PENSION MATHEMATICS
with Numerical Illustrations

Second Edition

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Chapter 14

Funding Policy

The statutory rules for determining minimum required and maximum tax deductible contributions were set forth in Chapter 10, and the accounting rules for determining annual pension costs were discussed in Chapter 11. Neither of these sets of rules, however, necessarily provides guidance to plan sponsors regarding the level of contributions that should be made to the pension plan each year. Statutory requirements, of course, place boundaries on such contributions; however, these boundaries themselves can be influenced by the choice of funding method, actuarial assumptions, and asset valuation method. Accounting rules, while not providing as much flexibility as statutory rules, nevertheless involve the selection of several factors that can affect both near-term and long-term accounting costs. Finally, there exists an interaction between contributions and accounting costs. While accounting costs have no impact on contributions or their statutory limits, the reverse is not true since contributions affect plan assets which, in turn, affect accounting costs.

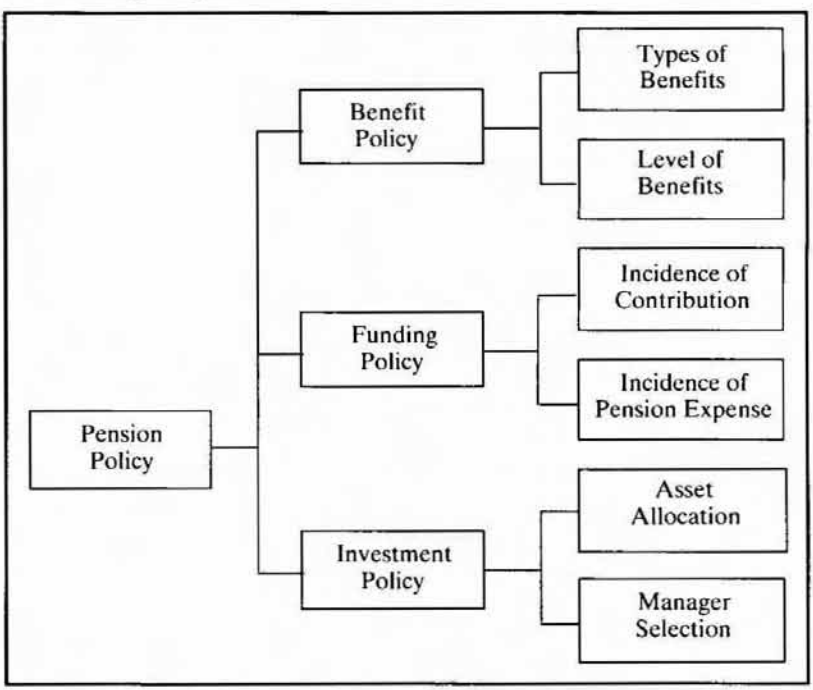
The plan sponsor's *funding policy* should set forth objectives regarding future contribution patterns, funded ratios, and accounting costs. The implementation of this policy involves selecting various methods and assumptions that, while conforming to the various statutory and accounting rules, are designed to meet management's objectives. Prior to the passage of ERISA and subsequent legislation, and before the promulgation of SFAS 87, it was relatively straightforward to implement an articulated funding policy. This is no longer the case, and plan sponsors must now accept the reality that it may not be feasible to

have contributions or expense conform to a rational funding policy.

As illustrated in Figure 14–1, there are two additional policies to be considered in conjunction with the plan's funding policy, namely, the *benefit policy* and *investment policy*. The benefit policy sets forth the sponsor's objectives with regard to the type and level of benefits to be provided under the plan, and the method for delivering such benefits. The investment policy sets forth the risk and return objectives of the sponsor, resulting in an asset allocation strategy (i.e., the percentage of assets to be invested in various asset classes) and guidelines for selecting and monitoring investment managers. For the analyses in this chapter, it is assumed that the benefit policy and investment policy are already established; however, all three policies should be developed jointly in formulating the sponsor's overall *pension policy.*

The purpose of this chapter is to illustrate the development and implementation of a funding policy for the model pension plan. While the policy selected for the analysis may not be appropriate for any given plan because of the sponsor's unique fi-

FIGURE 14–1
Pension Policy Components



nancial and tax circumstances, the analysis sets forth a general methodology that may be useful in approaching this important task.

