, when the plan is started, the employer grants the employees credit under the plan formula for the past service. In such a situation, the part of the employer's liability due to the past service is funded gradually. For simplicity, however, the plan in the example ignores the funding of past service credits. If there were unfunded past service liabilities in the example, the funding levels shown in the figures would tend to overstate actual funding levels in the early years.

Figure 2.5(b)

Annual Contributions under Methods 1 and 2 as Percentages of Contributions Under Method 3

Figure 2.5(c) summarizes how the choice of a funding method would affect the long term tax benefits for the complete population. The bars in the figure show how much the present value of future contributions would be reduced by the special tax treatment of pensions. The amounts are measured on a per-dollar basis. For example, for each dollar of contributions that would have been necessary in the long run (in present value terms) without the special tax treatment, pension funding under method 1 would result in a $0.42 reduction. In other words, for the plan in the example, the after-tax present value cost of all future benefit payments are reduced by 42 percent under method 1 by the special tax treatment of qualified pensions.[12]

For added illustration, Figure 2.5(c) also shows that the special tax treatment would offer no cost advantage if pension benefits were not funded in advance, i.e., in a "pay as you go" fashion. This is true because, to the extent tax rates do not change, the tax benefit can only be realized by funding future pension liabilities in advance.

III. PENSION FUNDING LIMITS

A. Before OBRA 87

An employer's pension funding decision normally has two important features: the long term strategic choice of an actuarial funding method and short-term decisions about how much to contribute to the fund annually. Likewise, the Internal Revenue Code (Code) regulates these two aspects of an employer's pension funding decisions. Section 412 of the Code regulates an employer's long term actuarial funding strategy by limiting the choice of actuarial funding methods and assumptions that may be used to establish a funding level standard called "accrued liability."[13] To regulate pension fund contributions in the short run, Section 404 of the Code limits annual deductible contributions by comparing the difference between assets and accrued liabilities to the annual contributions that would normally be necessary under an employer's long term actuarial funding method. Such contributions are referred to as "normal costs". The normal cost would generally be the maximum allowable deductible contribution allowed by the Code under Section 404 if all actuarial assumptions were always exactly correct, if plan benefits began accruing at the same time as the funding started, and if neither actuarial assumptions nor benefits ever changed. Under such conditions, by always setting contributions equal to normal

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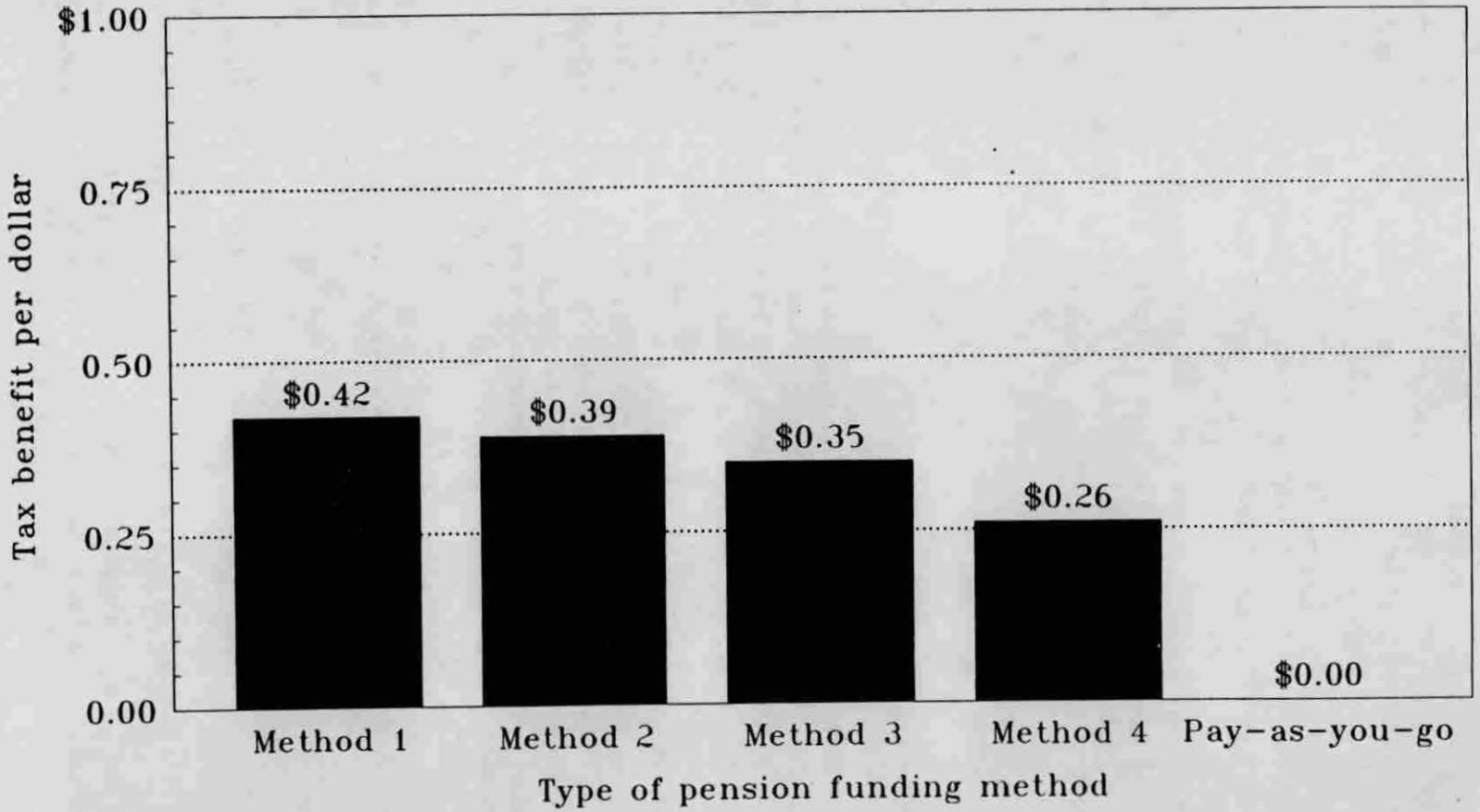
[12]Note that the tax benefit shown in Figure 2.5(c) for the complete population are similar to the tax benefits shown in Figure 2.2 for the single cohort example, even though the complete population is considerably more complicated.

[13]Note that "accrued liability" is an accounting measure defined by the optional actuarial funding method, and does not necessarily measure legal or economic pension liability. Under method 3, accrued liability is essentially the same as the "Projected Benefit Obligation" (PBO) as defined under the Financial Accounting Standard 87 (Financial Accounting Standards Board, 1985). See the glossary on page 75 for a definition of accrued liability.

Figure 2.5(c)

Tax Benefit Per Dollar of Long-Term Pension Cost
Complete Plan Population



cost in the short run, pension assets could be expected to always equal accrued liability in the long run.

In practice, however, actual salary increases, fund investment earnings, and other factors that affect pension funding usually differ from even the best actuarial assumptions. In addition, plan benefit formulas, actuarial assumptions, or funding methods are sometimes changed. As a result, annual contributions equal to the normal cost may be too large or too small. To account for such variation, therefore, the Code rules specify how annual contributions may be adjusted to allow for unexpected differences between accrued liability and the value of plan assets. When there is a shortfall of assets relative to accrued liability, the Code rules prescribe that the shortfall should be amortized over a period of 5 to 40 years.

Together, Sections 404 and 412 of the Code actually establish a range for deductible annual contributions. Maximum and minimum deductible annual contributions are determined by comparing normal cost to the shortfall of assets relative to accrued liabilities (plus normal cost) under the employer's chosen long term funding method. For the maximum, any shortfall would be amortized over 10 years. Minimum deductible contributions are determined by amortizing the shortfall over period of up to 40 years, depending on the reason for the shortfall. In addition, employers can affect the long-run speed of funding by choosing a faster or slower funding method within the range of funding methods allowed under the Code, although the chosen method can only be changed periodically and is therefore a long term decision.

To enforce the minimum and maximum contribution limits, the Code imposes an excise tax of ten percent of the shortfall or excess contributions for being outside of the allowable range. Excise taxes are collected in addition to disallowing deductions for contributions that are larger than the maximum.

B. Funding Limits in the Example

This section shows how the limits before OBRA 87 would work in the complete pension example. Section III.C shows how the upper limits in the example could be raised and the tax benefits of pension funding increased by an employer's choice of actuarial assumptions. Subsequent sections examine the effects of changes in the full funding limit under OBRA 87.

In the complete pension example so far, it is assumed that actual salary increases, fund investment earnings, etc., have the same values as were used in the actuarial calculations, i.e., the actuarial assumptions are always exactly correct.[14] It is also assumed that benefits, actuarial assumptions, and funding methods have not changed. Thus, the funding levels shown in Figure 2.5(a) also shows the long term funding standards, i.e., accrued liability, that an

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[14]However, the population simulation model uses a random number generator to determine uncertain events such as employee separation and mortality, although the actuarial assumptions about the probabilities of such events are always correct in the simulations.

employer might have used to apply the Code funding and contribution limits before OBRA 87. The highest line in the figure, i.e., for method 1, represents the long term funding standard under the fastest funding method considered in the example. The third highest line, for method 3, would be the funding standard for the slowest funding method considered in the example.[15]

Suppose that the employer chooses method 1, the fastest funding method shown. Each year, the employer would calculate the accrued liabilities plus the normal cost under method 1, which would equal the values shown in the highest line of Figure 2.5(a) where they are expressed as percentages of current liability. Then, to calculate the maximum deductible contributions, the employer would compare the accrued liabilities plus normal cost to the end-of-year value of plan assets before contributions are made. If the plan assets exceed accrued liabilities plus normal cost before contributions were made, then no deductible contributions would be allowed for that year. If, however, assets were less than accrued liabilities plus normal cost, but the shortfall was no larger than the normal cost, then the amount of the shortfall would equal the maximum deductible contribution. Finally, if assets were less than accrued liability, not including the current year normal cost, then the maximum deductible contribution would equal the normal cost plus a fraction, determined by 10-year amortization, of the additional shortfall. The minimum deductible contribution in this last case would be determined by amortizing the additional shortfall over a period of up to 40 years, depending on the reasons for the additional shortfall.

Similarly, the other lines in Figure 2.5(a) would be the long term funding standards if the employer chose one of those funding methods. However, for the final pay plan in the example, method 4 would not be allowed by the Code and regulations thereunder. For final pay plans, the funding method must account for expected future salary increases by at least spreading out benefit accruals in constant dollar amounts (as in method 3) over each employee's total expected years of active service. Employers are required to base the funding method for such a plan on projected future salaries. Method 4 would not be allowed because its funding pattern would reflect actual benefit accruals based only on current and past salary under the plan formula in the example: dollar amounts of accrual for each employee begin small and grow with salary growth.[16]

For the plan in the example, which experiences no economic surprises and no other changes, the ratios shown in the top line of Figure 2.5(a) (for method 1) would be the actual observed history of funding ratios if the employer were to choose the fastest funding method in the example and always make the maximum deductible annual contributions. Similarly, the line for method 3 shows what the funding history would normally be if the employer were to choose

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[15]For the plan in the example, and under the assumptions of the example, methods 1 and 3 correspond to the fastest and slowest methods allowed under the Code.

[16]The present value of accrual also grows because the term over which the present value is calculated decreases as the employee ages.

the slowest funding method and make the minimum annual contributions. The histories of funding ratios under methods 1 and 3 in Figure 2.5(a) thus show how the Code funding and contribution limits before OBRA 87 established a long term range for the speed at which pension liabilities could be funded. For the plan in the example, 44 percent would effectively be the maximum tax benefit that could be expected by choosing the fastest long term funding method (method 1) allowed by the Code for this plan.

C. Effects of Actuarial Assumptions

Up to this point, the example has been constructed as if all of the employer's actuarial assumptions were economically correct and are never changed. The example shows that an employer could minimize long term pension cost and maximize the tax benefit of funding by choosing the fastest funding method allowed under the Code. This section shows how an employer could further increase the speed of funding and lower the long term cost by the changing actuarial assumptions.

Although other assumptions matter, the most important actuarial assumption is the discount rate. So far in the example, a 7 percent discount rate has been used. The example has also used an investment rate of return of 7 percent. Suppose, instead, that the employer uses a 6 percent actuarial discount rate to construct the contribution limits for years 2 through 25 even though the actual rate of return is 7 percent. Suppose also that the employer uses method 1 to calculate the long term funding and annual contribution limits.

Figure 2.6 shows how the funding limits would be affected. The dashed lines show the history of upper and lower funding limits as percentages of current liability if the 7 percent discount had been used. In contrast, the solid lines show the history of upper and lower funding limits calculated at a 6 percent discount rate for 25 years.[17] As shown in the figure, lowering the discount rate from 7 to 6 percent would increase the funding ratio to 293 percent of current liability by year four.

As a result of the lowered discount rate assumption, the employer would be allowed to contribute larger amounts in the early years of the plan. Because actual economic liabilities and the investment rate of return would not be affected by the employer's discount rate assumption, the increased contributions in the early years would be offset by lower contributions in later years. The net effect would be to increase the speed of funding and the tax benefit. Figure 2.7 shows that lowering the actuarial discount rate would increase the contributions by between 50 and 60 percent in the first five years. The effect on annual contributions would then decrease in later years because the actual investment rate of return would still be 7 percent. When the actuarial discount rate is eventually changed back to 7 percent in year 27, no deductible annual contributions would be allowed through year 32, and contributions would be reduced in years 33

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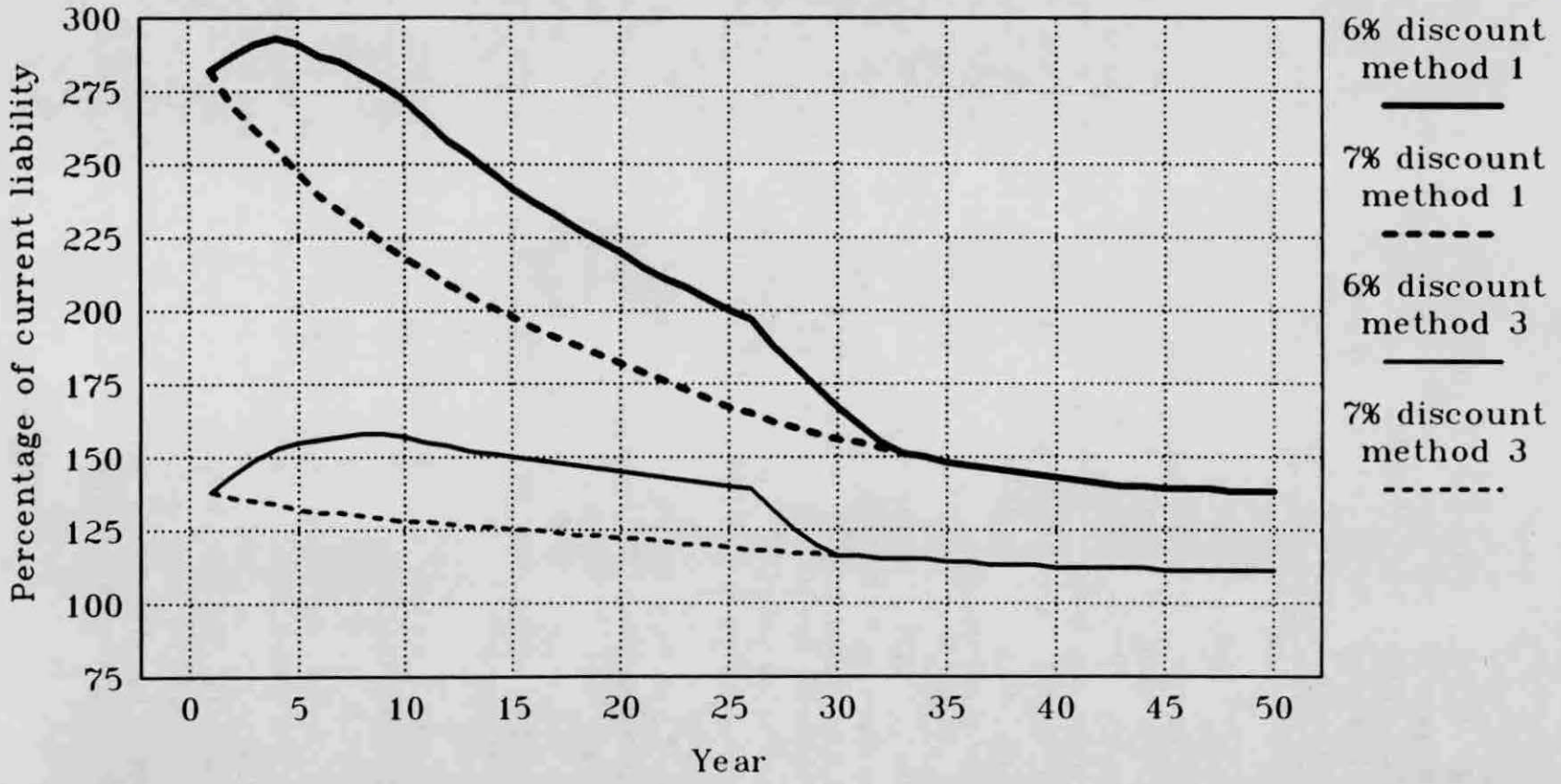
[17]Current liabilities, which are in the denominator, are discounted at a 7 percent annual rate.

Figure 2.6

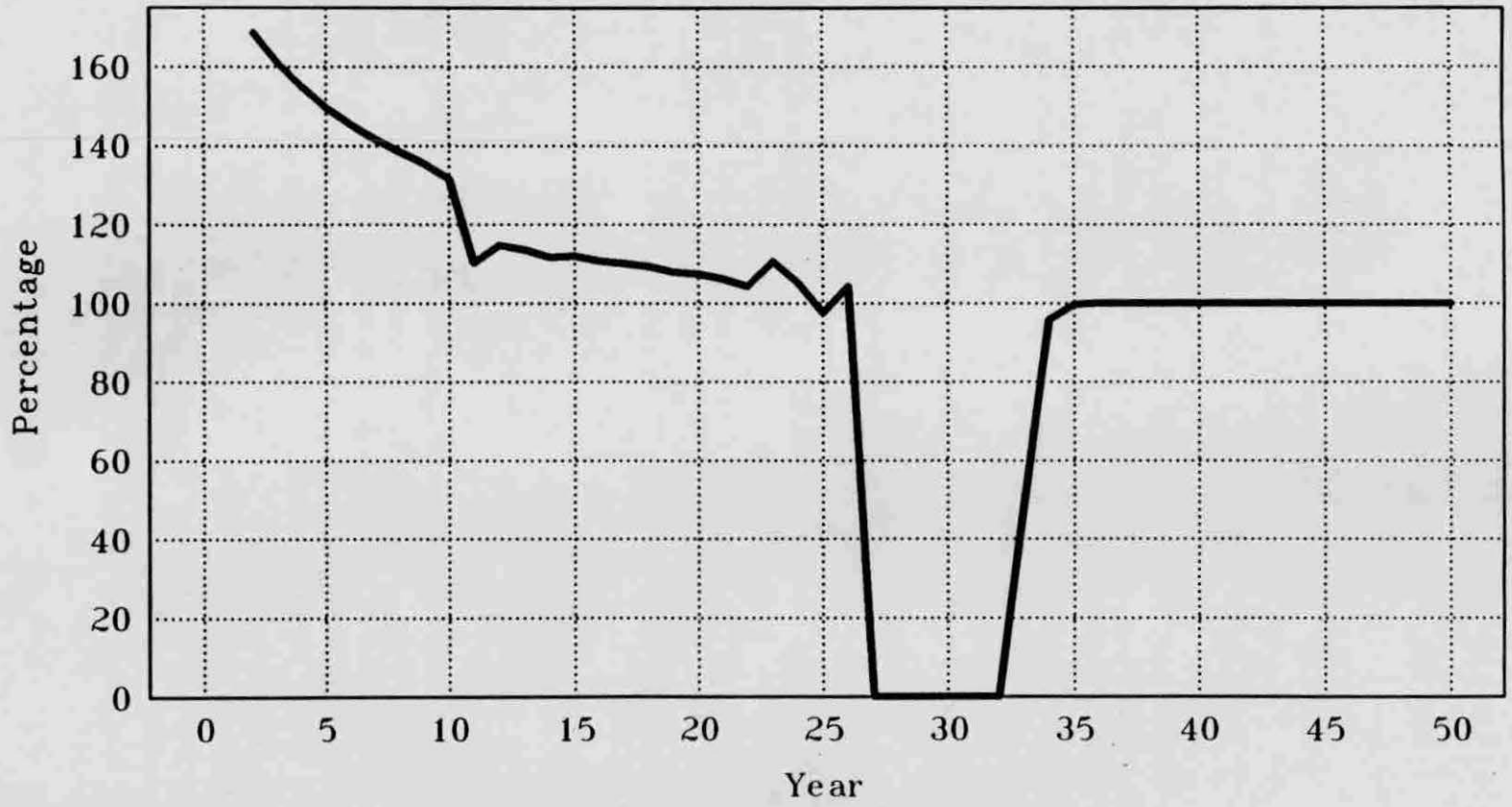
Effect of a Lower Actuarial Discount Rate Assumption on Pre-OBRA 87 Funding Ratios



Notes: For 6% example, 6% discount rate is used by the plan in years 2-26. Current liability is calculated at 7% discount rate in all years.

Figure 2.7

Annual Contributions at 6% Discount Rate as Percentages of Contributions at 7% Discount Rate



Notes: For 6% example, 6% discount rate is used in years 2–26. As a result, longrun cost is decreased by 4.2% over 50 years.

and 34. After year 34, contributions would be the same as if the actuarial discount rate had never been lowered.

The use of a lower discount rate would therefore speed up the contributions and the employer would realize a higher tax benefit and lower long term pension cost. By lowering the actuarial discount rate by one point and speeding up contributions in the short run, the employer in the example would lower the cumulative present value of all future contributions and therefore decrease pension cost over the next fifty years by 4.2 percent. Likewise the long term tax benefit would increase from 42 percent to 44.4 percent.

Similar cost reductions can be created by changing other actuarial assumptions such as the expected future salary growth rate or the expected future rate of employee turnover, although changing such assumptions might not have as large an impact on the long term tax benefit as changing the discount rate.

IV. OBRA 87 Full Funding Limit

A. The Limit

The Code and regulations thereunder clearly specify a range of funding methods that may be used to fund qualified plans. However, the ability of employers to significantly increase the tax benefits of a pension by changing actuarial assumptions can conflict with the provision that such assumptions should be "reasonable". This ability to increase the tax benefits of a pension by changing actuarial assumptions can create a significant element of selectivity in the funding and contribution limits.

If the effects of the Code limits only depended on a single assumption, such as the discount rate, then the solution to this problem of selectivity would be straightforward. For example, the Code could require the assumed discount rate to fall within a narrow range of a readily observed standard, objective measure such as the current annual yield to maturity on long term U.S. Treasury bonds. However, the solution to the problem is not so straightforward because many actuarial assumptions can be important in specifying the Code contribution and funding limits for each employer. The important assumptions include the discount rate, the expected future rate of return on pension assets, the expected inflation rate, the expected rate of future salary growth for each active employee, the mortality rates, the expected future rate of employee turnover, and other assumptions. An employer's adjustments to any of these actuarial assumptions could influence the contribution and funding limits in a way that would increase the employer's tax benefits of pension funding. Further, many of the assumptions can be expected to vary over time, across employers, and over plan participants, even if they are the best assumptions. It would therefore be very difficult to adequately regulate the actuarial assumptions by constructing objective, readily measured standards of "reasonableness."

As an alternative to imposing stricter rules about actuarial assumptions, the Omnibus Budget Reconciliation Act of 1987 (OBRA 87) took a new approach to solving this problem by creating an additional full funding limit that would depend on fewer actuarial assumptions. Before OBRA 87, Code Section 412 used each employer's accrued liability as the long term full funding standard. OBRA 87 changed the full funding standard to equal the lesser of an employer's accrued liability or 150 percent of the employer's current liability.[18] Further, under the new rules current liability for use in the funding limit must be calculated at an actuarial discount rate that falls within a 90-to-110 percent corridor of a four-year moving average of the annual yield to maturity for 30-year U.S. Treasury Bonds.

The new approach to limiting pension funding is fundamentally different from the old approach because the additional full funding limit, i.e., 150 percent of current liability, does not depend on an employer's funding method. Moreover, the new limit is less sensitive to actuarial assumptions because current liabilities only depend on benefits accrued to date. Future salary growth does not matter. As a result, the new funding limit does not require such strict regulation of actuarial assumptions as might otherwise be required. Further, the most important assumption, i.e., the discount rate, must now fall within a well-specified and narrow range of an objective index for calculating the new funding limit.

While this new solution to regulating pension funding has the advantage of making the maximum contribution limit less selective and less subject to possible abuse, the new approach also has side effects that might be undesirable to policy makers. In order to evaluate the new funding limit relative to other possible funding limit policies, therefore, it is necessary to understand both the possible advantages and disadvantages of the OBRA 87 full funding limit.

B. Effects of the OBRA 87 Limit: "Correct" Actuarial Assumptions

This section uses the example developed above to show how the new OBRA 87 limit would affect a young plan that uses the best possible actuarial assumptions.

Recall that Figure 2.5(a) shows what the pre-OBRA 87 funding standards under various funding methods would be under the "correct" assumptions with no economic uncertainty.[19] The ratios of the funding standards to current liabilities shown in the figure depend on the employer's chosen funding method and the demographic characteristics of the covered population. The new, additional full funding limit under OBRA 87 would be the lesser of the old full funding standard and 150 percent of current liabilities. OBRA 87 would therefore only

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[18]The term "current liability" in the Code is similar to the current liability defined in this chapter but may differ in its technical aspects.

[19]The use of "correct" here is not meant to imply that they are the correct assumptions to be used in practice. The usage only implies that they are the correct assumptions for the example.

affect the plan shown in Figure 2.5(a) if the old funding standard, accrued liability, would have exceeded 150 percent of current liability.

Figure 2.5(a) shows that the plan would never be affected under method 3 because, under method 3, accrued liability never exceeds 150 percent of current liability in the example. However, the figure also shows that the plan would have been affected under the faster funding methods (methods 1 and 2), depending on when the law became effective. For example, after year 33 the new limit would not matter under any of the funding methods shown. Figure 2.5(a) therefore illustrates two of the most important determinants of the effect of the OBRA 87 limit. First, plans that use faster funding methods are more likely to be affected. Second, plans with younger active worker populations and fewer nonactive plan participants are more likely to be affected by the OBRA 87 limit.

Figures 2.8(a) and 2.8(b) show how OBRA 87 would affect the plan if the new limit was imposed in year 2. The dashed line in Figure 2.8(a) shows what the funding ratios would have been under method 1. The solid line in Figure 2.8(a) shows what would actually happen to funding levels as a result of OBRA 87. Because accrued liability exceeds 150 percent of current liability in the early years, the new limit would become the funding standard until the accrued liability falls below 150 percent in year 33. After that, the old and new funding standards would be identical.

Figure 2.8(b) shows what would happen to annual contributions by showing annual employer contributions under the OBRA 87 limits as a percentage of what contributions would have been without the OBRA 87 limit. As a result of the 150 percent limit, no contributions would be permitted for the first five years of OBRA 87. Thereafter, contributions would be allowed but restricted by the 150 percent limit. After year 33, the new limit would not be binding because the old limit would have been below 150 percent of current liability anyway. Eventually, by year 45, contributions would equal what they would have equalled without the OBRA 87 limit.

Figure 2.8(b) also shows that as a result of being limited to making no contributions in the first five years of OBRA 87 and reduced contributions in years 6 through 12, the employer would eventually, after year 12, make larger contributions than would have been made without OBRA 87. Future liabilities do not change because of OBRA 87. The OBRA 87 limit would merely delay funding of future liabilities. Further, Figure 2.8(b) shows that contributions increase long before the old funding limit, accrued liability, falls below 150 percent of current liability in year 33.

As a result of delaying contributions, the OBRA 87 limit effectively slows the speed of funding and decreases the long-run tax benefit in the example. In the example, the present value of all future contributions increases by 4.1 percent through year 50. Similarly the long-run (per-dollar) tax benefit under funding method 1 is decreased by 2 cents from $0.42 per dollar to $0.40 per dollar.

Figure 2.8(a)

Effects of OBRA 87 on Funding Ratios
Under "Correct" Actuarial Assumptions

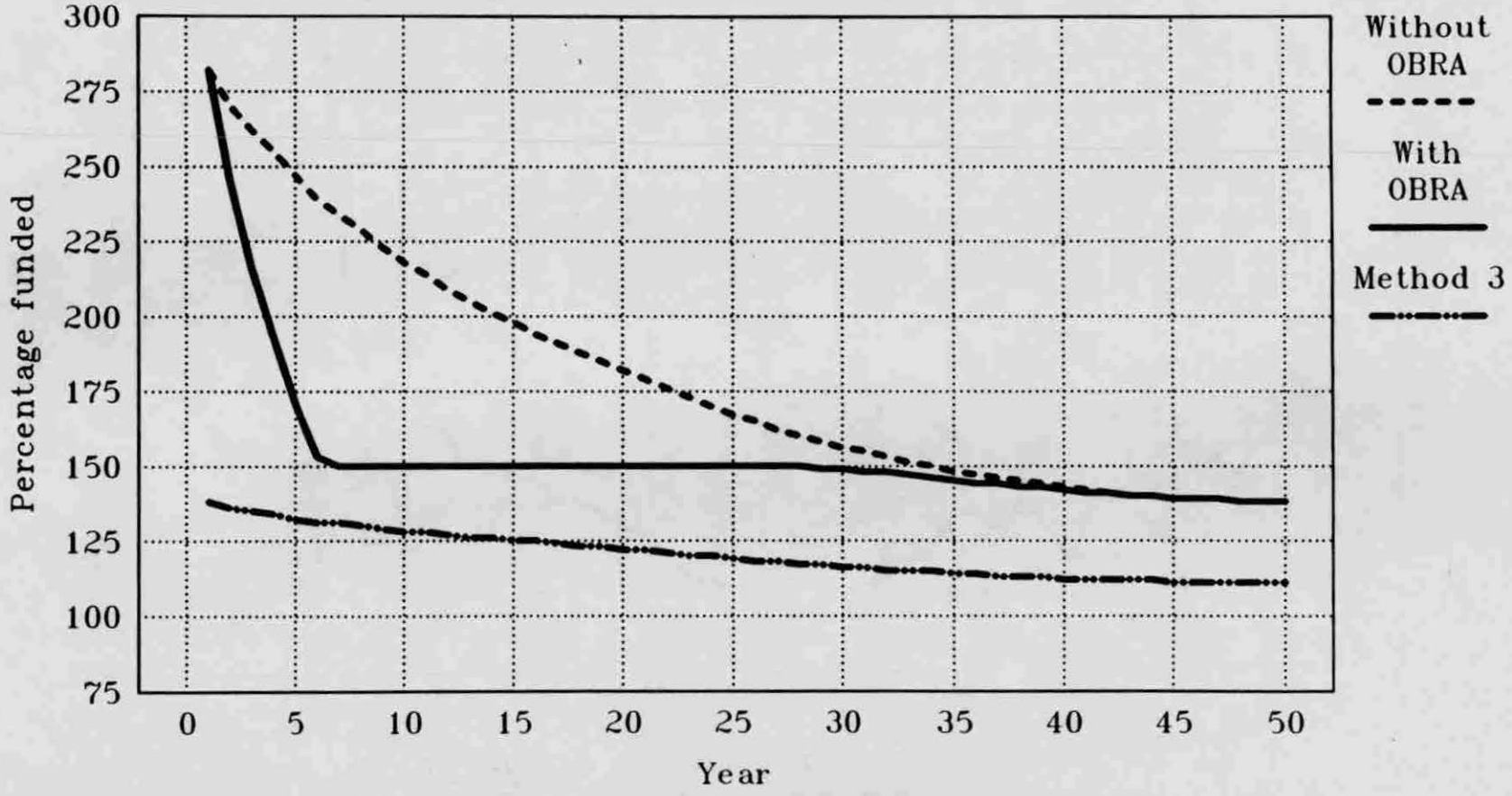
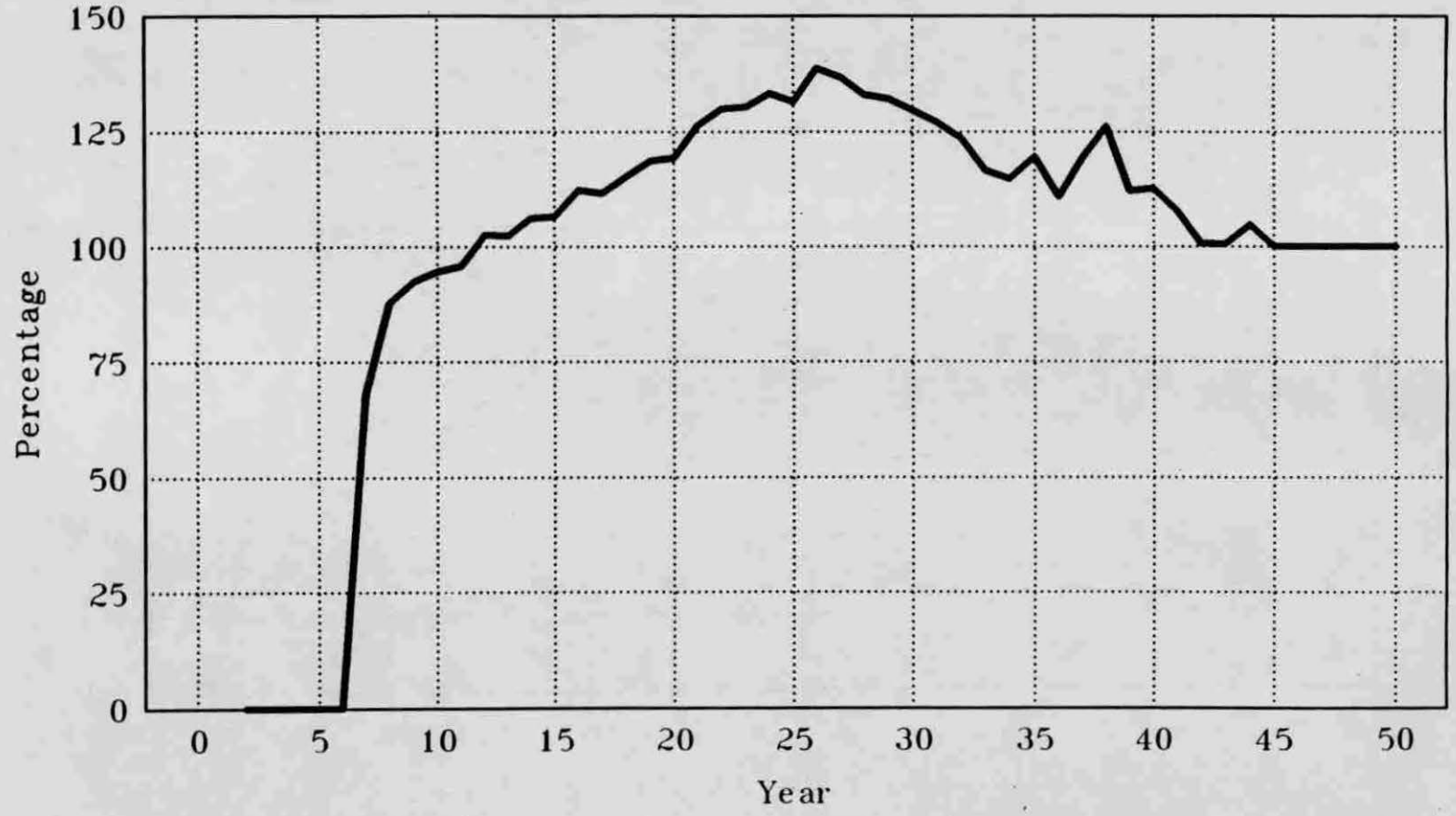


Figure 2.8(b)

Contributions With OBRA 87 Limit as Percentages
of Contributions Without the OBRA 87 Limit



Note: Longrun cost is increased
by 4.1% over 50 years.

C. Effects of the OBRA 87 Limit: Older Population

If the plan in the example was older when the new OBRA 87 limit was imposed, then the new limit would affect it less. If the plan had been more than 33 years old, the OBRA 87 limit would have had no effect at all. This is because the pre-OBRA 87 funding standard, i.e., accrued liability, becomes lower as a percentage of current liability as the active employee population grows older and as the inactive populations grow in relative size.

Figures 2.9(a) and 2.9(b) show what would happen to the example plan if the OBRA 87 limit was imposed in year 11 instead of year 2. This example shows the effect on a plan that is older than the plan in the previous example. Like the patterns shown in Figure 2.8(b), Figure 2.9(b) shows that no contributions would be allowed in the first five years of the OBRA 87 limit. Further, contributions would increase in years after that, but not by as much as they would have for the younger plan in terms of present value. As a result, the sponsor's long-run cost increase would be only 2.6 percent through year 50, whereas the sponsor of the younger plan in the first example would have experienced a long-run cost increase of 4.1 percent.

This example shows how plans that were affected by the OBRA 87 limit, but were older when the new limit took effect, would be less affected in the long run.

D. Effects of the OBRA 87 Limit: Low Discount Rate

Recall from the discussion of figures 2.6 and 2.7 in Section III.C that before OBRA 87 an employer was able to increase the long term tax benefit and decrease long term pension costs by using a lower discount rate in order to speed up the rate of funding. Figures 2.10(a) and 2.10(b) show how such a plan would be affected by the OBRA 87 limit.

This example was constructed to show the effects of two features of the OBRA 87 full funding limit. Not only is the new limit equal to 150 percent of current liability, but current liability must be calculated using a discount rate that is within a 90-to-110 percent corridor of average long term U.S. Treasury-Bond rates. To combine these two features, Figures 2.10(a) and 2.10(b) were constructed to show what would happen if the employer normally uses a 6 percent actuarial discount rate, but is required by OBRA 87 to use a 7 percent discount rate to calculate current liability for determining the new funding limit.