ECONOMIC LIABILITY

One of the first decisions a plan sponsor should make in formulating a funding policy is the ultimate level of assets that the plan should accumulate. In other words, what funding target should be adopted as part of the funding policy? Should assets systematically accumulate to the plan continuation liability, the plan termination liability, the ABO, the PBO, the current liability, or the actuarial liability of the actuarial cost method used for funding?

In addition to the liability (or funding) definition, there are benefit and assumption issues. For example, if the plan has a career average formula with periodic increases being given to mimic a final average formula, should the benefits used in setting the funding target be based on the benefit formula specified in the plan document or should it reflect the impact of anticipated periodic increases? As another example of the benefit issue, should fixed benefits after retirement be used in the funding target or should expected *ad hoc* COLA benefits be considered? Finally, what actuarial assumptions should be used? Should the interest rate be the SFAS 87 spot rate, the SFAS 87 expected return on assets, the PBGC interest rates, the interest rate used for determining the ERISA funding limits, the current liability interest rate, or some other rate based on management's views?

The concept of an economic liability has evolved to assist plan sponsors in defining an appropriate funding target. This liability represents management's best estimates with regard to future benefits and future plan experience, and represents what management believes is a rational allocation of benefits over the working career of an active employee. Since pensions can be viewed as deferred wages, correlating the benefit allocation with salary has a strong intellectual appeal. Consequently, the economic liability is frequently selected as the actuarial liability under the constant percent benefit prorate method.

The economic liability, if defined with best-estimate benefits, best-estimate assumptions, and the constant percent benefit pro-

rate method, may be very different from the various liabilities noted above, especially if the latter are evaluated according to the plan's legal benefits with the actuarial assumptions currently being used for such liabilities. On the other hand, it may well be that the sponsor is satisfied with a given liability value, e.g., the PBO under SFAS 87, in which case this measure is defined as the economic liability for determining the plan's funding policy.

For illustrative purposes, the economic liability defined in Table 14–1 is used in the subsequent analysis of the model pension plan. The economic liability for the model pension plan is given in Figure 14–2 along with five additional liability values for comparison purposes.

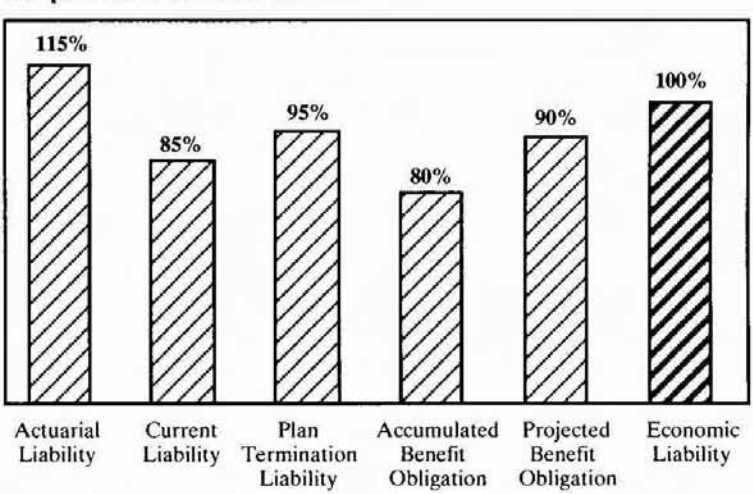
TABLE 14–1

Economic Liability Definition

Benefits: Based on the final average benefit formula, but with benefits assumed to increase after retirement at 25 percent of the inflation rate (i.e., 1 percent based on the 4 percent inflation assumption)
Benefit Allocation: Prorated by salary
Assumptions: Same as used with the model plan

FIGURE 14–2

Comparison of Alternative Liabilities



FUNDING POLICY OBJECTIVES

In addition to the funding target, the plan sponsor must select a funding period over which assets are to reach the funding target, the pattern of contributions and accounting expense, and the degree of conservatism associated with the funding policy. For illustrative purposes, it is assumed that the plan sponsor has developed the funding objectives set forth in Table 14–2. In effect, this policy states that assets are to accumulate to the economic liability of the plan over a period of 10 years, with a 70 percent probability that this funding objective is achieved, and with contributions (and accounting costs) equal to a level percentage of payroll.

TABLE 14–2

Illustrative Funding Policy

- ***Funding Target:*** The market value of assets should systematically approach the plan's economic liability.
- ***Funding Period:*** The funded ratio, based on the economic liability, should equal or exceed 100 percent at the end of 10 years.
- ***Contribution Pattern:*** Contributions should be approximately equal to a level percentage of payroll, having a relatively high degree of year-to-year stability, yet maintaining maximum flexibility to deviate from this pattern if financial circumstances so dictate.
- ***Accounting Cost Pattern:*** Same as contribution objectives.
- ***Confidence Level:*** The funded target should be met at the end of 10 years with a 70 percent confidence factor.

FINANCIAL MODELING

The implementation of a funding policy requires financial modeling, including current year valuations, deterministic projections, and stochastic projections. Actuarial valuations involve the determination of the plan's liabilities and costs for the current year. Annual valuations are required for accounting and statutory purposes; however, this is the final step in implementing a funding policy. The first step involves the use of valuations in performing sensitivity analyses of the different assumptions and methodologies that might be used to implement the funding policy. As a result of the advances in micro computer technology in recent years, management can quickly and cost-effectively

observe the current year's financial implications of a wide range of actuarial assumptions and methodologies, a useful process in narrowing the range of possibilities.

A series of valuations, however, is not sufficient for implementing a funding policy because no information is provided on the plan's financial status beyond the current year. Deterministic projections allow management to explore the behavior of alternative funding policies under differing economic and demographic scenarios. For example, if management believes there is a high probability of substantial early retirements in future years, deterministic forecasts can show the corresponding financial implications under several proposed funding policies which may be useful in selecting the appropriate policy.

The distinguishing feature of a deterministic projection is that management sets forth the economic and demographic scenario for each year of the projection. The advantage of this process is that the expected financial effect of each change in the economic or demographic scenario can be quantified. These types of projections are useful in testing alternative sets of assumptions and funding methods in establishing the plan's funding policy.

As an alternative to specifying future scenarios on a year-by-year basis, the plan sponsor can use stochastic projections. Under this methodology, both the expected value and the expected volatility of one or more assumptions is specified. For example, plan assets might be specified as having an expected return of 8 percent with a standard deviation of 15 percent. Multiple asset return scenarios, consistent with these inputs, are then developed by the computer. The number of computer-generated scenarios should be sufficient to cover the entire range of possibilities, with 500 to 1,000 trials generally being adequate, depending on the degree of volatility specified and the length of the projection. The final step is to perform deterministic projections on each of the several hundred scenarios, the result being a stochastic projection of the plan's financial condition. Stochastic projections are particularly useful in studying the interrelationship of the funding policy with the plan's asset allocation policy.

In summary, valuations are a useful first step in narrowing down alternatives available in establishing a funding policy. Deterministic projections are useful in testing the long-term validity of alternative funding policies, while stochastic projections are

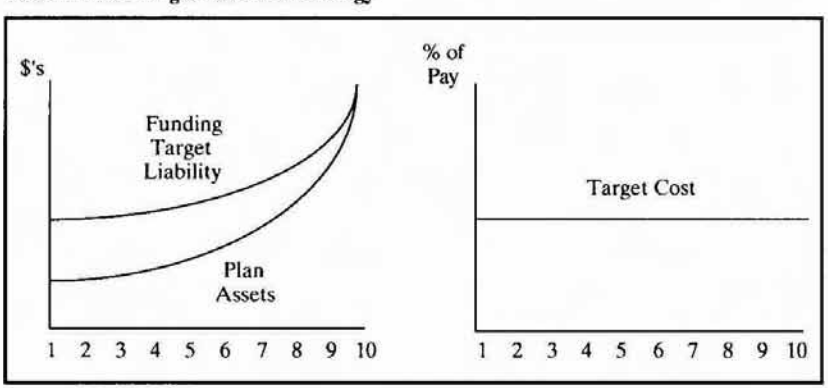
useful in exploring the impact of fluctuating experience, such as asset returns, on the proposed funding policy.[1]

TARGET COST METHODOLOGY

The so-called *target cost* methodology, which can be based on either deterministic or stochastic projections, is a useful step in the development of a funding policy. Based on the funding objectives set forth previously, Figure 14–3 illustrates this methodology deterministically. The funding target is projected to the end of the planning period, in this case 10 years. A level percent of the projected payroll is then calculated such that plan assets accumulate to the funding liability by the end of 10 years. This represents the ideal pattern of both contributions and accounting expense under the funding objectives previously stated, i.e., reaching a designated funding goal with contributions equal to a level percent of payroll. With this cost guideline, management can proceed to explore alternative assumptions and methodologies that produce contributions and accounting costs approximately equal to these levels.