Figure 2.10(a) shows that because the employer would have used a 6 percent actuarial discount rate in years two through 26, the funding standard would have been higher for those years without the OBRA 87 limit. Recall that this same pattern was shown in Figure 2.6. However, because the OBRA 87 limit is imposed in year 2 and is calculated at a 7 percent discount rate, the new funding standard would result in a pattern of funding that is identical under OBRA 87 to the pattern for the first example that was shown in Figure 2.8(a). This funding pattern under the OBRA 87 limit is shown by the solid line in Figure 2.10(a). The

Figure 2.9(a)

Effects of OBRA 87 on Funding Ratios
For an Older Pension Plan

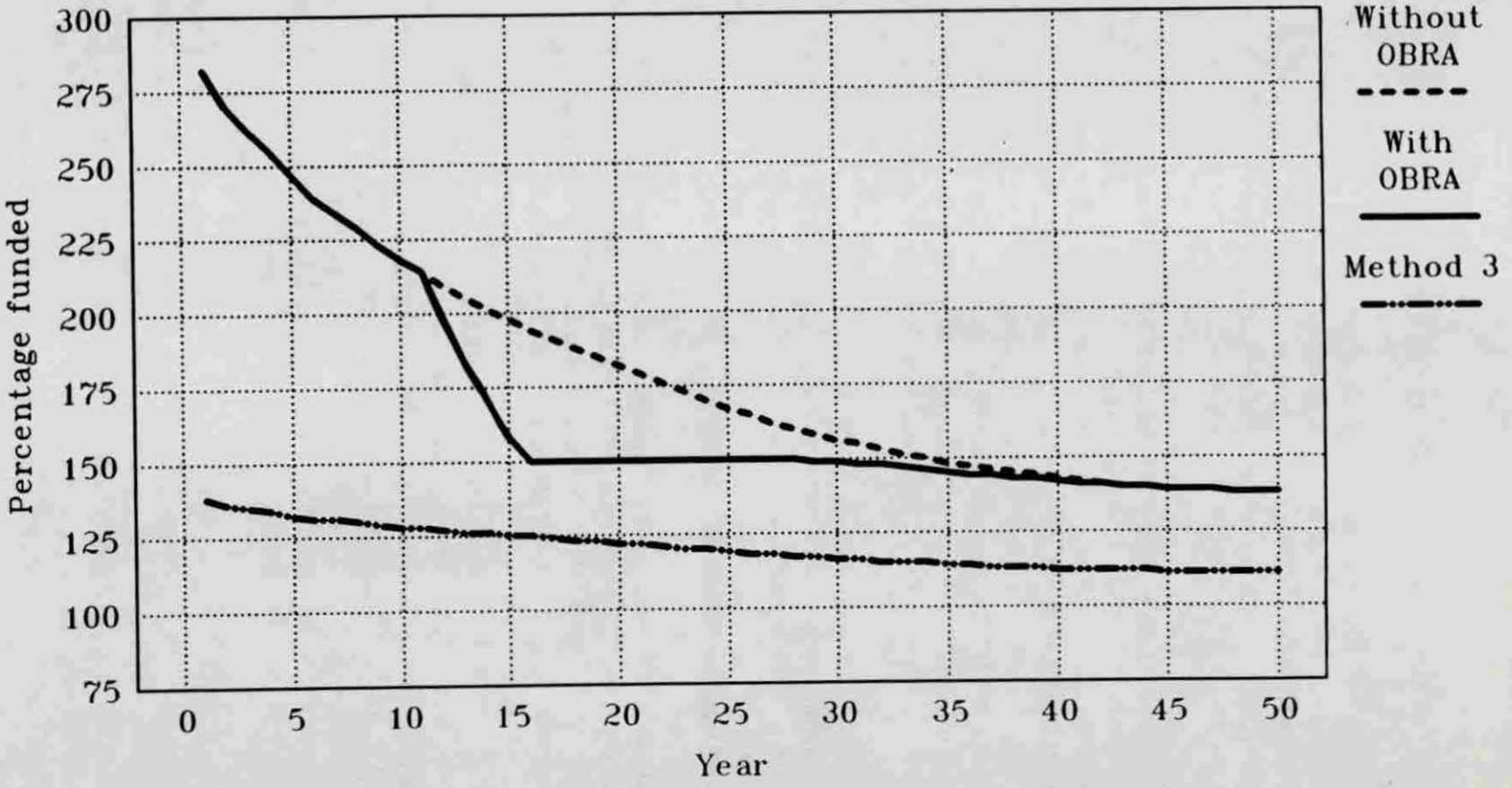
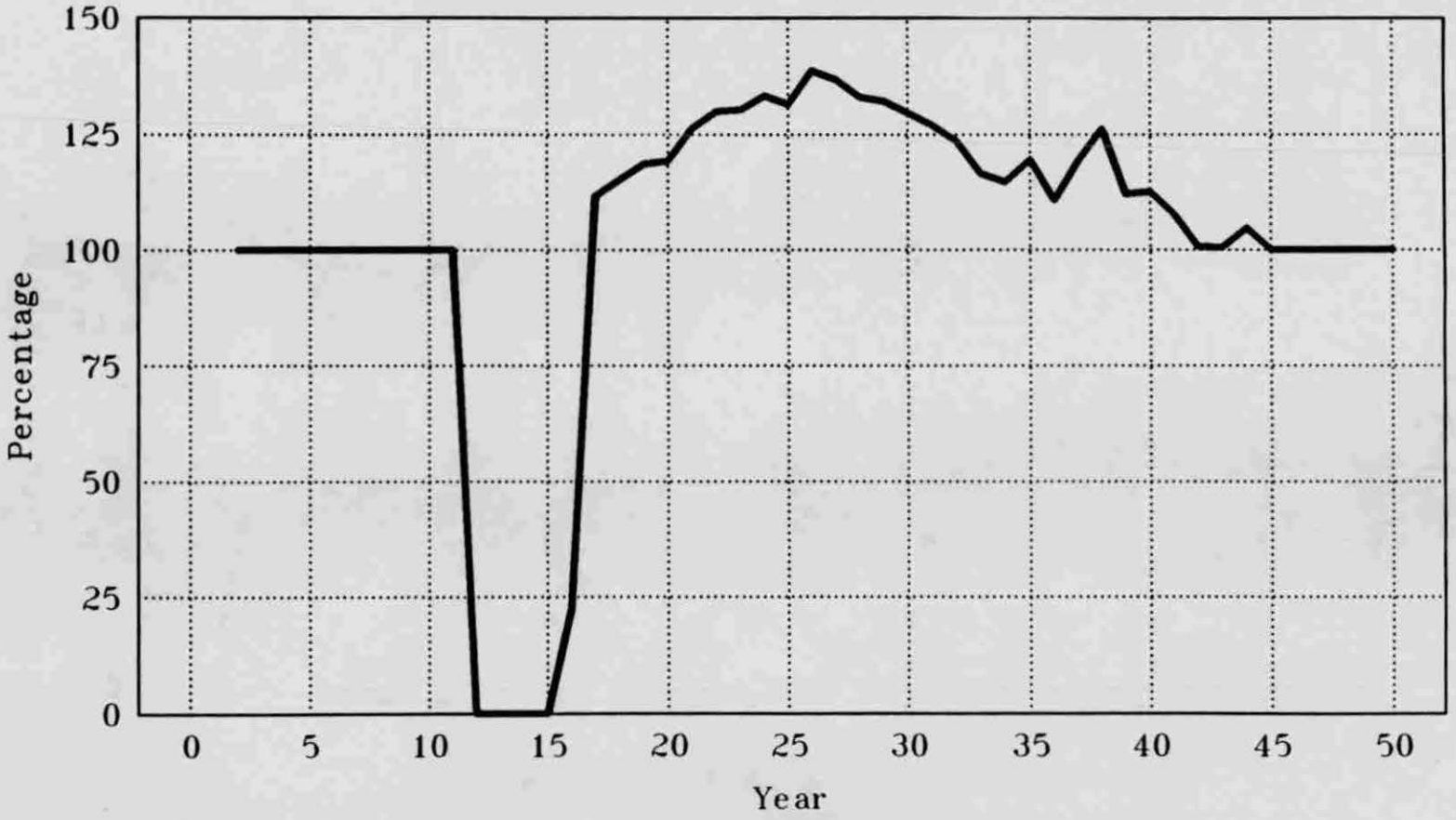


Figure 2.9(b)

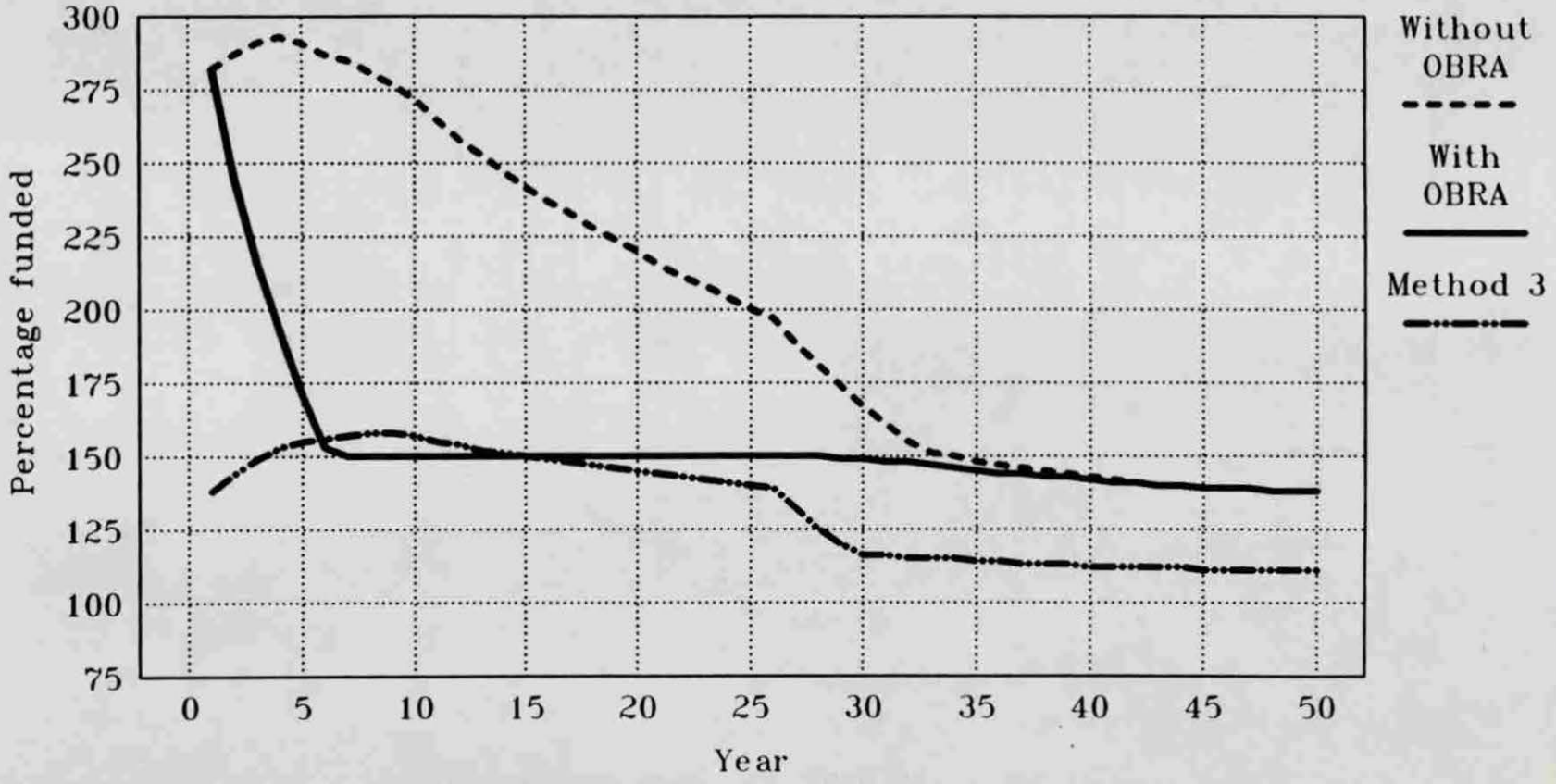
Effects of OBRA 87
on Contributions for an Older Plan



Note: Longrun cost is increased by 2.6% over 50 years.

Figure 2.10(a)

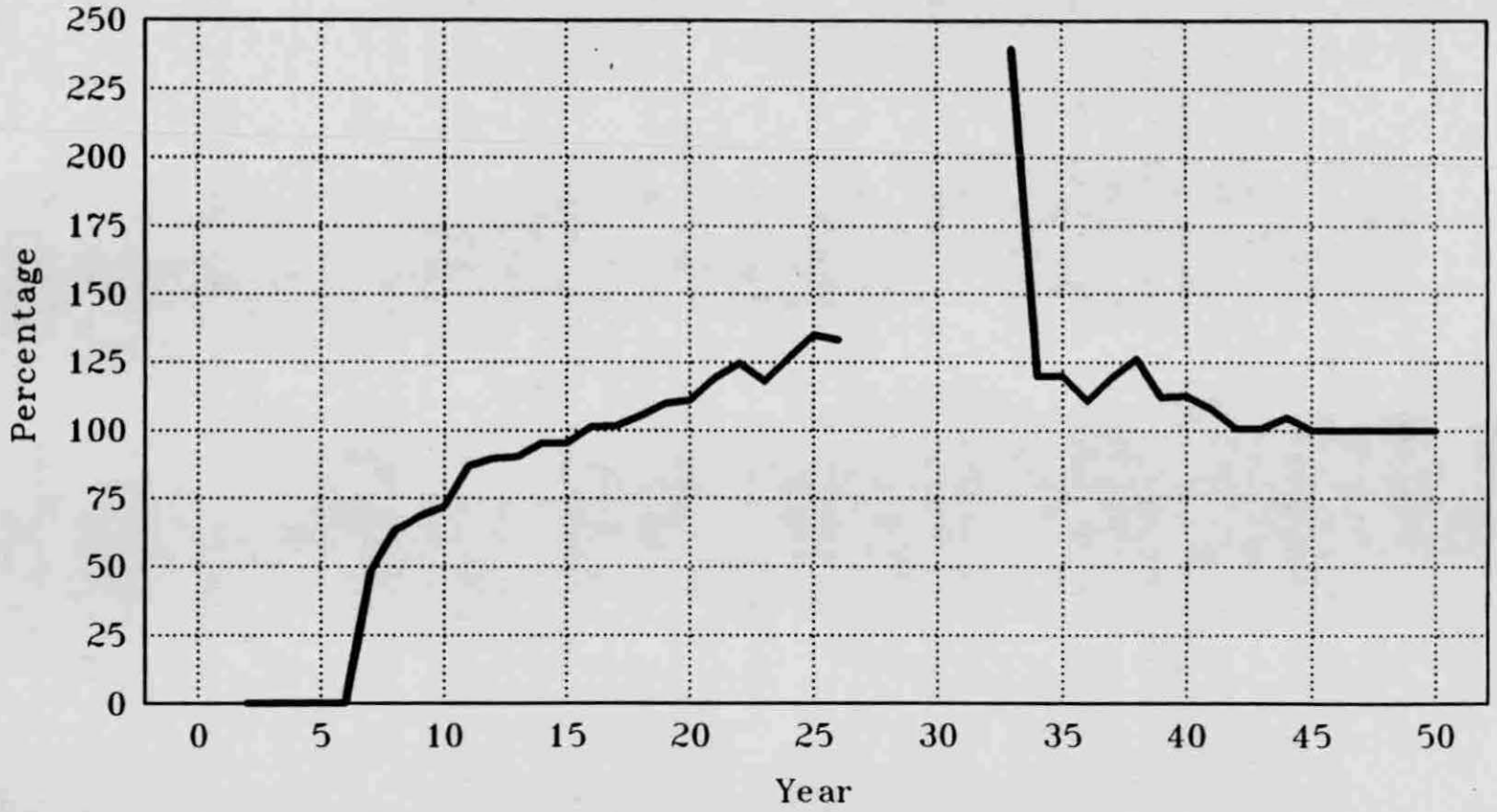
Effects of OBRA 87 on Funding Ratios for Plan
That Uses a 6% Discount Rate in Years 2-26



Note: 6% discount is used by plan in years 2-26. Current liability is calculated at 7% discount rate in all years.

Figure 2.10(b)

Effects of OBRA 87 on Contributions for Plan That Uses a 6% Discount Rate in Years 2–26



Notes: Longrun cost is increased by 8.7% over 50 years. Denominator (contributions without OBRA 87) is zero in years 27–32.

employer's new limit under OBRA 87 would therefore not be affected by the employer's choice of a low-discount rate.[20]

Figure 2.10(b) shows how contributions would be affected. As in the first two examples, the OBRA 87 limit would not allow any contributions in the first few years, but contributions would increase in the following years. In this example, the OBRA 87 limit would lead to the same maximum annual contributions as in the first example, but the contributions without OBRA 87 would have been larger in the early years in this example (compare Figures 2.8(b) and 2.10(b)). As a result, the OBRA 87 limit would increase the long term pension cost by more in this example than it would have in the first example. The long term cost would increase in this case by 8.7 percent through year 50, whereas the increases would have been only 4.1 percent in the first example. Note, however, that the resulting long term tax benefit under OBRA 87 would be the same as it would be in the first example under OBRA 87, i.e., 40 percent.

This example shows that the OBRA 87 limit can be effective in preventing employers from increasing their tax benefits by adjusting actuarial assumptions. However, even though the new limit can have such an effect, this example also shows that the total effect of OBRA 87 depends upon the employer's choice of actuarial assumptions, the funding method, and the demographic characteristics of the employer's covered population of pension participants.

E. Effects of the OBRA 87 Limit: Annuitized Benefits

The accrued liability for a plan population is the sum of the accrued liability for active employees and the accrued liability for inactive participants such as retirees and vested ex-employees. The accrued liability for active employees is defined by the funding method and tends to be greater than 100 percent of current liability under methods that depend on projected future salaries. In contrast, the accrued liability for inactive participants would equal 100 percent of current liability regardless of the funding method. As a result, total accrued liabilities would tend to be higher as a percentage of current liabilities for plans that have relatively fewer inactive participants. Such plans are therefore more likely to have been affected by the OBRA 87 limit because it is more likely that their pre-OBRA 87 funding standard, accrued liability, would be above 150 percent of measured current liability.

In the preceding examples, the plan was assumed to have relatively fewer inactive participants in the early years when the active employees also tend to be younger. These two combined factors increased the impact of OBRA 87 on younger plans in the example relative to

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[20]Note that the OBRA 87 limit would even be binding under the slowest method in the example in years 3 through 13. This occurs in the example because the employer uses a low discount rate. In principle, however, this phenomenon could also occur even under the "correct" 7 percent discount rate for a population with even younger active employees than in these examples.

older plans. However, plans do not have to be relatively new and have young active employees for inactive participants to account for a relatively small fraction of liabilities. Even older plans can have a relatively small fraction of liabilities allocated to inactive participants. For example, an employer might purchase annuity contracts from a private insurer on an ongoing basis when employees retire. Once such an annuity contract is purchased, the associated liabilities no longer belong to the employer and are therefore no longer counted as part of either accrued liabilities or current liabilities. As another example, employers sometimes purchase privately-insured annuity contracts for inactive participants on a one-time basis. In either case, the purchase of annuity contracts would increase the ratio of accrued liabilities to current liabilities and would therefore increase the likelihood that the OBRA 87 limit would affect the employer's contribution limits.

This example was constructed to show the possible importance of such private annuity purchases. This example uses the same assumptions as the first example, except that it is assumed that annuity contracts are purchased whenever a participant leaves active service either to retire (an immediate annuity) or to be part of the vested, non-retired population (a deferred annuity). As a result, total accrued liabilities and total current liabilities in this example only account for active employees.

Figures 2.11(a) and 2.11(b) show what would happen. The top, dashed line in Figure 2.11(a) shows the history of pre-OBRA 87 funding standards (accrued liability) and funding levels as they would be measured for such a plan. Note that the levels are higher than those shown for the first example in Figure 2.8(a). This is because Figure 2.11(a) only accounts for active employee liabilities. As a result, the figure shows that the OBRA 87 limit would become the funding standard for all 50 years of the example, whereas the OBRA 87 limit only matters for 33 years in the first example.

Figure 2.11(b) shows how contributions would be affected by the OBRA 87 limit. As in the previous examples, contributions would not be allowed in the first few years of OBRA 87, but would increase thereafter. In terms of present value, the contributions in this example would not be affected by OBRA 87 over the 50-year period. However, the present value of all future contributions would eventually increase as a result of the OBRA 87 limit because contributions would be slower.

This example shows that the OBRA 87 limit is more likely to affect plans that purchase private annuity contracts. The new 150 percent OBRA 87 limit would not account for the fact that under normal conditions, as determined by the old full funding standard, assets would normally be higher as a percentage of measured current liabilities than they would have been if there were no annuity purchases.