The deterministic methodology produces target costs that have an equal chance of falling below or above the ultimate fund-

FIGURE 14–3
Deterministic Target Cost Methodology



[1]This discussion implies that the asset allocation policy is established independently from the funding policy, which may in fact be the case for many plan sponsors. A more correct procedure, however, is to establish these two policies jointly. The stochastic methodology is an ideal tool for this task.

ing goal.[2] Management may wish to build into the target cost calculation a higher confidence factor. For example, the funding objectives stated previously specified a 70 percent probability that assets will equal or exceed the funding target after 10 years. One method of injecting a higher than 50-50 probability into the target cost calculation is to fund toward some multiple of the funding liability, e.g., 125 percent. This approach, however, does not provide information on the *probability* of success, other than the fact that the probability exceeds 50 percent. Another approach is to use the stochastic projection methodology illustrated in Figure 14–4.

The stochastic methodology produces a range of target costs, shown in Figure 14–4 as percentiles of 50, 60, 70, 80, and 90 percent, based on a stochastic projection of the funding target. This methodology is typically implemented by management selecting distributions for inflation and various asset classes, along with structural relationships among such distributions. Distributions for various decrements can also be used; however, for a population with more than a few thousand employees, the financial variability introduced by stochastic decrements is small.

The stochastic methodology allows management to develop a target cost that explicitly meets the fourth funding objective, namely, to achieve the funding goal with a given confidence level.[3] If the confidence factor is 70 percent, as in the previously stated funding objectives, then the cost level associated with the 70th percentile is the appropriate guideline to be used in establishing the plan's funding policy.

As a practical matter, a plan sponsor would not perform a target cost analysis and then passively observe the results over the ensuing planning horizon. The analysis should be updated

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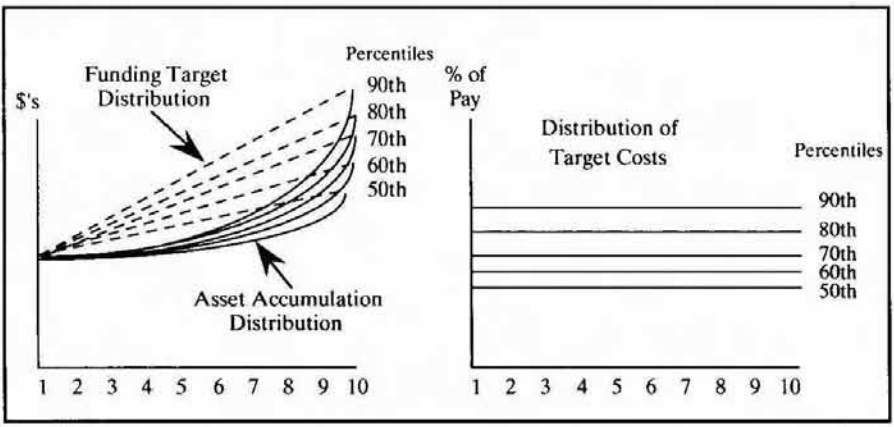
[2]This assumes, of course, that management has chosen the median value for each assumption's distribution in the target cost methodology. While this can not be done with precision, the point is that if management selects best estimate assumptions, then assets, by definition, have a 50–50 chance of being under or over the funding target at the end of 10 years.

[3]There is nothing inherently inappropriate about a 50 percent confidence level; however, most corporations using this methodology have opted for a confidence level falling between 60 and 80 percent. In only one company that the author is aware of did management select a factor less than 50 percent. In this case, 40 percent was selected for an hourly plan, representing management's view that, if the plan reached an overfunded status, the negotiation process for benefit increases would be compromised.

FIGURE 14–4
Stochastic Target Cost Methodology



periodically, especially if unusual events have occurred, such as a benefit change, or if the sponsor's views on capital market returns have change substantially.

The largest source of financial variability in the stochastic target cost analysis typically comes from asset returns. Consequently, a complete analysis requires the asset allocation dimension to be analyzed in tandem with target costs. As noted previously, it is assumed for this analysis that the asset allocation decision has been preselected; however, this subject is studied in Chapter 15.