Figure 2.11(a)

Effects of OBRA 87 on Funding Ratios for Plan That Buys Private Annuities

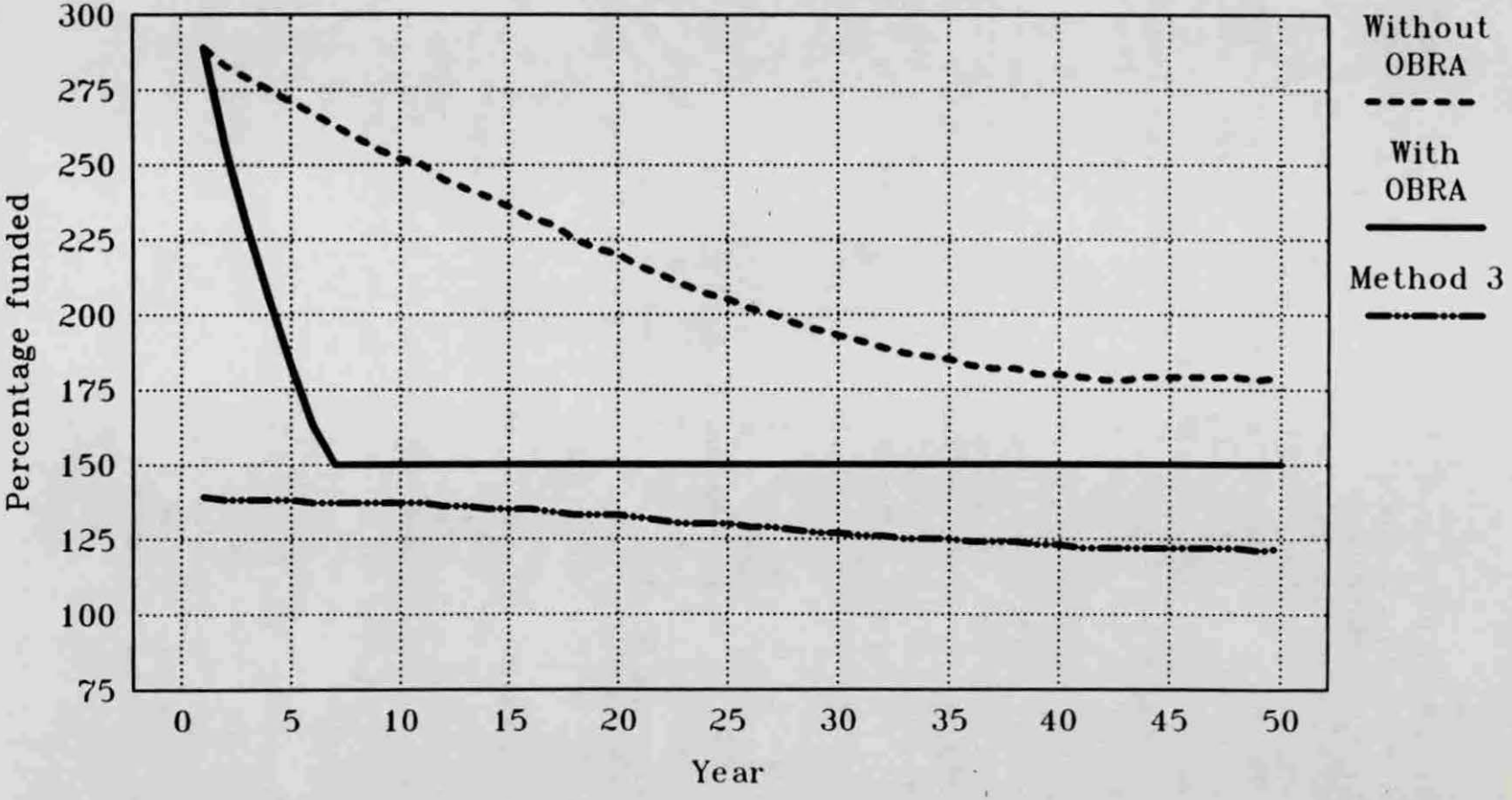
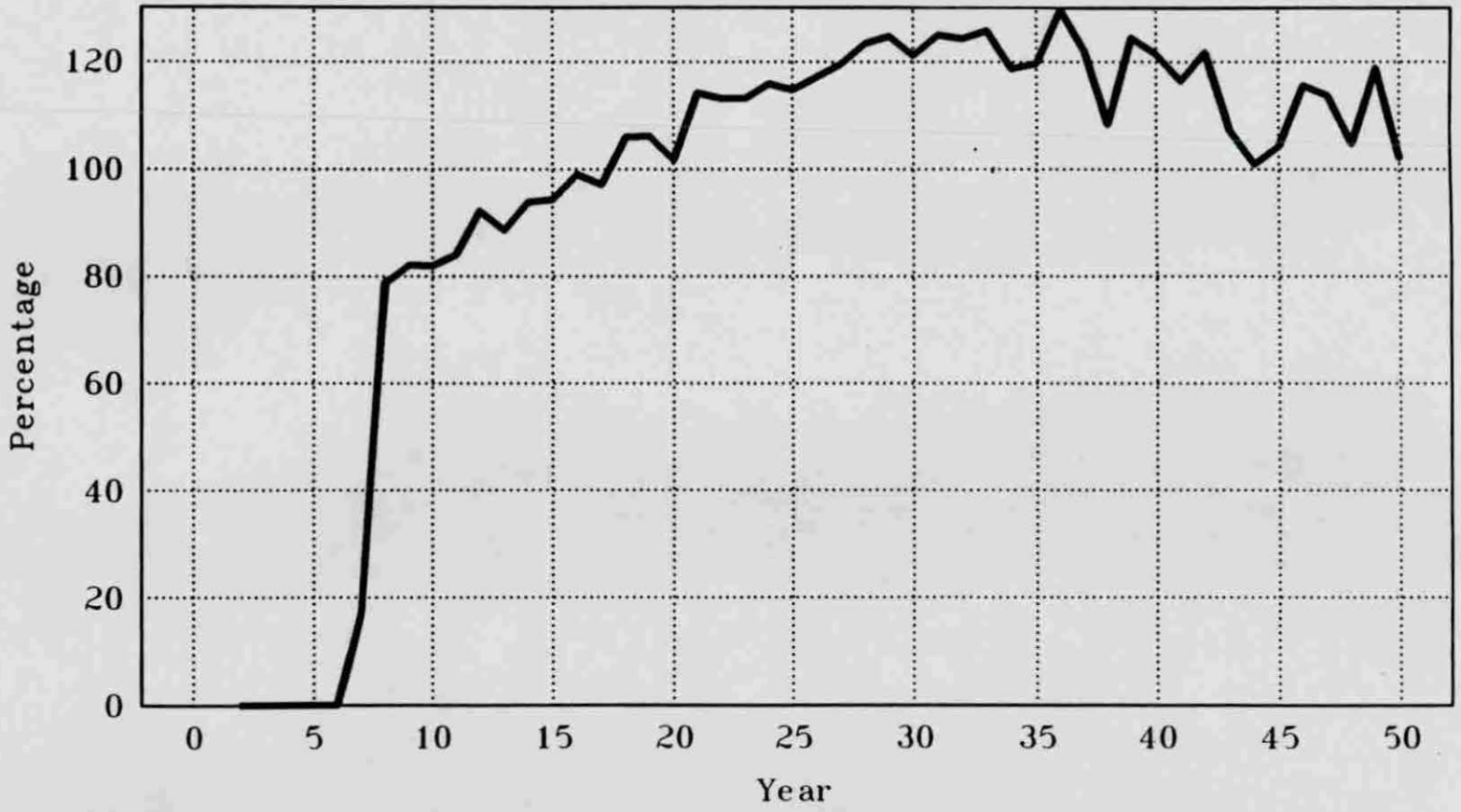


Figure 2.11(b)

Effects of OBRA 87 on Contributions for Plan That Buys Private Annuities



Note: Longrun cost is reduced by 0.3% over 50 years.

CHAPTER 3: EMPIRICAL EVIDENCE ABOUT THE FULL FUNDING LIMIT

I. INTRODUCTION

The analysis in Chapter 2 shows that the effects of OBRA 87 depend on many factors that can differ among plans. For example, plans that cover younger employees are more likely to be affected than plans that cover older employees. Likewise, employers that fund faster are most likely to be affected, as are employers that use low discount rates and employers that privately annuitize retirement benefits. The reasons that such factors matter and the ways that they matter are shown in Chapter 2, but the extent to which they matter is an empirical issue.

Based on data from 1989 financial statements of corporate pension sponsors, the analysis in this chapter examines the degree to which private, single employer defined benefit pension plans have been affected by the OBRA 87 full funding limit and the extent to which actuarial factors and demographic factors matter. In addition, the last section of this chapter examines the likely effects of the OBRA 87 funding limit on employees' pension risk.

II. HOW FUNDING RATIOS ARE DISTRIBUTED[1]

A. The Distribution

Figure 3.1 shows how funding ratios were distributed in 1989 for all private, single-employer defined benefit pension plans in the United States.[2] The distribution is based on data from 1989 financial statements of private employers whose pension assets totaled $652 billion, or about 85 percent of all private, single-employer defined benefit pension assets.[3] The area under the curve in Figure 3.1 shows the percentage distribution of funding ratios. The area inside each rectangular grid under the curve represents five percent of the plans. Thus, for example, because there are about five rectangular grids under the curve between the 150

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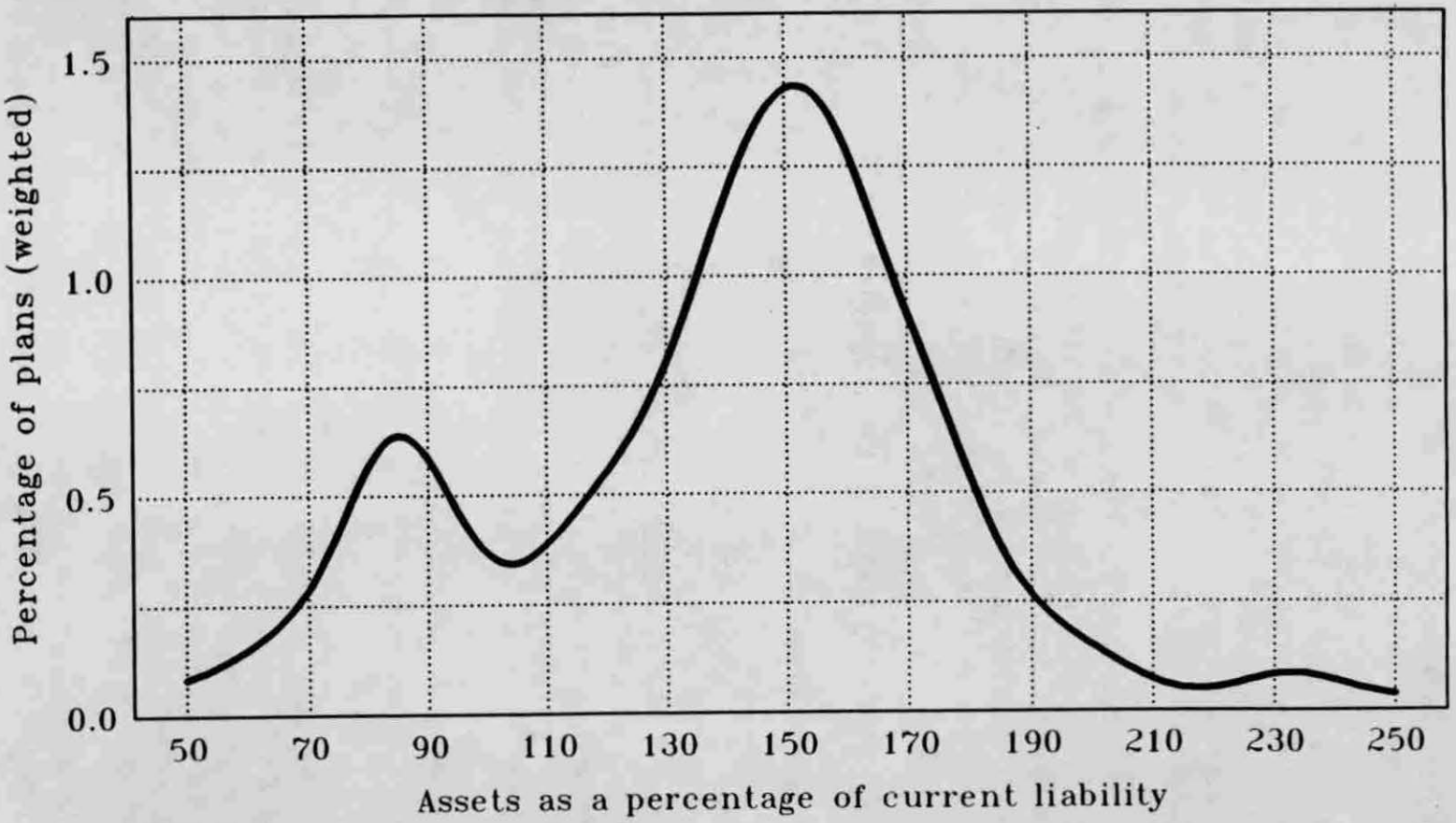
[1]See the Glossary on page 75 for a summary description of actuarial terms used in this chapter.

[2]As in Chapter 2, funding ratios are defined here as assets expressed as a percentage of current liability. Current liability was measured for this chapter by using the Accrued Benefit Obligation reported on financial statements. In Section III below, current liability is adjusted to account for discount rate requirements under OBRA 87. See Appendix B for details. The measure of current liability used in this chapter is only an approximation to "current liability" as it is defined under the Code.

[3]Data used throughout this chapter are from Compustat II, Standard & Poor's Compustat Services, Inc. and IRS Form 5500 as noted on each figure and table. Appendix B further describes the data and methods.

Figure 3.1

Distribution of Funding Ratios in 1989:
All Private Single Employer Pension Plans



Source: Compustat II
(see Appendix B for details)

and 170 percent marks on the horizontal axis, the figure shows that about 25 percent (=5*5%) of plans had funding ratios between 150 percent and 170 percent of current liability. Likewise, because the area under the curve is relatively small to the right of the 190 percent mark on the horizontal axis, the figure implies that only a small percentage of plans (about 5 percent of plans) had funding ratios higher than 190 percent of current liability.

Throughout this chapter, unless otherwise noted, plans are weighted by dollars of current liability for the purpose of calculating statistics and distributions. Such weighting causes plans to be represented in direct proportion to their size. As a result of weighting, the areas under the curve in Figure 3.1 actually represent percentages of dollars of current liability of plans. However, when discussing distributions and statistics, the term "percentage of plans" is used throughout this chapter as shorthand for "percentage of dollars of current liability of plans." [4]

Figure 3.1 shows that funding ratios of plans varied widely in 1989. The average funding ratio was 139 percent of current liability, but Figure 3.1 shows that a significant percentage of plans were funded at much higher levels. For example, 50 percent of the plans were funded at levels higher than 144 percent of current liability. Further, 10 percent of the plans had funding levels higher than 178 percent of current liability. The figure also shows that a significant percentage of plans were funded at levels far below the average. For example, 10 percent of the plans had funding ratios lower than 83 percent of current liability.

Understanding the effects of OBRA 87 requires an understanding of the causes of the variation shown in Figure 3.1. Some causes of the variation are purely random. For example, funds may earn different rates of return on their investments simply by chance. Funds that have earned extraordinarily high investment returns tend to be funded at high levels. However, much of the variation shown in Figure 3.1 can be explained by systematic differences between plans, such as the type of benefit formula and the type of actuarial method used for funding. Further, funding levels can be systematically influenced by differences in actuarial assumptions, plan amendments, and demographic factors.

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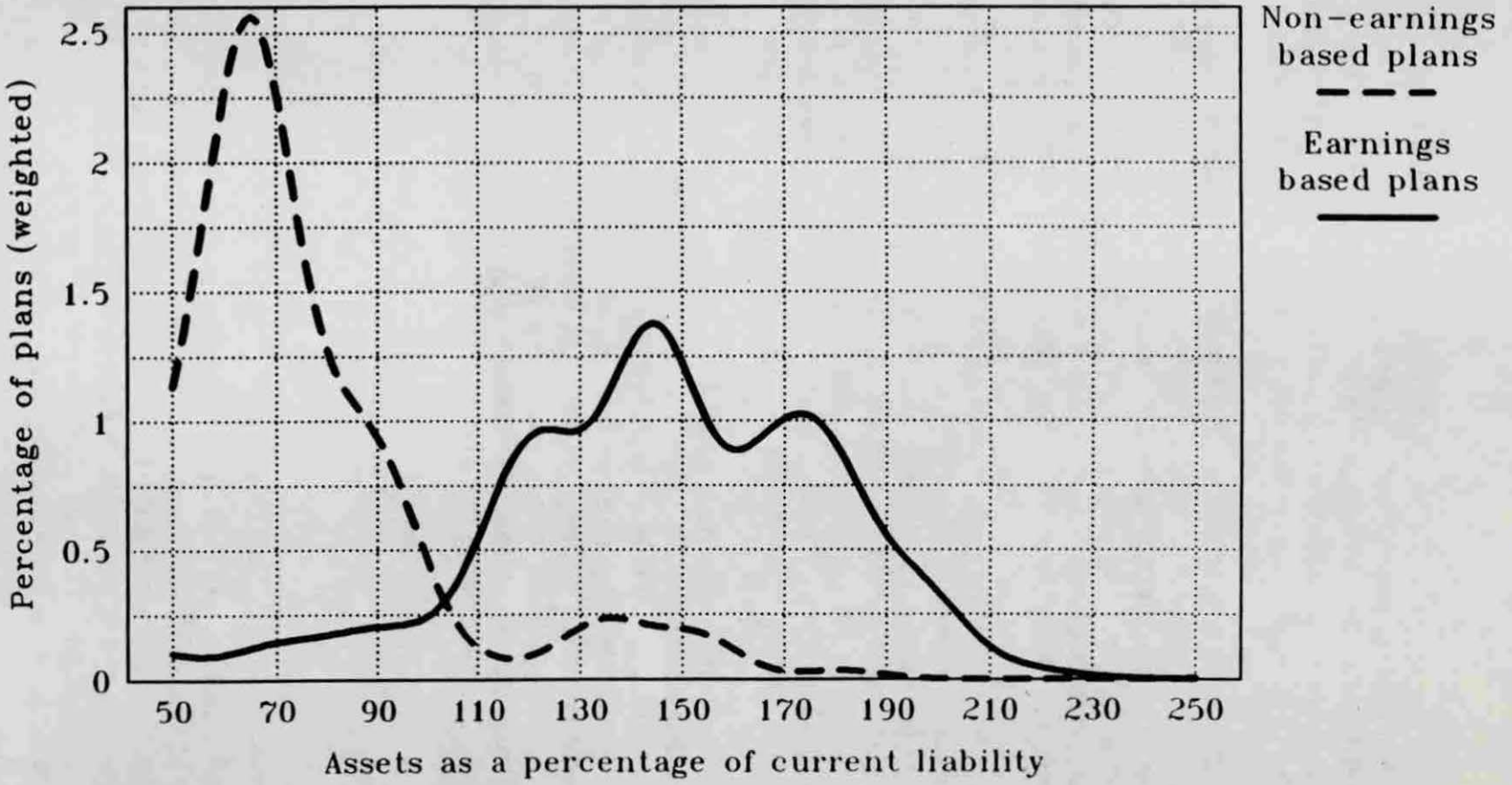
[4]Current liability was used as the weight because it is a more standardized and meaningful measure of plan size for this study than alternative measures such as total assets or employees. Unweighted statistics and distributions could be misleading because plan sizes vary enormously. Unless one is explicitly interested in the effects of plan size, it could be misleading, for example, to weight a plan with $10 million of current liability the same as a plan with $10 billion of current liability. As an extra check, however, all statistics and distributions were also computed without weights. The unweighted quantitative results differ from the weighted results, but the qualitative nature of the results and general conclusions of the analysis in this chapter are unaffected.

Figure 3.2

Distributions of Funding Ratios in 1989:
Effect of Benefit Formulas



Sources: Compustat II and IRS Form 5500
(see Appendix B for details)

B. Benefit Formula

Different defined benefit plans can use different formulas to calculate retirement benefit amounts. Out of all employees covered by medium and large private defined benefit plans in 1989, 76 percent were covered by plans that use a formula based on annual employee earnings and years of service.[5] As an example of a typical earnings based plan, the plan examined in Chapter 2 calculates annual benefits by multiplying 1.5 percent times an employee's years of service times the employee's average annual salary in the final five years of service. In contrast, non-earnings based plans offer retirement benefits that are not based on annual earnings but are often based on years of service. For example, an employee might be promised $20 monthly for each year of active service. In such a plan, an employee's monthly retirement benefit would equal $600 after 30 years of service. In 1989, 24 percent of employees covered by private defined benefit plans were covered by non-earnings based plans.[6]

The funding levels of plans are greatly influenced by whether or not the plan formula is based on earnings. This is because earnings based plans are funded in a way that accounts for expected future employee earnings growth.[7] The pension funds for earnings based plans therefore typically contain assets that are large in value relative to current liability because current liability only accounts for past employee earnings. In contrast, non-earnings based plans are funded in a way that does not account for expected future employee earnings growth because the benefits paid by such plans are not based on earnings. The pension funds for non-earnings based plans therefore contain assets that are typically smaller in value relative to current liability when compared to the funding levels of earnings based plans.

Figure 3.2 shows how the distribution of funding ratios for single employer earnings based plans differs from the distribution of funding ratios for non-earnings based plans. The distribution for earnings based plans is represented by the solid curve. Such plans had an average funding ratio equal to 145 percent of current liability. By comparison, funding levels of non-earnings based plans are considerably lower, as shown by the dashed curve. The average funding ratio for non-earnings based plans was only 75 percent of current liability in 1989. Such low funding ratios are a direct consequence of the fact that non-earnings based plans are not funded in a way that accounts for future earnings growth.[8]

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[5]Source: U.S. Department of Labor, Bureau of Labor Statistics, "Employee Benefits in Medium and Large Firms, 1989," June, 1990.

[6]ibid. U.S. Department of Labor, Bureau of Labor Statistics.

[7]See Section II.B of Chapter 2.

[8]Note that the funding ratios in Figure 3.2 are truncated below 50 percent of current liability for display purposes even though about 5 percent of non-earnings based plans are funded at levels below 50 percent of current liability.

General price inflation provides another reason why non-earnings based plans are funded at such relatively low levels. In addition to not accounting for future earnings growth, the benefits of non-earnings based plans are often increased in an ad hoc fashion to reflect inflation. The increases are ad hoc in the sense that they are not promised by a formal pension contract. Every time such inflation indexing occurs, the employer's current pension liability is increased immediately. To account for the increased current liability, however, assets are only increased gradually under current law. As a result, non-earnings based plans tend to be funded at levels below 100 percent of current liability.

Ad hoc inflation indexing also occurs sometimes for earnings based plans, but there is an important difference. The sponsors of earnings based plans may increase the fixed annuities paid to retirees after they retire to account for past inflation, but these increases do not affect the benefits that have been promised to currently active employees. This is because the benefits promised to active employees covered by earnings based plans increase automatically with earnings, which tend to already include adjustments for inflation. In contrast, the sponsors of non-earnings based plans sometimes index retirees' benefits, but when they do, they also increase the flat dollar amounts that have been promised to currently active employees. Thus, inflation indexing tends to have a relatively larger affect on the funding ratios of non-earnings based plans. This partly explains why the average funding level for such plans equaled only 75 percent of current liability in 1989.

The differences in funding levels caused by differences in benefit formulas also explain why the distribution of funding ratios for all single employer defined benefit plans shown in Figure 3.1 has two modes. (Note the two large bumps on the distribution.) The lower mode, centered at 85 percent of current liability, reflects the presence of non-earnings based plans. The higher mode, centered at 150 percent of current liability, reflects the presence of earnings based plans. Thus, as demonstrated in Figure 3.2, the distribution shown in Figure 3.1 is noticeably affected by variation in benefit formulas of different plans.

C. Actuarial Funding Methods

The solid curve in Figure 3.2 shows the distribution of funding ratios for earnings based plans, which make up most of medium and large private single employer plans. Under the Internal Revenue Code (Code), the funding methods for such plans must always account for projected future salaries. This is why the assets of earnings based plans tend to exceed current liabilities. However, even though the non-earnings based plans are excluded from the distribution, the solid curve in Figure 3.2 shows that the funding levels for earnings based plans still vary considerably among plans. Some of this variation could be caused by remaining differences in benefit formulas of different plans. For example, some earnings based plans calculate benefits based on average earnings in an employee's final few years of active service while other plans use formulas based on average earnings over all years of active service. However, another important source of systematic variation in the funding ratios of earnings based plans are differences in the actuarial funding methods used by employers.

Employers may choose from a variety of funding methods that can each be associated with a different speed of funding, as shown in Chapter 2. Although other factors may also affect the choice of funding methods, faster funding methods increase the tax benefits and can decrease the private cost of a pension. Faster funding methods also result in higher levels of funding relative to current liability. These higher levels of funding are reflected in the data.

Figure 3.3 shows how the choice of a funding method affects the distribution of funding ratios for earnings based plans. The dashed curve shows the distribution of funding ratios for plans that are funded under the "projected unit" method, which is like method 3 in Chapter 2 and tends to be the slowest funding method allowed under the Code, although it is based on projected future salaries.[9] Plans funded under the Projected Unit method represent 22.6 percent of the current liabilities of earnings based plans. They had an average funding ratio equal to 128 percent of current liability in 1989. The solid curve shows the distribution of funding ratios for plans that are funded under the other methods similar to methods 1 and 2 in Chapter 2. Such methods are called "Level" methods throughout the rest of this chapter because they are are designed to hold annual employer contributions constant (level) either in dollar terms or as a percentage of annual salary payments. Plans funded under Level methods represent 77.4 percent of the current liabilities of earnings based plans. They had an average funding ratio equal to 150 percent of current liability in 1989.

Level funding methods result in typically higher funding ratios than the Projected Unit method because the funding standard, i.e., accrued liability, is typically higher under Level funding methods. Equivalently, Level funding methods tend to be faster than the Projected Unit method.[10] As shown in Chapter 2, accrued liability is measured differently under each funding method. Faster funding methods are associated with higher levels of accrued liability relative to current liability. Because accrued liability is the funding standard against which assets are compared to determine annual employer contributions, higher accrued liabilities result in higher funding ratios.

The relation between funding ratios and accrued liability under different funding methods can be seen by comparing Figures 3.3 and 3.4. Figure 3.3 shows the distributions of funding ratios for plans funded under different actuarial methods. Figure 3.4 shows the corresponding distributions of accrued liability expressed as a percentage of current liability. The dashed curve in Figure 3.4 is for plans that are funded under the Projected Unit method. Such plans had an average accrued liability equal to 122 percent of current liability. The solid curve in Figure 3.4 is for plans that are funded under the Level funding methods. Such plans had an average accrued liability equal to 144 percent of current liability. The similarity between the

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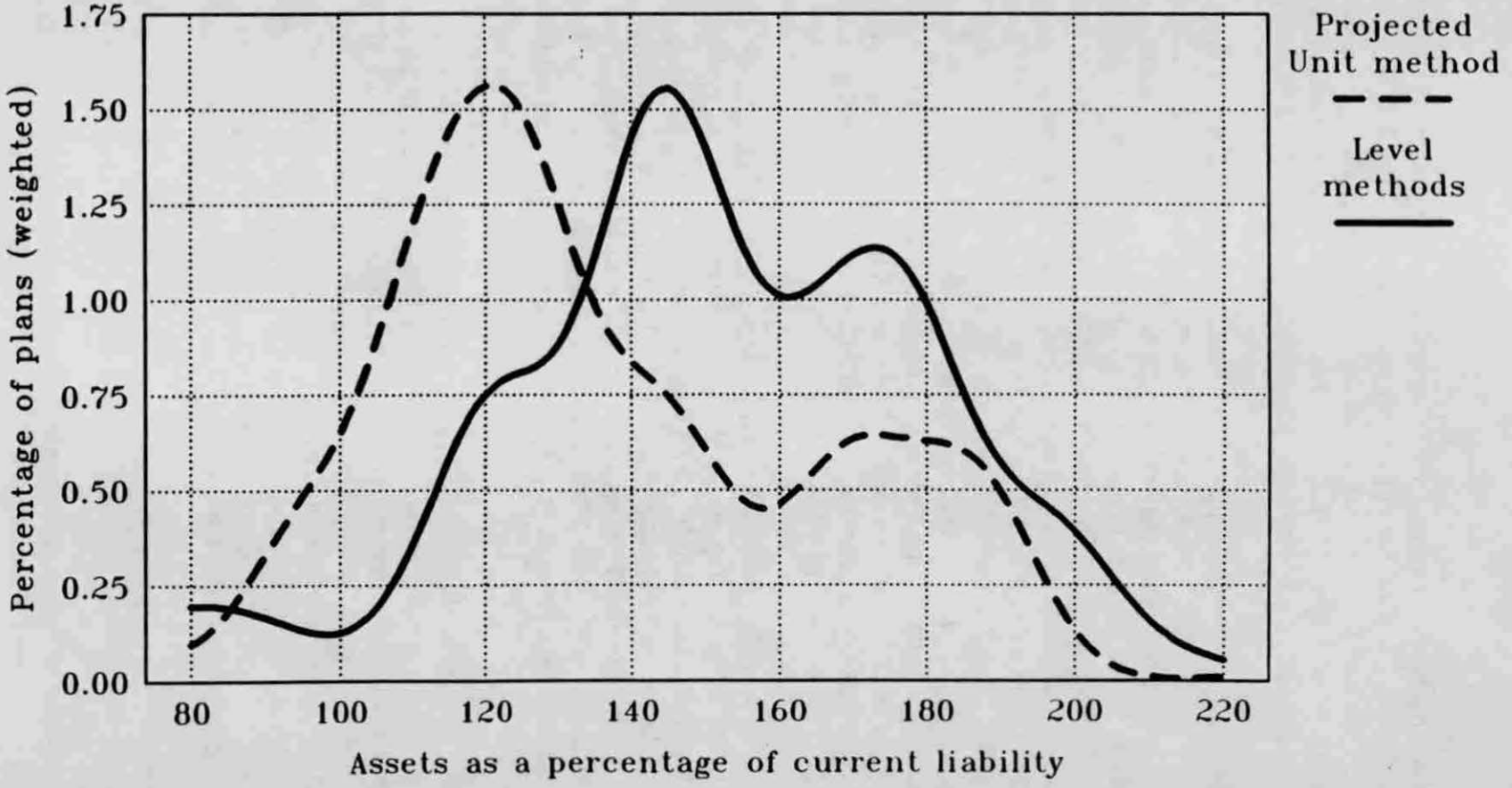
[9]This method is often called the "projected unit credit" method.

[10]For technical reasons explained in footnote 6 of Chapter 2, Level methods are not always faster than the Projected Unit method. Because plans that use Level methods are found to be typically funded at higher levels than plans using the Projected Unit method, data suggest that Level methods typically fund faster than the Projected Unit method.

Figure 3.3

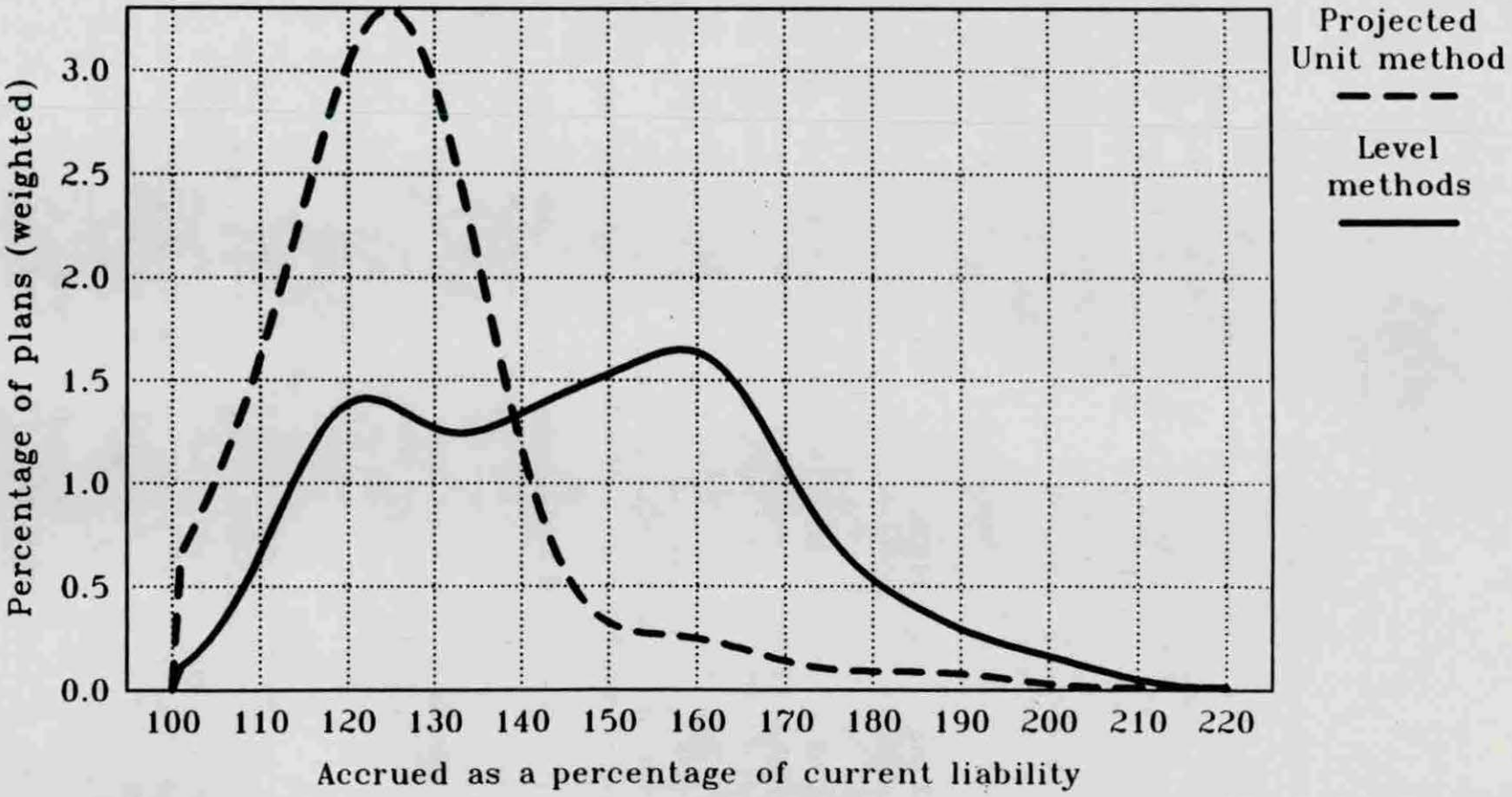
Distributions of Funding Ratios in 1989:
Effect of Actuarial Funding Methods



Sources: Compustat II and IRS Form 5500
(see Appendix B for details)

Figure 3.4

Distributions of Accrued Liability in 1989:
Effect of Actuarial Funding Methods



Sources: Compustat II and IRS Form 5500
(see Appendix B for details)

distributions of funding ratios in Figure 3.3 and the distributions of accrued liability ratios shown in Figure 3.4 suggests that differences in actuarial funding methods are an important systematic reason why funding ratios vary among plans.

D. Factors That Affect Accrued Liability

The similarity between distributions of funding ratios and accrued liability ratios shown in Figures 3.3 and 3.4 also suggests that much of the systematic variation of funding levels can be explained by other factors that affect accrued liability in addition to the optional funding method. Such factors include the current ages and typical retirement ages of active employees, the actuarial discount rate, the salary growth rate, and the percentage of total plan current liability that is associated with active employees. Differences in the values of this last factor can reflect variation among plans either in plan ages or in the degree to which benefits have been annuitized through the purchase of private annuity contracts.

Table 3.1 shows how such factors vary across earnings based plans. The first row of the table shows that the ages of active employees tend to vary across plans.[11] As shown in Chapter 2, such variation can systematically affect accrued liability and funding levels. Higher values of the age index correspond to active employee populations for which the time remaining before retirement tends to be greater, mostly because the employees are younger.[12] Higher values of the index therefore tend to be associated, other things fixed, with higher accrued liability and funding levels. The table shows that the mean value of the index was 149 and the median (50th percentile) was 146. Five percent of the plans had an index that was lower than 125 because they had relatively old active employee populations. Another 5 percent of the plans had an index value higher than 179 because they covered relatively young active employees.

The other rows of Table 3.1 also show how other important factors vary across plans. The variation in such factors is important because they are systematic sources of variation in the ratio of accrued liability to current liability and in the funding ratios. As shown in Section III below, such factors can be important determinants of the degree to which plans have been affected by the OBRA 87 change in the full funding limit.

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[11]The age index was constructed by adjusting the active employee ratio of PBO to ABO for differences among plans in the discount rate, the salary growth rate, and turnover rate assumptions (ABO and PBO are the accrued benefit obligations and projected benefit obligations reported on financial statements). The remaining variation in the index after the adjustment is due to differences among plans in the typical time remaining until retirement. Such variation would be caused partly by differences in retirement ages, but mainly by differences among plans in the ages of active employees. Details about the construction of the age index are in Appendix B.

[12]In addition, the index may be higher for plans in which the typical retirement age is higher.

Table 3.1
Estimated Distributions of Factors that Affect Accrued Liability for Earnings Based Plans in 1989

	Percentile of factor among earnings based plans[a]					
Factor	5th	25th	50th	75th	95th	Mean
Age index, active employees[b]	125	139	146	156	179	149
Discount rate	6.7%	7.2%	8.2%	8.7%	9.7%	8.2%
Salary growth rate	1.4%	4.8%	6.3%	7.0%	8.0%	5.9%
Spread (discount minus salary)	0.0%	1.3%	2.1%	2.9%	6.8%	2.3%
Percentage of current liability due to active employees	20.4%	32.5%	47.2%	52.7%	72.2%	45.2%

Sources: Compustat II and IRS Form 5500 (see Appendix B for details)

Notes:

[a] Plans are weighted by dollars of current liability in 1989.

[b] Larger index values suggest that the time remaining before retirement is greater on average, i.e., that the active employees tend to be younger.

Higher discount rates (row 2 of Table 3.1), other things constant, tend to be associated with lower accrued liability and funding levels. Higher salary growth rates (row 3), other things constant, tend to be associated with higher accrued liability and funding levels. Higher "spreads" (row 4), i.e., the difference between the discount rate and the salary growth rate, tend to be associated with lower accrued liability and funding levels. Higher percentages of current liability associated with active employees (row 5) tend to be associated with higher accrued liability and funding levels. Higher values of this last factor are associated with relatively young plans and plans that have annuitized benefits by purchasing private insurance contracts.

III. THE OBRA 87 FULL FUNDING LIMIT

In this section, the effects of the OBRA 87 full funding limit are examined by measuring the degree to which plans have a pre-OBRA 87 funding limit that exceeds the new funding limit under OBRA 87. Further, this section examines the importance of the factors discussed above in Section II. Because such factors affect both accrued liability and current liability, they also influence the degree to which plans are affected by the OBRA 87 full funding limit.

A. Plans Affected by the Limit

The OBRA 87 full funding limit is the lesser of accrued liability or 150 percent of current liability. Further, current liability must be computed by using a discount rate that reflects annuity purchase rates and falls within a 90-to-110 percent corridor of a four-year moving average of the annual yield on 30-year U.S. Treasury Bonds. If the discount rate assumption used for a plan falls outside the corridor, then current liability is adjusted for the difference when computing the OBRA 87 full funding limit. After such an adjustment is made, the resulting current liability is called "adjusted current liability" throughout the rest of this chapter.[13]

Because accrued liability was the full funding limit under pre-OBRA 87 law, a plan is only affected by the OBRA 87 limit if accrued liability exceeds 150 percent of adjusted current liability. According to the data for 1989, 49 percent of earnings based plans were affected in this way by the OBRA 87 full funding limit.[14]

Some of the plans affected by the OBRA 87 full funding limit had maximum contributions reduced immediately by the OBRA 87 limit.[15] Other plans affected by the

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[13]See Appendix B for details of the adjustment for this study.

[14]This percentage is weighted by dollars of current liability. The unweighted percentage, which does not account for the varying size of plans, was 59 percent of plans.

[15]The exact percentage of plans for which this was true can not be derived from the data examined in this study.

OBRA 87 limit had fund assets that were large enough that contributions would not have been allowed in the short run even under the pre-OBRA 87 full funding limit. The effects of the OBRA 87 limit will be delayed for such plans.

As shown in Chapter 2, employers who are required by OBRA 87 to decrease pension contributions will eventually increase contributions relative to what contributions would have been without OBRA 87. This would be true even if their accrued liability always exceeds 150 percent of current liability. The long term effect of OBRA 87 will be to slow the speed of funding and slightly decrease the long term tax benefit for the plans affected by OBRA 87.

B. Degree of the Effect

Although plans are affected by the OBRA 87 full funding limit if their accrued liability exceeds 150 percent of adjusted current liability, not all plans are affected to the same degree. For example, plans for which contributions are reduced immediately are likely to be affected more than plans for which contributions are not reduced immediately. This is because an immediate reduction in contributions is likely to have a larger effect on the speed of funding and the size of the tax benefit. As another example, plans are likely to be affected to a greater degree by the OBRA 87 funding limit if their accrued liability is larger relative to 150 percent of adjusted current liability. Plans with the highest relative accrued liability are likely to experience the largest reduction in the speed of funding and the tax benefit associated with funding.