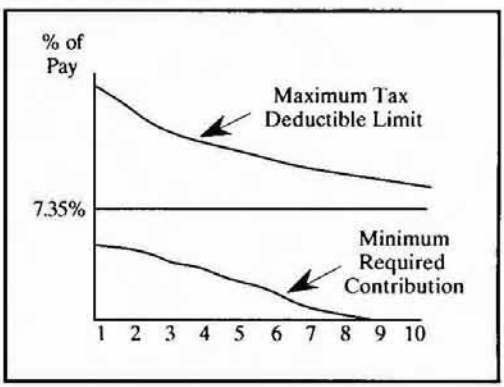
Based on the funding objectives specified previously in Table 14–2, the target cost for the model pension plan, based on a 70 percent confidence factor, is 7.35 percent of covered payroll.

STATUTORY METHODS AND ASSUMPTIONS

The plan sponsor, in the illustrative case, desires to contribute 7.35 percent of payroll, barring any new developments and/or until it is deemed appropriate to recalibrate the target cost guidelines. The funding policy articulated previously also calls for as much stability and flexibility as possible in annual contributions. Ideally, the statutory funding method would develop as wide a band around the target cost as possible. Figure 14–5 illustrates an ideal funding policy. The upper limit is drawn as a downward sloping line because, as the plan increases its current statutory funded position, the maximum contribution de-

creases and the full funding limits (FFLs) are more likely to be reached. Full funding limits are particularly troublesome in implementing a funding policy because generally they are either "on or off" in a given year, implying that contributions are either zero or approximately equal to the plan's normal cost. Thus, as the plan approaches its FFLs, contributions may fluctuate from zero to the plan's normal cost from one year to the next, creating a planning nightmare.

FIGURE 14–5
Ideal Relation Between Statutory Limits and Plan Contributions



Other things being equal, the upper statutory limit should be as high as possible to avoid spurious full funding "hits" when the plan has not yet reached management's funding target. Conversely, the lower limit should be as low as possible. If the minimum required contribution can be set below the target cost, then the excess contributions will develop a credit balance in the funding standard account and drive the minimum down to zero. By the same token, the larger the difference between the minimum and maximum limits, the greater will be the year-to-year stability in annual contributions. In fact, contributions can be estimated with virtual certainty for at least a few years, since the employer will simply contribute the target costs. Finally, a corollary to establishing stability is that it also develops flexibility. Clearly, if the minimum and maximum limits are wide, the

employer can vary contributions in the upcoming year to either boundary.[4]

The cost prorate (entry age normal) method is the ideal funding method to be used for determining statutory limits, provided, of course, that actuarial assumptions can be selected such that the minimum required contribution is lower than the target cost. This method, which develops the largest actuarial liability and, hence, unfunded liability, provides the greatest gap between the minimum and maximum limit. Ironically, this method or some variation of it, was by far the most popular method used prior to the promulgation of SFAS 87, which mandated the benefit prorate method for pension expense. Although not logical, most plan sponsors likewise adopted this method for their contributions and statutory limits. It is unlikely that this represented the appropriate course of action for most corporations, especially if assets had not yet reached management's funding target.

If the funded status of the plan is deemed to be adequate, and especially if the plan develops a surplus, then it may be desirable to place the plan in full funding for a period of years until assets come back into balance with the funding target. This can best be accomplished by adopting an actuarial funding method for statutory purposes having a low full funding limit. In this case, the accrued benefit method would be ideal, with the constant dollar benefit prorate method being the second choice. Overfunded plans that adopted the benefit prorate method at the time SFAS 87 was promulgated may have done so with this strategy in mind. Nevertheless, when it is time to begin contributing again, it may be appropriate to change back to the cost prorate method.[5]

There are several forms of the cost prorate method: (1) explicit amortization of all unfunded liability (entry age method), (2) implicit amortization of all unfunded liabilities, (aggregate method), and (3) a combination of explicit and implicit amortiza-

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[4]There are many reasons for engineering flexibility into annual contribution ranges. For example, such flexibility would have been beneficial when TRA '86 lowered corporate tax rates. The astute plan sponsor would have maximized 1986 contributions and then lowered 1987 contributions such that the total during the two years was equal, but with a substantial after-tax cost savings. The opposite strategy should be adopted if tax rates are increased by future legislation.

[5]Funding methods for statutory purposes can be changed once every 3 years without IRS approval; consequently, such changes should be made only after careful study.

tions (frozen attained age method). The aggregate method provides very little contribution flexibility, with the maximum limit exceeding the minimum limit by one year's interest at the valuation rate. It is difficult, if not impossible, to rationalize this method being used as the statutory funding method. The entry age normal cost method was the logical choice prior to OBRA '87, which reduced the amortization period for actuarial gains and losses from 15 to 5 years. The frozen entry age method amortizes such losses over future working lifetimes (a period longer than 5 years); hence, this method would be ideal in many cases.

All of the actuarial assumptions can be selected with an eye toward developing wide statutory boundaries; however, each assumption must fall within a range that the actuary will certify as representing a "best-estimate" assumption.[6] Figure 14–6 illustrates the process by which one begins to search for an acceptable set of assumptions. In this illustration, only variations in the interest rate and salary rate assumptions are considered; however, all of the actuarial assumptions are candidates for such sensitivity analyses.[7] The funding method used is the frozen entry age method (the cost prorate method). These results indicate that an 8.5 percent interest rate and a 6 percent salary rate produce minimum required contributions and maximum tax deductible contributions that comfortably encompass the target cost.[8] Based on these results, the preliminary funding policy set forth in Table 14–3 can be tested for its long-term viability using one or more deterministic projections.

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[6]An actuary will generally recognize that, for each assumption, a range of values rather than a single point is consistent with professional standards and legal responsibilities under ERISA. In selecting a specific value in that range, it is reasonable to recognize the plan sponsor's goals. Unless management is abusing either tax deductions or the funded status of the plan, a rare occurrence in large corporations, assumptions should be selected to implement the target costs as efficiently as possible. The interest rate, which is by far the most powerful assumption, is also the most visible. Thus, even though a thoughtful and responsible target cost is being implemented, the use of an interest rate that does not fall within easily defensible boundaries should not be used. Salary scales graded by age, termination rates, and retirement rates provide opportunities to develop appropriate statutory boundaries.

[7]The indicated salary rate is in addition to the standard merit scale from Table 2–9.

[8]The 8 percent interest and 4.5 percent salary assumptions actually produce a somewhat wider range around the target cost than the 8.5 and 6 percent combination; however, the latter combination may have less audit risk for the plan sponsor.

FIGURE 14–6
Contribution Limits Under Alternative Actuarial Assumptions

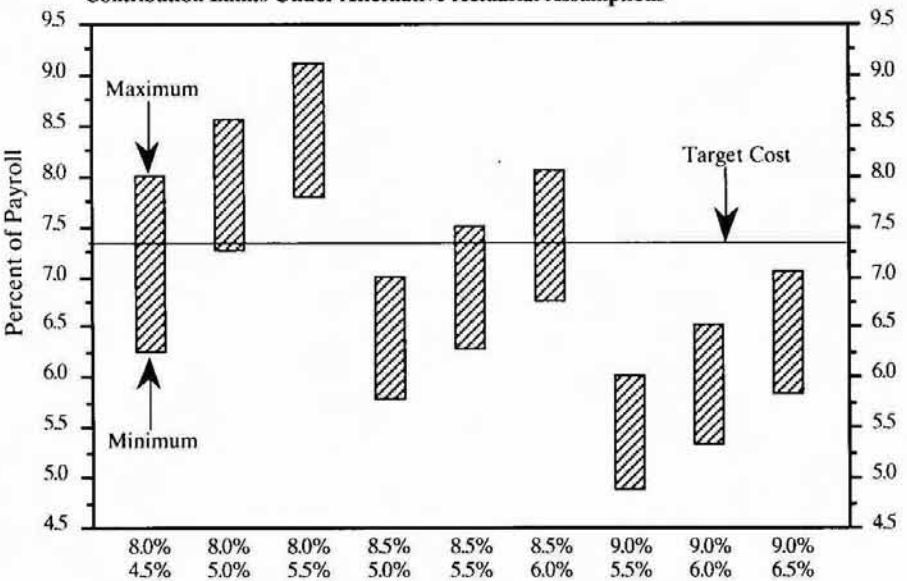


TABLE 14–3
Funding Policy Assumptions

Funding Method:	Frozen Entry Age Method
Interest Rate:	8.5%
Salary Rate:	6% plus merit scale
Decrement Rates:	Model assumptions

The next step is to test these assumptions over the planning horizon. Figure 14–7 shows the results of a 10-year deterministic projection and Figure 14–8 shows the results of a stochastic projection of the model pension plan under the preliminary set of assumptions. The deterministic projection shows that costs are expected to be a level percentage of pay equal to the target costs for the first 8 years of the projection, after which the maximum constraint lowers the contribution somewhat. Plan assets reach 100 percent of the economic liability after 5 years because of the 70 percent confidence factor specified in the funding policy. By the end of 10 years, the funded ratio is 112 percent of the economic liability and 96 percent of the actuarial liability. Based on these results, the preliminary funding policy appears to meet the funding policy objectives.