Figure 3.5 shows the degree to which some plans are more affected than other plans because they have a relatively higher accrued liability. The solid curve in the figure shows the distribution of accrued liability relative to adjusted current liability for all earnings based plans.[16] The 49 percent of plans affected by the OBRA 87 limit are represented by the area under the solid curve to the right of the 150 percent mark on the horizontal axis. The remaining 51 percent of plans not affected are represented by the area under the solid curve to the left of the 150 percent mark on the horizontal axis. According to the figure, about 12 percent of all earnings based plans had an accrued liability that was between 150 and 160 percent of current liability. This is shown in the figure by the fact that about 12 percent of the area under the solid curve is between the 150 percent and 160 percent marks on the horizontal axis. OBRA 87 reduced the full funding limit for such plans at most from 160 percent to 150 percent of adjusted current liability. Similarly, the figure shows that about another 12 percent of all earnings based plans had their full funding limit reduced from between 160 percent and 170 percent to 150 percent of adjusted current liability. Further, the figure shows that about 11 percent of all earnings based plans had their funding limits reduced by the OBRA 87 limit from levels greater than 190 percent of adjusted current liability.

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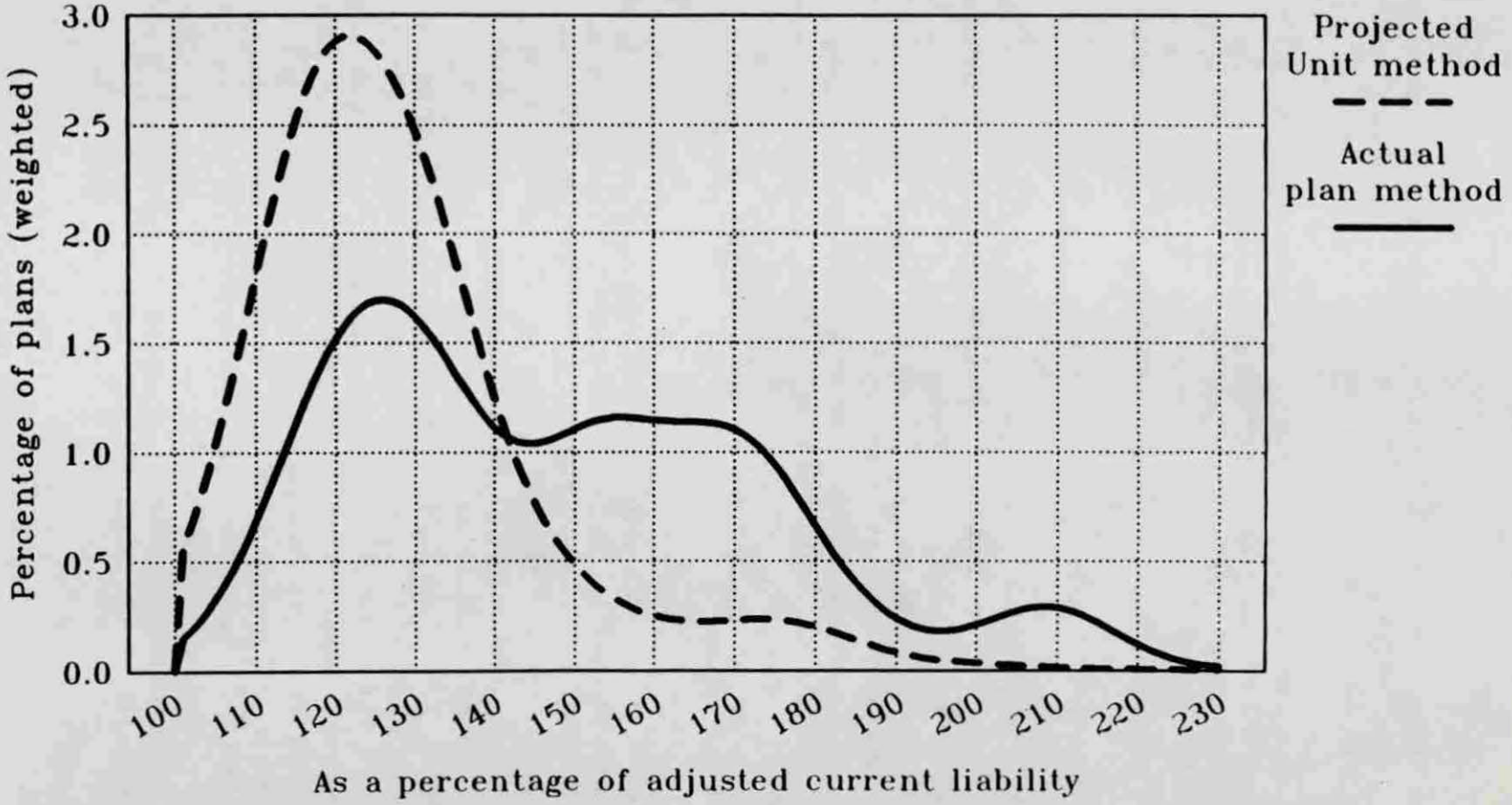
[16]The dashed curve is discussed below in Section III.C.

Figure 3.5

Distributions of Accrued Liability and Lower Funding Limits For Earnings Based Plans



Sources: Compustat II and IRS Form 5500
(see Appendix B for details)

C. Why Plans Are Affected by the OBRA 87 Limit

1. Actuarial Funding Methods

As shown above in Section II, plans that are funded under Level methods, which are typically faster than the Projected Unit method, tend to have higher levels of accrued liability relative to current liability than plans funded under the Projected Unit method. As a result, plans funded under the Level methods are most likely to be affected by the OBRA 87 full funding limit. The effects of funding methods are shown in Figure 3.4, which is discussed above in Section II.C. Figure 3.4 shows that earnings based plans funded under Level methods (the solid curve) are far more likely to have a high ratio of accrued liability to current liability than plans funded under the Projected Unit method (the dashed curve). Of all plans funded under the Level methods, 60.2 percent had an accrued liability greater than 150 percent of adjusted current liability and were therefore affected by the OBRA 87 full funding limit. By comparison, of all plans funded under the Projected Unit method, only 8.4 percent were affected by the OBRA 87 full funding limit.[17]

Figure 3.5 further illustrates the effect of funding methods. The solid curve shows the distribution of accrued liability for all earnings based plans expressed as a percentage of adjusted current liability. In contrast, the dashed curve shows an estimate of what the distribution of the accrued liability would be if all such earnings based plans had been funded under the Projected Unit method. The area under the dashed curve to the right of the 150 percent mark on the horizontal axis represents only 11.8 percent of plans. This implies that only 11.8 percent of earnings based plans would have been affected by the OBRA 87 limit if all such plans had been funded under the Projected Unit method.[18] In other words, about 76 percent (=(48.5%-11.8%)/48.5%) of the earnings based plans affected by OBRA 87 were affected because they use a Level method rather than the Projected Unit method. Therefore, the OBRA 87 full funding limit has mainly limited the degree to which plans can be funded under the typically faster Level funding methods.

The effects of funding methods on whether or not plans have been affected by the OBRA 87 full funding limit are summarized in Table 3.2. These results imply that the choice of funding method is a major determinant of whether or not plans have been affected by the OBRA 87 full funding limit.

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[17]These are weighted percentages. The corresponding unweighted percentages are 70.4 percent for Level method plans and 28.1 percent for Projected Unit method plans. The weighted percentages may be lower because the larger plans, i.e., those with larger amounts of current liability, tend to be older and more mature than the smaller plans.

[18]Unweighted, 30.5 percent of earnings based plans would have been affected by OBRA 87 if they were all funded under the Projected Unit method, whereas the unweighted actual percentage of earnings based plans affected by OBRA 87 was 58.5 percent.

Table 3.2

The Effects of Funding Methods on Whether Earnings Based Plans Were Affected by the OBRA 87 Limit in 1989

	Funding method[a]		
	Level Funding Methods	Projected Unit Method	All Methods
Accrued liability			
Greater than 150% of adjusted current liability[b]	60.2%	8.4%	48.5%
No greater than 150% of adjusted current liability	39.8%	91.6%	51.5%
All plans in column	100.0%	100.0%	100.0%
Accrued liability under Projected Unit method			
Greater than 150% of adjusted current liability[c]	12.8%	8.4%	11.8%
No greater than 150% of adjusted current liability	87.2%	91.6%	88.2%
All plans in column	100.0%	100.0%	100.0%
Percentage of earnings based plans	77.4%	22.6%	100.0%

Sources: Compustat II and IRS Form 5500 (see Appendix B for details)

Notes:

[a] Percentages weighted by dollars of current liability in 1989.

[b] Unweighted percentages for this row are 70.4%, 28.1%, and 58.5%.

[c] Unweighted percentages for this row are 31.4%, 28.1%, and 30.5%.

2. Factors That Affect Accrued Liability

Table 3.2 shows that 39.8 percent of plans funded under the Level methods have not been affected by the OBRA 87 limit, and that only 8.4 percent of plans funded under the Projected Unit method have been affected by the OBRA 87 limit. Thus, while these numbers show that the funding method is of central importance, they do not fully explain why some plans have been affected by OBRA 87 while others have not been affected.

The other actuarial and demographic factors discussed above in Section II.D can also be important determinants of whether and by how much plans are affected by the OBRA 87 limit. This is because such factors can affect accrued liability and can therefore cause accrued liability to exceed 150 percent of adjusted current liability. Table 3.3 shows how the medians of such factors differed between plans that were affected and plans that were not affected by the OBRA 87 limit. The top line shows how funding methods matter. It shows that 96.1 percent of plans affected by the OBRA 87 limit have been funded under the typically faster Level funding methods. In contrast, the table shows that only 59.6 percent of the plans not affected by the OBRA 87 limit have been funded under Level funding methods. The last column of the first row shows that 77.4 percent of all earnings based plans have been funded under Level methods.

The second row of Table 3.3 shows that plans affected by the OBRA 87 limit tend to cover younger active employees and/or have older retirement ages on average than plans not affected by the OBRA 87 limit. The median index was 152 for plans affected by the OBRA 87 limit, but only 141 for plans not affected by the OBRA 87 limit.

The third row of Table 3.3 suggests that the discount rate has also been an important determinant of whether plans have been affected by the OBRA 87 limit. The table shows that the median discount rate was 8.7 percent for plans not affected by OBRA 87. This analysis suggests that the discount rate used for plan funding has been an important determinant of whether plans have been affected by the OBRA 87 funding limit. However, some plans that have been funded under a relatively low discount rate have also been funded under a relatively low salary growth rate assumption. In such cases the low discount rate would be expected to have less effect.

The discount and salary growth rates are both expressed in nominal terms in Table 3.3. Both nominal terms are the sum of an assumed inflation rate and an assumed real growth rate. For example, a nominal discount rate of 8 percent could be the sum of a 4 percent inflation rate and a 4 percent real discount rate. Likewise, a 6 percent nominal salary growth rate could be the sum of a 4 percent inflation rate and a 2 percent real annual salary growth rate. For the funding ratios of earnings based plans, the difference, i.e., the spread, between the real annual salary growth rate and the real discount rate often matters more than the absolute nominal level of each rate. This is because a lower real projected salary growth rate assumption tends to decrease accrued liability, but a lower real discount rate assumption tends to increase accrued liability. If the two assumptions are decreased by the same amount, they would tend to offset

Table 3.3
Median Actuarial Factors For Earnings Based Plans:
Plans Affected Compared to Plans Not Affected by the OBRA 87 Limit

Factor	Not Affected by OBRA 87	Affected by OBRA 87	All plans
Percentage funded under Level funding methods[a]	59.6%	96.1%	77.4%
Age index, active employees[b,c]	141	152	146
Discount rate[b]	8.7%	7.2%	8.2%
Salary growth rate[b]	6.3%	6.3%	6.3%
Spread (discount minus salary)[b]	2.7%	1.4%	2.1%
Percentage of current liability due to active employees[b]	41.0%	47.2%	47.2%

Sources: Compustat II and IRS Form 5500 (see Appendix B for details)

Notes:

[a] Percentages, weighted by dollars of current liability in 1989.

[b] Sample and subsample medians, weighted by dollars of current liability in 1989.

[c] Larger index values suggest that the time remaining before retirement is greater on average, i.e., that the active employees tend to be younger.

each other and would thus have less effect on accrued liability than if only one of the assumptions was changed.[19] Plans for which the real discount rate exceeds the real salary growth rate by less than other plans are likely to have an accrued liability that is higher relative to current liability.

The effect of differences between real discount rates and real salary growth rates can be measured by subtracting the nominal rates. The difference between the nominal discount rate and the nominal salary growth rate equals the difference between the corresponding real rates. This is because a single inflation rate assumption is used for each plan. Thus, the difference in real rates can be measured by subtracting the nominal salary growth rate from the nominal discount rate.

The fifth row of Table 3.3 shows, as expected, that the real discount rate exceeds the real salary growth rate by less for plans that have been affected by the OBRA 87 limit. For plans not affected by OBRA 87, the median spread was 2.7 percent. For plans affected by OBRA 87, the median spread was only 1.4 percent. This result suggests that some plans have been affected by the OBRA 87 limit because they have been funded under a real discount rate assumption that is low relative to the real salary growth rate assumption.

The last row in Table 3.3 shows how the division of current liability between active and inactive employees differed between plans affected and plans not affected by the OBRA 87 limit. On average, at the median, the current liability for active employees accounted for 47.2 percent of the total current liability for plans affected by the OBRA 87 limit. In contrast, the median was 41.0 percent for plans not affected by the OBRA 87 limit, which suggests that this factor has had some effect on whether plans have been affected by the OBRA 87 limit.

3. The Relative Importance of Factors

The analysis so far suggests that the funding methods, the average age of active employees, the discount rate, the salary growth rate, the spread, and the division of current liability between active and inactive employees are all factors that help determine whether or not plans are affected by the OBRA 87 funding limit. Figure 3.6 shows how important such factors have been in determining the degree to which plans are affected by the OBRA 87 limit.

Figure 3.6 was constructed by adjusting each factor and then measuring the effect of the adjustment on each plan's accrued liability expressed as a percentage of adjusted current liability. For a particular "benchmark" percentage of adjusted current liability (for example, 150 percent), it is known how many plans actually had an accrued liability higher than the benchmark. For each factor and each benchmark shown on the horizontal axis, the vertical axis in Figure 3.6

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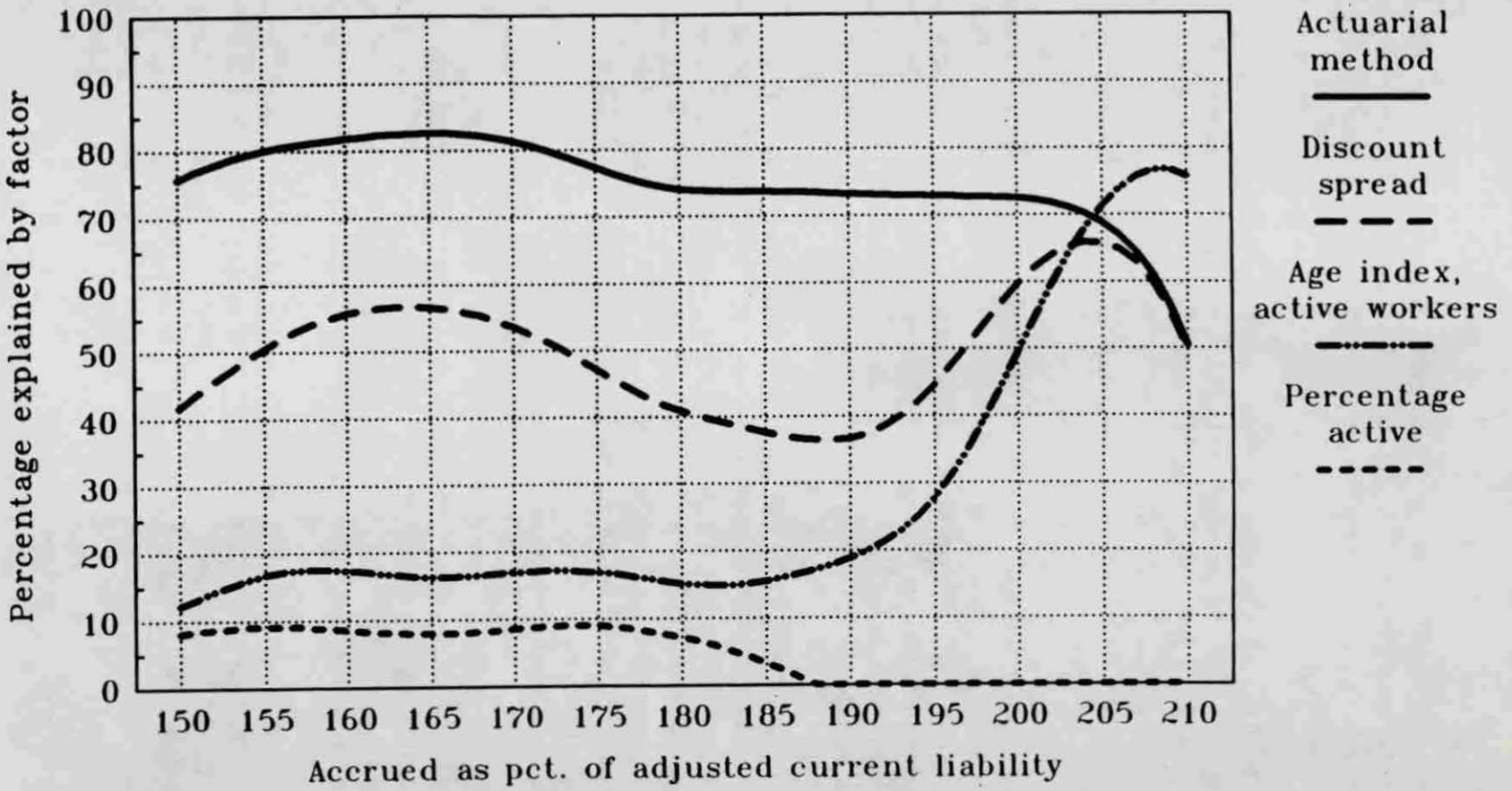
[19]This reasoning applies to the liabilities for active workers in earnings based plans. For inactive plan participants, the projected salary growth rate does not matter, and so, changes in the discount rate matter independently of changes in the salary growth rate.

Figure 3.6
Effect of Actuarial Factors on Accrued Liability



Note: All percentages and averages are weighted by dollars of current liability.

Sources: Compustat II and IRS Form 5500 (see Appendix B for details)

shows the percentage of these plans that would instead have an accrued liability less than the benchmark after the factor is adjusted. Figure 3.6 thus shows the relative importance of the factors in determining the degree to which plans have been affected by the OBRA 87 change in the full funding limit.

The top line (solid) in Figure 3.6 shows the importance of the funding method. According to the figure, 76 percent of all plans (shown on the vertical axis) for which accrued liability was higher than 150 percent of adjusted current liability (shown on the horizontal axis) would have had an accrued liability less than 150 percent of adjusted current liability if they had used the Projected Unit method rather than a Level funding method. The figure also shows that 50 percent of plans that had accrued liability higher than 210 percent of adjusted current liability would have had an accrued liability less than 210 percent of adjusted current liability if they had used the Projected Unit method rather than a Level funding method. Thus, the figure shows that the funding method choice is an important determinant of whether plans have been affected by the OBRA 87 limit. However, the figure also shows that the funding method choice is a less important factor for plans that have been affected the most, i.e., because they had very high levels of accrued liability relative to adjusted current liability.

The second highest line (long dash) in Figure 3.6 shows how much the assumed spread between discount rates and projected salary growth rates matters. The figure shows that 42 percent of the plans (shown on the vertical axis) for which accrued liablity exceeded 150 percent of adjusted current liability (shown on the horizontal axis) would have had accrued liability lower than 150 percent of adjusted current liability if they had not assumed a spread that was lower than the median spread for all earnings based plans. Further, the figure shows that such reasoning applies to 50 percent of the plans for which accrued liability exceeded 210 percent of adjusted current liability. Thus, the use of a relatively low discount spread assumption explains why many plans have been affected by the OBRA 87 limit. Further, a low assumed discount spread is a slightly more important explanation for plans that have been affected the most by OBRA 87.