FIGURE 14–7
Deterministic Projection of Contribution Policy

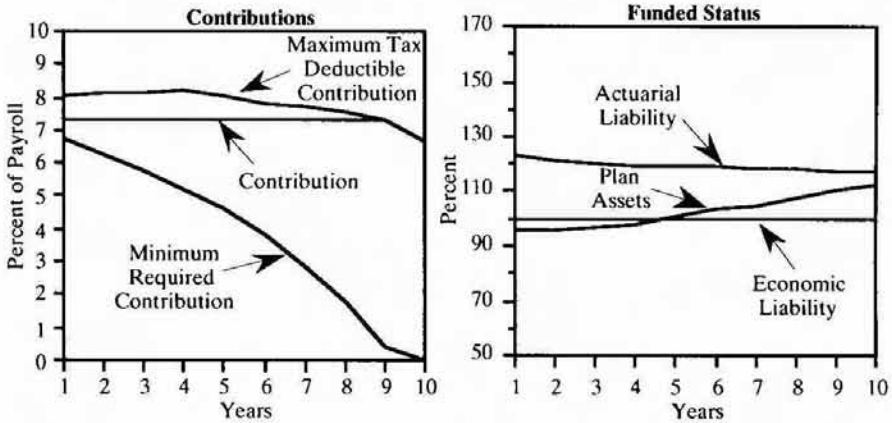
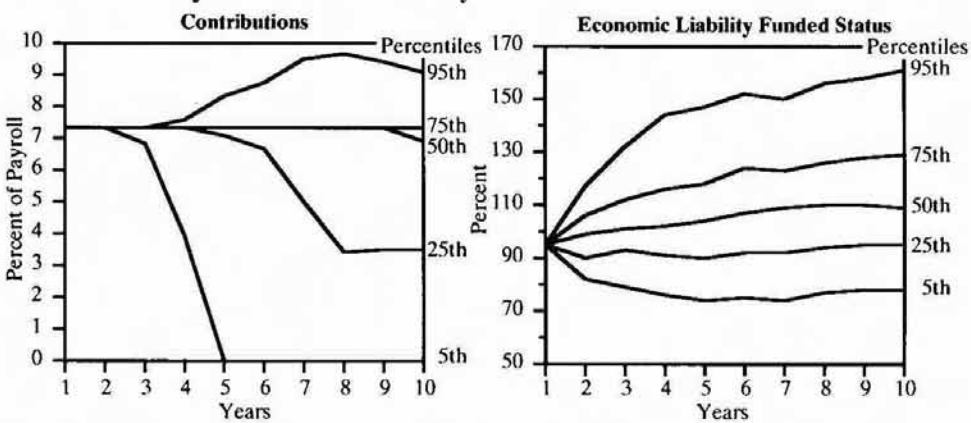


FIGURE 14–8
Stochastic Projection of Contribution Policy



The stochastic projection shown in Figure 14–8 indicates the full range of expected costs and funded ratios, and their corresponding probabilities of occurrence. The contribution projection indicates that, while contributions may be forced away from the 7.35 percent target cost, the "worst case" increase is less than 10 percent of payroll, as indicated by the 95th percentile. The probability that contributions will be forced downward from the target cost is greater than the probability of their being forced upward. The funded status, based on the economic liability, shows a low probability that the funded ratio will sink below 80 percent and fairly substantial probability that the funded ratio

will greatly exceed 100 percent of the economic liability. Based on these results, the funding policy assumptions set forth in Table 14–3 appear to hold up satisfactorily during the 10-year planning horizon.

FASB ASSUMPTIONS

A preliminary contribution policy must be established before the SFAS 87 costs can be examined, since contributions affect such costs. In the case of the previously articulated funding policy, it is the plan sponsor's objective to have SFAS 87 costs approximately equal to target costs. Table 14–4 shows the net periodic pension cost under alternative interest discount rates and expected return on assets. Again, all of the actuarial assumptions used to determine SFAS 87 costs are candidates for these types of sensitivity analyses. Based on the results in Table 14–4, an interest assumption of 7.5 percent and an expected return on assets of 8 percent represent reasonable assumptions for initial testing.

TABLE 14–4

Net Periodic Pension Costs Under Alternative Assumptions

Interest Discount Rate	*Expected Return on Assets*	*Net Periodic Pension Cost*
7.0%	8%	8.82%
7.0%	9%	7.88%
7.0%	10%	6.95%
7.5%	8%	7.57%
7.5%	9%	6.64%
7.5%	10%	5.70%
8.0%	8%	6.46%
8.0%	9%	5.52%
8.0%	10%	4.59%

Figures 14–9 and 14–10 provide the deterministic and stochastic projections of the SFAS 87 policy. The net periodic pension cost decreases over the 10-year planning horizon, primarily because, as plan assets increase, the expected return on assets grows proportionately. The funded status indicates that assets will reach the PBO, which is somewhat higher than the economic liability, by year nine. The stochastic projections indicate that the

FIGURE 14–9

Deterministic Projection of SFAS 87 Expense and Funded Status

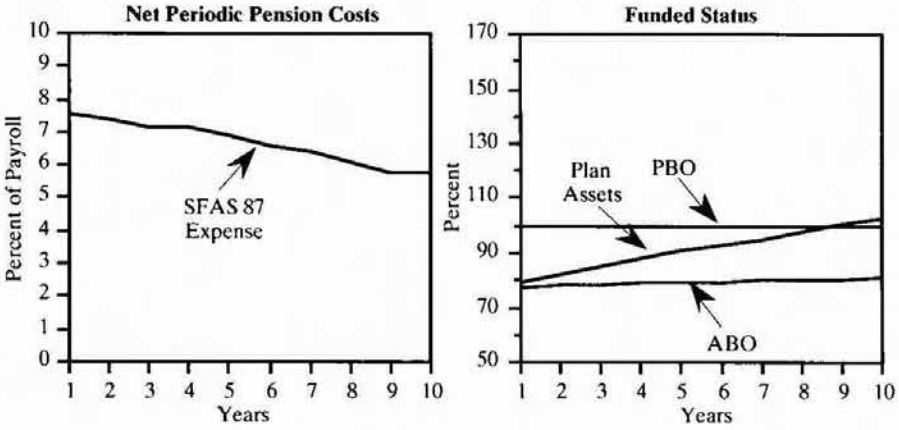
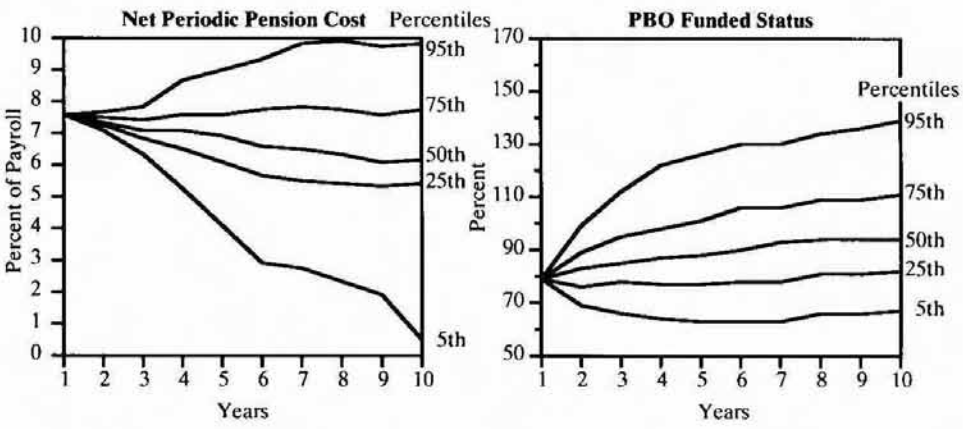


FIGURE 14–10

Stochastic Projection of SFAS 87 Expense and Funded Status



upside costs (or downside funded ratios) are well contained, with the most probable course of events being a reduction in costs and redundant funded ratios.

Based on these results, the preliminary assumptions appear to produce costs that are reasonably in line with the plan sponsor's objectives. In developing an overall funding policy, however, it may be necessary to revise the contribution policy and then reexamine the SFAS 87 policy and continue this process until satisfactory results are achieved.