The third highest line (broken dash) shows the importance of the ages of active employees. Plans that cover younger active employees who have more years remaining before retirement tend to have higher levels of accrued liability relative to current liability and are therefore more likely to have been affected by the OBRA 87 limit. The figure shows the effect of covering active employees for which the age index is higher than the median, 146, for all earnings based plans.[20] According to the figure, only 12 percent of the plans for which accrued liability exceeded 150 percent of adjusted current liability would have had an accrued liability less than 150 percent of adjusted current liability if the age index for their active employees was not higher than the median age index for all earnings based plans. However, the figure shows that the ages of active employees are much more important in determining whether plans are

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[20]Thus, their active employees are relatively young and/or retirement ages are higher than average.

affected to a high degree by the OBRA 87 funding limit. For example, the figure shows that 75 percent of the plans for which accrued liability exceeded 210 percent of adjusted current liability would have had accrued liability less than 210 percent of adjusted current liability if their age index was not higher than the median for all earnings based plans. Age is thus the most important factor for plans affected the most by the OBRA 87 limit.

The lowest (dashed) curve in Figure 3.6 shows that about 8 percent of the plans affected by the OBRA 87 limit would not have been affected if their percentage of current liability associated with active employees had not been higher than the median for all earnings based plans. Further, the figure shows that this factor has no explanatory power for plans affected the most by the OBRA 87 full funding limit.

In summary, Figure 3.6 shows that the choice of funding method is the most important determinant of whether plans have been affected by the OBRA 87 limit. The assumed spread between the discount rate and salary growth rate is the next most important factor. However, the spread and the funding method are less important than employee ages for plans affected the most by the OBRA 87 limit. The ages of active employees are of next greatest importance in determining whether plans have been affected by the OBRA 87 limit. However, active employee ages are of greatest importance in determining which plans are affected the most by the OBRA 87 limit. Finally, the least important factor shown in Figure 3.6 is the percentage of current liability associated with active employees.

D. Effect on Funding Levels and Benefit Security

The OBRA 87 funding limit will result in lower levels of funding for affected plans. Lower funding levels can increase the risk that the assets in a pension fund will be insufficient to cover the legal pension liability in the event that an employer's business fails and the pension plan is terminated. Such an increase in risk can increase the risk that the PBGC would have to pay part of the retirement liability of failed employers out of the PBGC insurance fund. The increase in risk can also increase the risk to plan participants because the PBGC does not insure all retirement benefits of the plans it covers. For example, there is a ceiling on the annual benefit amount that the PBGC will insure. Also, the PBGC does not insure benefits not vested before such a plan termination. Further, benefit improvements such as ad hoc cost of living increases that occur within five years before such a plan termination are not fully insured because PBGC insurance coverage of benefit improvements is phased in over a period of five years. Any increased risk associated with lower levels of pension funding would therefore increase the risk both to the PBGC and to pension plan participants.

The level of such risk is determined by many factors such as the risk of an employer's business failure and the level of diversification and investment risk associated with pension fund assets. However, one of the most important determinants of risk is the extent to which the value of pension fund assets exceeds the current value of benefits that have been promised to plan participants, i.e., the funding ratio.

Figure 3.7 shows how the OBRA 87 full funding limit is likely to affect the distribution of funding ratios of private single-employer earnings-based defined benfit plans. The solid curve shows the actual distribution of funding ratios in 1989. Because the OBRA 87 full funding limit had already been in effect in 1989, the distribution shown by the solid curve already reflects a partial effect of the OBRA 87 full funding limit. Plans with funding ratios in excess of 150 percent of adjusted current liability probably had lower funding ratios than they would have had without the OBRA 87 change in the funding limit.

The dashed curve in Figure 3.7 shows how the distribution of funding levels might eventually shift as a result of the OBRA 87 limit. The shift in the distribution implies that the average funding level for earnings based plans will be decreased from 145 percent to 136 percent of current liability as a result of the OBRA 87 limit, i.e., a -6.2 percent (=(136%-145%)/145%) shift in the average funding ratio.

The small shift in the distribution between the solid curve and the dashed curve shows that some plans with the highest funding ratios will have lower funding ratios as a result of the OBRA 87 limit. For example, the solid curve shows that about 25 percent of plans had funding ratios higher than 170 percent of current liability in 1989. Many of these plans had high funding ratios because they had an accrued liability that was higher than 150 percent of adjusted current liability. Because OBRA 87 decreases their full funding limit to 150 percent of adjusted current liability, their funding ratios can also be expected to decrease. As a result, the dashed curve shows that only about ten percent instead of 25 percent of such plans would have funding ratios higher than 170 percent of current liability as a result of OBRA 87. This shift in funding ratios is reflected in Figure 3.7 by the fact that some of the area under the solid curve at high levels of funding is "pushed" to funding ratios between 130 percent and 170 percent of current liability. In addition, as a result of the interest rate corridor rule under OBRA 87, some funding ratios will be lowered to below 150 percent of unadjusted current liability, as shown in the figure.[21]

The small shift in distributions reflects an assumption that funding ratios will not be decreased below 150 percent of adjusted current liability by the OBRA 87 limit. The shift in the distribution is small because many of the plans affected by OBRA 87 had accrued liability that was not much higher than 150 percent of adjusted current liability. This pattern was shown in Figure 3.5 above. For example, a plan that has a funding ratio of 170 percent and an accrued liability of 155 percent of adjusted current liability is likely to only have its funding level reduced to 165 percent of adjusted current liability. Further, a plan that has an accrued liability equal to 170 percent of adjusted current liability but has a funding ratio equal to 155 percent of current liability is likely to have its funding level only reduced from 155 to 150 percent of adjusted current liability as a result of the OBRA 87 funding limit.

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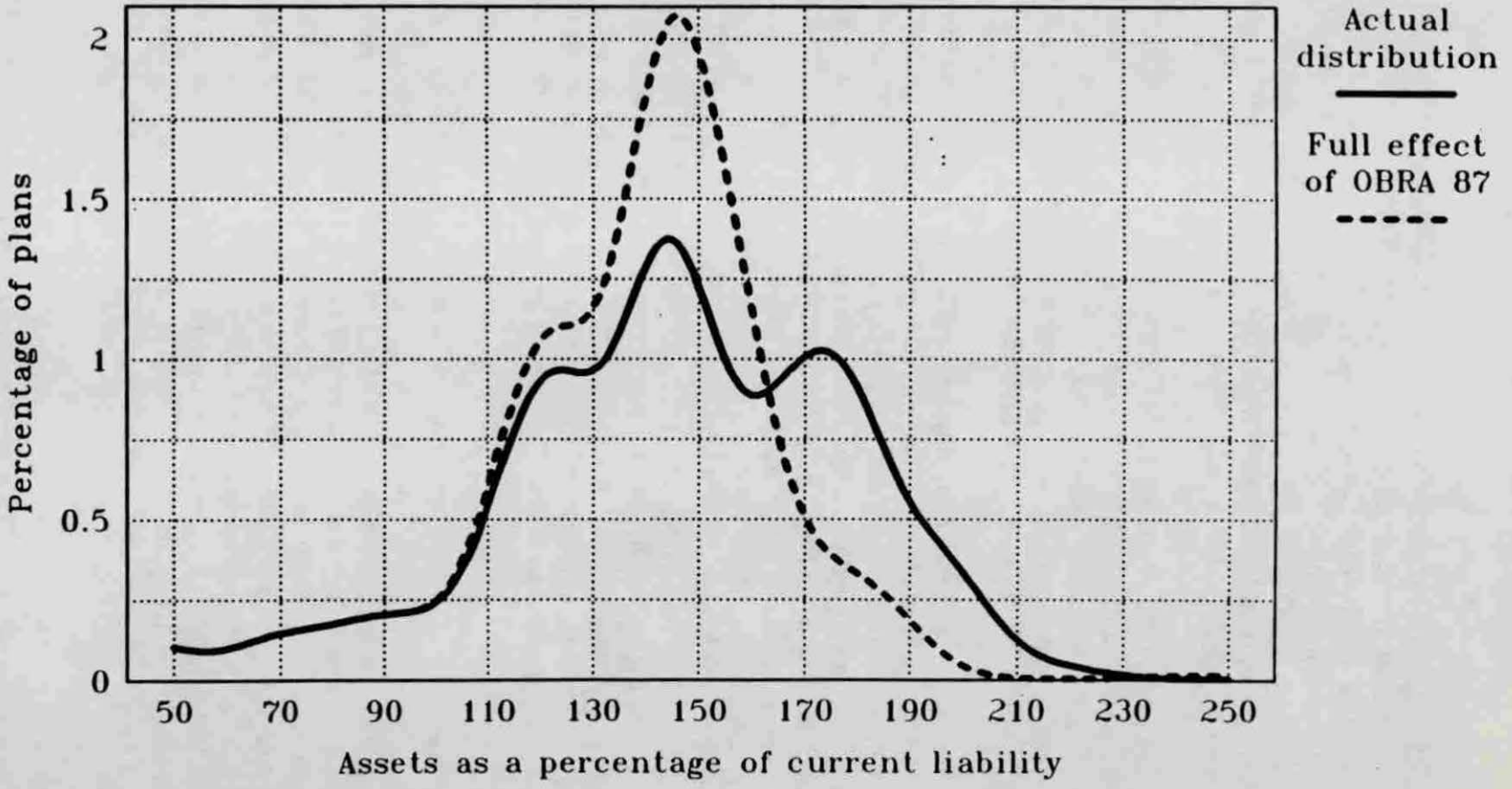
[21]Some plans would still have funding levels higher than the OBRA 87 funding limit because, for example, they have either earned extraordinarily high rates of return on their pension fund investments or experienced other unexpected actuarial events.

Figure 3.7
Distribution of Funding Ratios in 1989:
Effect of OBRA 87



Sources: Compustat II and IRS Form 5500
(see Appendix B for details)

The decrease in funding levels resulting from the OBRA 87 change in the full funding limit will cause a small increase in the risk to plan participants and the PBGC because there is a small risk even at funding levels exceeding 150 percent of adjusted current liability. However, the figure shows that OBRA 87 will only affect well funded plans and, even then, only by relatively small amounts. Thus, the OBRA 87 full funding limit is likely to have an insignificant effect on employee benefit security.

CHAPTER 4: OPTIONS FOR FURTHER CONSIDERATION AND ANALYSIS

We have concluded that the OBRA 87 amendments to the full funding limit do not have a significant adverse effect on benefit security of defined benefit plans. However, the report indicates that the application of the OBRA 87 full funding limit may have an uneven impact among employers. In particular, plans that cover relatively young employees are likely to be most affected. This chapter discusses the advantages and disadvantages of three full funding options for further consideration and analysis. The options are not intended as Treasury recommendations.

The first option is to maintain the current law full funding limit without modification. The second option is to allow plans to make a one-time election to use an alternative full funding limit based on 100 percent of projected liability (defined below). Projected liability would be calculated under a single method for all plans, subject to restrictions on the discount and salary growth rate assumptions. For earnings based plans, projected liability would account for future salary growth. To maintain the revenue neutrality of the option, the current liability limit would be reduced from 150 percent to 147 percent. The third option is the same as the second option, except that the current liability limit would be retained at 150 percent. This option would lose revenue.

Under an existing grant of discretionary regulatory authority, the second option could be implemented without legislation. However, any such change would, by necessity, adversely affect some taxpayers and benefit other taxpayers. For this reason, the Treasury Department has concluded that it will not exercise this authority unless directed by the Congress to do so.

I. MAINTAIN CURRENT LAW

A. Advantages

The OBRA 87 change in the full funding limit has decreased the maximum funding speed and tax benefits that can result from pension funding for many plans. Plans are typically affected by the OBRA 87 limit if they are funded under actuarial assumptions or methods that entail faster rates of funding than other plans. The OBRA 87 limit has increased Federal tax revenues, but only by decreasing the tax benefits for the best-funded plans for which the tax benefits are the greatest and the effects on benefit security are likely to be the smallest.

B. Disadvantages

The OBRA 87 limit does not fully allow for demographic differences among plan populations. Plans are more likely to be affected by the OBRA 87 limit if they cover relatively young employees, which is most likely for plans sponsored by start-up firms. Further, the OBRA 87 limit is more likely to affect plans that purchase private annuity contracts for retirees.

The OBRA 87 limit is also most restrictive for plans that use level funding methods, which allow plan sponsors to budget their pension contributions in a smooth fashion over time. Finally, even though the OBRA 87 limit is more restrictive than the old full funding limit, it still allows actuarial assumptions to have a significant effect on the speed and tax benefits of funding.

II. ALLOW ELECTION OF A PROJECTED LIABILITY LIMIT, AND REDUCE CURRENT LIABILITY LIMIT

This option is designed to allow for differences in levels of pension funding that result from demographic differences among plans. Under this option, taxpayers could make a one-time election to compute maximum deductible annual pension contributions by using an alternative full funding limit equal to the lesser of accrued liability, as computed under a plan's funding method and actuarial assumptions, or 100 percent of projected liability. The election would be irrevocable without permission of the Internal Revenue Service, which would generally grant a revocation only when demographic shifts or changes in other factors expected to affect long-run pension funding were observed. Projected liability would be computed under the method used to calculate the Projected Benefit Obligation (PBO) under the rules of the "Statement of Financial Accounting Standards No. 87," (FAS 87).[1] The discount rate used to calculate projected liability would be required to equal the discount rate used to calculate current liability under the OBRA 87 limit. In addition, the assumed annual salary growth rate used to calculate projected liability would be required to be at least 2 percentage points less than the discount rate used to calculate projected liability.[2]

To maintain the revenue neutrality of the option, the current liability limit would be reduced from 150 percent to 147 percent. Taxpayers who did not make the one-time election would therefore be subject to a full funding limit of the lesser of accrued liability or 147 percent of current liability.

A. Advantages

The funding limit under this option is designed to result in the same level of Federal tax revenues as the OBRA 87 full funding limit, while still decreasing (relative to the pre-OBRA 87 limit) the maximum funding speed and the maximum tax benefits that could be received by funding a pension. Like current law, this option would reduce the flexibility of using actuarial methods and assumptions to increase the speed and tax benefits of funding. As an advantage over current law, however, this option would be less biased against plans that cover younger

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[1]Financial Accounting Standards Board, 1985. Note that the PBO method is essentially the projected unit-credit method, which is like method 3 of Chapter 2.

[2]This difference is called the spread. The average spread for earnings based plans, weighted by current liability, was 2.3 percent in 1989, as shown in Table 3.1.

populations of employees. This option would also partially correct for differences in the effects of the OBRA 87 limit that may result because retirement benefits are annuitized by some plans.

B. Disadvantages

This option would slightly increase the complexity of the Internal Revenue Code for corporate taxpayers. However, the degree of additional complexity is limited by the fact that the method of calculating PBO under FAS 87 is already familiar to many pension actuaries and is already used for financial reporting by the many plan sponsors who are required to follow the FAS 87 rules.

Relative to the OBRA 87 funding limit, this option would allow the speed of pension funding and the tax benefits to be more sensitive to actuarial assumptions. In particular, the salary growth rate assumption would be more important than for the OBRA 87 funding limit, even though the salary assumption would be restricted under this option. Other assumptions, such as those relating to employee turnover rates, mortality, and retirement ages would also have a greater effect on the funding limit under this option than under the OBRA 87 funding limit.

The reduced current liability percentage needed to maintain revenue neutrality would require slightly slower rates of funding for some plans, and would also result in slightly lower levels of funding for such plans.

III. ALLOW ELECTION OF PROJECTED LIABILITY LIMIT, WITH NO REDUCTION IN CURRENT LIABILITY LIMIT

This option is the same as option 2, except that the current 150 percent limit on current liability would be retained. Thus, taxpayers could make a one-time election to compute their full funding limit each year as the lesser of accrued liability or 100 percent of projected liability; if no election were made, the limit each year would be the lesser of accrued liability and 150 percent of current liability. This option would result in a loss of Federal tax revenues. This revenue loss is estimated to be approximately $600 million over five years.

A. Advantages

This option would have the same advantages as the second option. In addition, no plan would be required to have slower rates of funding or lower funding levels than allowed under current law.

B. Disadvantages

This option has many of the same disadvantages as the second option and would lose $600 million in revenue over five years. Implementation would require acceptable offsetting revenues from other sources.

GLOSSARY

Active employees: Employees who are currently working for an employer and participating in the retirement plan. (see page 15)

Accrued liability: Pension liability as it is measured under each plan's funding method; sometimes called "ongoing plan liability". Accrued liability typically accounts for both benefits accumulated to date and benefits for currently active employees associated with the past that are expected to accumulate in the future. All else constant, accrued liability would typically have a different value when calculated under each different funding method. (see page 23)

Current liability: A pension liability measure that accounts only for benefits accumulated up to the current date, not counting benefits associated with the past that are expected to accumulated in the future; sometimes called "termination liability". (see pages 16 and 87)

Funding level (funding ratio): Pension assets as a percentage of current liability. (see page 16)

Level methods: Funding methods designed to hold annual employer contributions constant (level) either as dollar amounts or as a percentage of salary payments. Methods 1 and 2 of Chapter 3 (see below) are examples of level methods. (see page 51)

Method 1: Annual contributions made on behalf of each active employee are expected to equal a constant dollar amount over all years of active service. (see pages 11-13)

Method 2: Annual contributions made on behalf of each active employee are expected to equal a constant percentage of salary payments over all years of active service. (see pages 11-13)

Method 3: Annual contributions made on behalf of each active employee are based on the rate at which employees accrue future pension benefits. Benefit accruals are measured under method 3 by smoothing the rate of accrual over all years of active service. Such smoothing accounts for both past and expected future years of service and future salary increases. (see pages 11-13)

Method 4: Same as method 3, but benefit accruals are measured simply by using a plan's benefit formula, not counting expected future years of service or future salary increases. (see pages 11-13)

Normal costs: Under a plan's funding method, the annual contributions that would be normally be expected if actuarial assumptions were always exactly correct, if plan benefits began accruing at the same time that funding started, and if neither actuarial assumptions nor benefits ever changed. (see page 23)

Projected unit-credit (or: projected unit) method: Essentially method 3 as described above.

APPENDIX A

SYNOPSIS OF FEDERAL TAX LAWS RELATING TO PENSIONS

APPENDIX A: SYNOPSIS OF FEDERAL TAX LAWS RELATING TO PENSIONS

I. TAX TREATMENT OF CONTRIBUTIONS, EARNINGS AND WITHDRAWALS

The Internal Revenue Code provides favorable tax treatment for certain trusts which are established to hold pension plan assets and for the participants in those plans. These tax incentives are available if the plans meet the qualification requirements described in Sections 401-417 of the Code and act as an inducement for employers to provide retirement benefits for their employees. The tax benefits consist of the following:

Exclusion of Contributions. Contributions made on behalf of employees to pension trusts are deductible by the employer, but excluded from employees' current income for both income and social security tax purposes.

Tax Exemption of Pension Fund Earnings. Earnings on the funds in a pension trust are exempt from tax at the trust level. Neither are such earnings currently taxable to employees.

Deferred Recognition of Income on Withdrawal. Even when benefits are withdrawn from a pension plan, taxation can be deferred as an employee has the opportunity to roll a lump sum payment into an IRA or another qualified plan. Alternatively an employee can elect special lump sum taxation which provides a partial reduction of the tax burden associated with receipt of a lump sum in a single year.

A. Contributions

A participant in a qualified pension plan does not recognize the value of employer contributions made on his or her behalf for tax purposes when the contribution is made, but rather recognizes the value when benefits are actually paid from the plan. This is true even if the payments are not subject to a substantial risk of forfeiture and despite the fact that employers can take deductions for pension plan contributions when they are made.

This generous treatment contrasts with non-qualified deferred compensation plans, where an employee is taxed when the employer contribution is no longer subject to a substantial risk of forfeiture and the deduction is taken by the employer when the income is recognized by the employee. This treatment also contrasts with an individual's regular savings account deposit, which must be made from after-tax income.

B. Earnings

Generally no taxes are paid on the income earned by trust assets during the period that taxation is deferred. Depending on the length of the period involved, the amount of earnings

deferred within the trust can be substantially more than the original contribution amounts. Again, this treatment contrasts with that on earnings in a regular savings account, which are generally subject to tax annually as earned.

When the participant retires and is taxed on the amount of current benefits paid, there is no distinction as to whether the benefits are attributable to employer contributions or earnings on the trust fund. The character of the source of the funds and any additional preferential tax treatment associated with the investments disappears when benefits are paid from the trust.[1] Thus, even if a trust were invested entirely in tax-free municipal bonds, the earnings on the trust fund are taxed at the time benefits are paid. Note that the taxation of all pension benefits, contributions as well as earnings, when paid preserves the tax exemption of the earnings.[2] The tax on the earnings portion of benefits simply recoups the present value of the tax savings from the exclusion of contributions.

C. Withdrawals

An employee is generally taxed on the benefits he or she receives on a cash basis. However in the event that a participant elects to receive his benefits in a lump sum distribution as defined in the Code, several additional tax breaks are available.

- An employee can elect to roll over any portion of the benefit into an Individual Retirement Account (IRA) or other qualified plan and defer taxation on that portion of the distribution until it is withdrawn from the IRA. (Withdrawals from an IRA need not be made before age 70 1/2.)

- To the extent that an employee receives employer securities as part of the distribution, an election can be made to be currently taxed on the cost value (at the time of contribution of those securities). This election allows the employee to defer recognition of any appreciation until sale of the securities.

- If an employee is over 59 1/2 years of age and if certain other conditions are met, he or she may elect to "forward average" the distribution. Under forward averaging, the tax on the distribution is calculated as if the distribution was received in 5 equal annual installments and was the only income received in those years. The hypothetical tax for all 5 years is paid in the first year. This special tax treatment was more valuable in the era of sharply graduated tax rates.

- If an employee was over 50 years of age on January 1, 1986, The Tax Reform Act of 1986 indefinitely grandfathered eligibility for two additional tax breaks. First,

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[1]In some cases, employees make after-tax contributions to pension plan. Under these circumstances, the character of the source of the funds is identified.

[2]This assumes constant tax rates.

such a participant can elect 10 year (instead of 5 year) forward averaging, provided that the tax is calculated using 1986 tax rates. The forward averaging option is available for these employees even if the distribution occurs prior to age 59 1/2. Secondly, these employees can elect to have the portion of their benefit associated with work prior to 1974 taxed at a flat 20 percent rate.[3]

II. LIMITATIONS ON TAX PREFERENCES

In order for pension plans to receive preferential tax treatment, plans must satisfy qualification rules. These rules define allowable benefits and allowable pension funding. Effectively, the qualification rules limit the tax benefit of pension plans by limiting both pension benefits and the funding of pension benefits.

The goals of the rules regarding benefits are to ensure that benefit levels are not excessive; to ensure that benefits are used for retirement purposes; and to ensure that rank-and-file employees (non-highly compensated employees) and employees who leave employment before normal retirement get their fair share of benefits provided by the plan.

For defined contribution plans, plan funding and plan benefits are closely intertwined, and a relatively simple set of rules govern both.

Because there is a weaker connection between plan funding and plan benefits for defined benefit plans, the rules for defined benefit plans are more complex than for defined contribution plans. The goals of the defined benefit plan funding rules are to ensure a plan has sufficient assets to provide for promised benefits and to prevent contributions which change the nature of a plan from a retirement plan to a tax shelter.

A. Contribution and Funding Limits

In general, contributions (including forfeitures) allocated to individuals in defined contribution plans are limited to the lesser of $30,000 and 25 percent of compensation. There are additional limits on profit-sharing plans and stock bonus plans. Profit-sharing plans and stock bonus plans are limited to 15 percent of total compensation in the aggregate (up to a maximum of $222,220 in 1991 for each plan participant).

For a defined benefit plan there is no specific percentage of pay limitation on contributions. Each year the employer must contribute enough to meet the minimum funding

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[3]Under a separate grandfather rule, any employee who receives a lump sum distribution in 1991 may elect to treat 10 percent of the distribution attributable to work prior to 1974 as a long term capital gain.

standards.[4] Furthermore, any amount required to be contributed under these minimum funding rules is deductible regardless of the percentage of pay it represents. Deductions are limited however to an amount supported by the actuarial valuation, including the full funding limit. In the event an employer sponsors both defined benefit and defined contribution plans, the limit for the total deduction is the greater of the defined benefit limit and 25 percent of total compensation in the aggregate.

In order to determine the minimum funding requirement and maximum deductible limits for a defined benefit pension plan, an actuarial valuation must be prepared. The valuation projects the future cash requirements of the plan on the basis of actuarial assumptions. The assumptions include interest rates, probabilities of death, probabilities of continued employment, and future salary increases (if benefits depend on earnings.) The future cash flow requirement is then discounted at the assumed interest rate and the result is called the actuarial present value of future benefits.

The actuarial method allocates a portion of the actuarial present value of future pension benefits to each year of an employee's service.[5] In general the allocation of future benefits is designed to produce a smooth pattern of contributions throughout an employee's career. The portion allocated to the employee's past work history is known as the accrued liability. The portion allocated to the present year's service is known as the normal cost. If there were no past services liability at the beginning of the plan, if all actuarial assumptions were always exactly correct, and if plan benefits and actuarial assumptions never change, the minimum funding standard would be the normal cost. Adjustments are made to the minimum funding standard as pension benefits are changed and as experience indicates that assumptions have not been realized.

Prior to OBRA 87, the allowable contribution under the full funding limit was determined by comparing the accrued liability (plus the normal cost) with the actuarial value of plan assets.[6]

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[4]Plans that use the entry age normal cost method have the option of using an alternative minimum funding standard during any plan year. As a result, these plans have the flexibility of using the higher standard during years they want to contribute more and the lower standard during years they want to contribute less.

[5]See Chapter 2 for discussion of the impact of the actuarial method on pension funding.

[6]If the full funding limit is less than the minimum funding requirement, the minimum funding requirement is reduced to equal the full funding limit. To the extent that the assets are less than the accrued liability, the plan has an unfunded accrued liability, which is amortized over a period of 5-40 years (the amortization period depends on the reason there is an unfunded accrued liability). These amortized contributions are in addition to contributions for the present year normal cost. To the extent that the plan is "overfunded", contributions are temporarily reduced until assets no longer exceed accrued liability (including the present year's normal cost).

(continued...)

The accrued liability (and normal cost) is a function of the actuarial method used for funding the plan and the actuarial assumptions used in the valuation. Thus a plan could be "overfunded" as measured by one actuarial method and yet have an unfunded accrued liability when measured by another method or by the same method but using different assumptions.

OBRA 87 revised the full funding limit. Under OBRA 87, a plan must suspend contributions if the assets exceed either 150 percent of the current liability (regardless of the funding method otherwise used by the plan) or the accrued liability (plus normal cost) as calculated by the funding method used by the plan. Current liability is calculated as the sum of accrued liability and the normal cost under the unit credit funding method.[7] Further, the interest rate used in calculating current liability must be within 10 percent of the weighted average of the rates of interest on 30-year Treasury securities during the four-year period ending on the last day before the beginning of the plan year.

B. Limitations on Withdrawals

Since there are limits on contributions allocated to individuals in defined contribution plans, there are no limits on pension benefits withdrawn from the pension fund.

For defined benefit plans, there is a limit on the amount of benefits which may be paid by the plan. The 1991 limit on annual pension benefits is the lesser of $108,963 and 100 percent of earnings for pensions payable at age 65. If the form of distribution is other than a life annuity (or qualified joint and survivor annuity) payable at age 65, the benefit limit is adjusted actuarially.

The defined benefit limit was $90,000 in 1987 and increases each year at the rate of inflation. The defined contribution limit on contributions will also track the rate of inflation once the defined benefit limit exceeds $120,000.[8]

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[6](...continued)
Effectively, contributions are limited to the amount required to increase assets to level of the accrued liability (plus normal cost).

[7]Current liability is determined by the amount of benefits that an employee has accrued to date. In order to calculate current liability, the pension benefit is determined based on the benefit formula, current years of service and the earnings history (if benefits depend on earnings). The Value of the pension benefits are then discounted to the present year.

[8]If an employee participates in both types of plans, he or she is limited to a total of 100-140 percent of the individual limits. Where in the range of 100-140 percent the employee's combined plan limit falls depends on whether the dollar limit or the percentage of pay limit is the effective constraint and whether the plan is "top-heavy". For example, if the total limit for the employee was 125 percent and he or she was at the dollar limit for the defined benefit plan,
(continued...)

In addition to the limits regarding the amount of distributions, the Internal Revenue Code incorporates a set of excise taxes to discourage the use of pension plans for purposes other than retirement. For example, there is a 10 percent additional income tax in most cases if benefits are paid prior to age 59 1/2. Similarly, there is a 50 percent excise tax if benefits are not paid out beginning with the attainment of age 70 1/2 and extending over a participant's life expectancy.

C. Non-discrimination Rules

In return for extending tax preferences to employers as incentives for providing pension plans to their employees, Congress required that meaningful benefits be provided to rank-and-file employees. This requirement is enforced in two principle ways. First, non-discrimination rules, require (with certain limited exceptions) that benefits be proportional to compensation, where compensation is limited to $222,220 (indexed for increases in the cost of living). Second, the vesting rules permit an employee's benefits to be forfeited only if the employee leaves the employer before completing a minimum period of service. Generally, benefits must become nonforfeitable under a 5 year cliff or a 3-7 year graded vesting schedule. The vesting rules work in conjunction with accrual rules which define the minimum acceptable level of benefits payable to early leavers when compared to benefits for employees who remain with the employer until retirement.

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[8](...continued)
he or she would be limited to 25 percent of the otherwise permitted defined contribution plan allocation.

APPENDIX B
DESCRIPTION OF DATA AND METHODS USED IN CHAPTER 3

APPENDIX B: DESCRIPTION OF DATA AND METHODS USED IN CHAPTER 3

I. DATA SOURCES

The data are primarily from two sources. Data on assets and liabilities for 1989 are from Compustat II, published by Standard & Poor's Compustat Services Inc. Other data about plans are from a matched sample of information from the 1984 IRS Form 5500. The sample of 1984 IRS Form 5500 data was initially prepared by the U.S. Department of Labor, Pension and Welfare Benefits Administration. As described below in Section III, some actuarial data from a matched sample of 1984 Form 5500's were used to impute 1989 actuarial variables such as the discount rates and salary growth rates for plans in the sample. The imputation procedure, as described below, also used results from The Wyatt Company's 1989 Survey of Actuarial Assumptions and Funding.[1]

Data from Compustat II are from the 1989 financial statements of private employers that sponsor single employer defined benefit plans. The sample consists of companies that issue publicly traded common stock and file 10-K forms with the Securities and Exchange Commission. Wholly-owned subsidiaries that trade preferred stock and/or debt are also included in the sample. The sample excludes some banking institutions and closely held companies. Pension assets held by plans sponsored by companies in the sample accounted for approximately 85 percent of private single employer defined benefit assets in 1989.

The Compustat II data on pension assets and liabilities were prepared by companies under rules of the "Statement of Financial Accounting Standards No. 87, Employers' Accounting for Pensions," issued by the Financial Accounting Standards Board (FASB). Under FAS 87 rules, assets are reported at their current market value. Liabilities are calculated and reported in two ways: as Accrued Benefit Obligations (ABO) and Projected Benefit Obligations (PBO). Accrued Benefit Obligations were used in Chapter 3 as the measure of unadjusted current liability.[2] Discount rate adjustments to current liability for the purpose of measuring the OBRA 87 full funding limit are described below in Section V. Projected Benefit Obligations

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[1]Wyatt Company (1989).

[2]ABO was used as an approximation to current liability, unadjusted for differences between the disclosure discount rate and the discount rate used to calculate the OBRA 87 full funding limit. Adjustments for such differences are discussed below in Section V. Both ABO and current liability are based on employees' past service, not counting projected future service and salary/benefit increases. However there are differences in the way that the two concepts, in practice, treat nonvested benefit accruals and the Code Section 415 limits on benefits. If the current liability used for applying the OBRA 87 limit counts nonvested benefits more heavily than ABO counts nonvested benefits, then ABO would possibly understate the unadjusted current liability. On the other hand, ABO may count benefits in excess of the Code Section 415 limits, whereas current liability would not, thus causing ABO to possibly overstate the unadjusted current liability.

equal an employer's accrued liability as it would be calculated under a method like method 3 in Chapter 2 and under the actuarial assumptions used for discosure purposes. For non-earnings based plans, PBO equals ABO. An employer's actual accrued liability would be different from PBO if they used a different actuarial method and/or different actuarial assumptions for funding purposes.

Companies in the Compustat II sample sometimes sponsor more than one defined benefit plan. Under the FAS 87 rules, and in Compustat II, plans of each employer are grouped according to whether or they are overfunded relative to ABO. Plans were grouped according to the same rules for the analysis in Chapter 3.

II. MATCHING AND WEIGHTING

Much of the analysis for Chapter 3 required information about actuarial assumptions and funding methods used for plans in 1989. Such data were imputed, as described below in Section III, based on data from the 1984 Form 5500 of a matched subsample of employers whose plans are also in the 1989 Compustat II sample. Exact matches were made by using Employer Identification Numbers (EIN).

The matched subsample equals about 11 percent of the original Compustat II sample of earnings based plans. This subsample includes plans for which the plan formula is based on employee earnings and years of service.

Sample weights were constructed so that the marginal distribution of funding ratios, weighted by ABO, was approximately the same in the full sample and subsample of earnings based plans. This was done by reweighting plans in the subsample so that the percentages of ABO were the same as the full sample in the six funding ratio brackets bounded by 120.6, 143.9, 157.9, 180.8, and 198.3.

III. IMPUTATION PROCEDURES

A. Actuarial Method

The actuarial funding method for earnings based plans was imputed from the Form 5500 data. The funding methods were divided into two classes: the (projected) unit credit method and other (level) funding methods. When there was more than one plan in the Form 5500 sample with the same EIN as an employer in the Compustat II sample, i.e., when there were multiple donors, the actuarial method used for the largest plan donor (in terms of total participants) was used in the imputation.

B. Discount and Salary Assumptions

Values of the 1984 salary growth rates, discount rates used for funding, and discount rates used for disclosure were imputed from the Schedule B data of the Form 5500 sample. In cases of multiple donors from the Form 5500 sample, the annual salary growth rate of the largest plan was used. Discount rate assumptions were averaged across multiple donors.

Values of these three assumptions were imputed for 1989 by assuming that a plan's deviation from the unweighted mean for all plans, in each case, did not change between 1984 and 1989. The 1989 means are from the 1989 Wyatt "Survey of Actuarial Assumptions and Funding."[3] For example, if a plan's 1984 discount rate for funding was 7 percent, then its deviation from the unweighted matched sample mean in 1984 was -.82 (=7.0-7.82). The imputed 1989 discount rate for funding for this plan would have been 7.18 (=8-.82), where the mean from the 1989 Wyatt survey was 8 percent. The same procedure was used to impute the 1989 salary growth rates and 1989 disclosure interest rates.

C. Percentage of Current Liability for Active Employees

The percentage of current liability for active employees was computed based on information from the 1984 Form 5500, Schedule B answers to questions 6(d) and 6(f). The denominator was the total value of vested benefits from question 6(d). The numerator was the total value of vested benefits other than for retired participants and beneficiaries from question 6(d), multiplied by the ratio of active participants to active plus vested terminated participants from question 6(f). When there were multiple donors from the Form 5500 sample, the totals were computed using all donors.

D. Construction of the Age Index for Active Employees

The age index was constructed by adjusting the active employee ratio of PBO to ABO for differences among plans in the disclosure discount rate, the salary growth rate, and the turnover rate assumptions. First, the unadjusted ratio of PBO to ABO for active employees was calculated using the following formula:

$$\text{Unadjusted } (\text{PBO/ABO})_{\text{actives}} = [(\text{PBO/ABO}) - f] \div (1 - f),$$

where f is the fraction of ABO accounted for by inactive plan participants. The ratio of PBO to ABO for active employees was then multiplied by the following factor to account for deviations of the salary growth rate from the 1989 mean rate of 5.9 percent, the disclosure

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[3]Unweighted means from the Wyatt survey were: 7.2 percent in 1984 and 8.0 percent in 1989 for the funding discount rate; 7.5 percent in 1984 and 8.3 percent in 1989 for the disclosure discount rate; 5.9 percent in 1984 and 6.0 percent in 1989 for the salary growth rate.

discount rate from the 1989 mean funding discount rate of 8.2 percent, and the average percentage turnover rate from the mean of 14 percent.[4]

$$\text{Adjustment factor} = (5.9/\text{annual salary growth})^{.1} \times (8.2/\text{discount rate for funding})^{-.31} \times (14/\text{average percentage turnover rate})^{-.042}$$

The exponents in the formula, i.e., .1, -.31, and -.042 were estimated by regressing the natural logarithm of the unadjusted ratio of PBO to ABO for active employees on a constant and the logarithms of the annual salary growth, discount rate for funding, and average percentage turnover rate. For the regression estimation, observations were weighted by ABO. The T-statistics for the regression coefficient estimates .1, -.31, and -.042 were 5.0, -4.3, and -3.1, respectively.[5]

E. Accrued Liability

For earnings based plans that used the projected unit credit method, the ratio of accrued liability to current liability was measured as the 1989 ratio of PBO to ABO. For this purpose, PBO was adjusted for differences between each plan's funding discount rate and its disclosure discount rate by multiplying PBO by the factor (1+.13 × (disclosure discount rate - funding discount rate). The 13 percent adjustment factor was derived from simulations based on the complete pension simulation model used in Chapter 2. For other earnings based plans, the 1989 ratio of PBO to ABO, similarly adjusted for differences between the funding and disclosure discount rates, was used as a measure of the ratio of accrued liability to current liability as it would be calculated under the projected unit credit method. However, the actual 1989 ratio of accrued liability to current liability for plans that did not use the projected unit credit method was imputed using regression methods. For such plans, the following estimated regression was used.

$$(100 \times \text{Assets/ABO}) = 126.2 + .51 \times [(\text{age index for active employees})] - 13.2 \times [(\text{discount rate for funding})] + 6.4 \times [(\text{annual salary growth rate})]$$

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[4]The turnover rate is the percentage annual turnover rate, averaged over employee ages 25 and 40.

[5]The R-squared for the regression equalled .23.

+ .25 × [(percentage annual turnover, average at ages 25 and 40)]

+ 31.0 × [(fraction of CL due to actives)]

The regression parameters were estimated by a weighted (by ABO) least squares method using the ratio of assets to ABO. The sample size was 136 and consisted of earnings based plans that were not funded under the projected unit credit method. The R-squared equalled .45, which implies that the imputation regression explained 45 percent of the weighted sample variation in the ratio of assets to ABO. T-statistics of the regression coefficients 126.2, .51, -13.2, 6.4, .25, and 31.0 were equal to 3.8, 3.8, -5.7, 5.6, 0.9, and 2.0, respectively.

For the plans in the sample used to estimate the regression, the regression was used to impute the ratio of accrued liability to ABO (times 100), under the assumptions: (1) that the ratio of assets to ABO equals the ratio of accrued liability to ABO plus random noise for such plans and (2) that the ratio of accrued liability to ABO is systematically correlated with the actuarial and demographic variables on the right hand side of the regression. If the projected value from the regression was less than the actual 1989 ratio (times 100) of PBO to ABO, then the ratio of PBO to ABO (times 100) was used as the imputed value, adjusted for differences between the funding and disclosure discount rates.

IV. METHOD FOR ESTIMATING DISTRIBUTIONS

Distributions were estimated by using kernal density estimation methods.[6] The kernal density estimates can be thought of as smoothed histograms that have the properties of a density function, e.g., they integrate to one. The estimates also have other desirable statistical properties such as consistency.[7]

V. ADJUSTED CURRENT LIABILITY

Unadjusted current liability was measured using the 1989 ABO reported for each plan. For Figures 3.5, 3.6, and for the purpose of computing the OBRA 87 full funding limit, for example, for Tables 3.2 and 3.3 and Figure 3.7, ABO was adjusted to account for the interest rate corridor rule of of the OBRA 87 limit. The midpoint of the corridor for the sample period equalled 8.8 percent. Because ABO is computed under the disclosure discount rate, ABO was adjusted when the disclosure discount rate was less than the midpoint of the corridor. The adjustment was made by decreasing ABO by 8 percent for every 1 point deviation from the midpoint of the corridor. The 8 percent adjustment is an approximation based on simulations

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[6]See Silverman (1986).

[7]See Silverman (1986) for analysis of these properties.

of the pension model used in Chapter 3. Lacking information about the actual interest rate used for calculating the OBRA 87 limit, the midpoint of the corridor was used in the adjustment even though plans are allowed to use a discount rate as low as 90 percent of the midpoint for computing the limit. This assumption is conservative and would tend to overstate the percentage of plans affected by OBRA 87 if plans actually used a discount rate lower than the midpoint for calculating the OBRA 87 limit.

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