Pension Plan Financing

Under Inflationary Conditions

July 30, 1976

Introduction

The Employee Retirement Security Act of 1974 focused management's attention, as never before, on the need to develop a rational, integrated financing policy for the company's pension plan. This report is designed to identify the major factors which influence corporate pension costs in those areas where management can significantly affect the level of corporate outlay.

In developing these concepts, we seek to make it clear that there is a very wide range within which corporate contribution requirements may fall. This is so, despite the fact that, once the assumptions with regard to future inflation and investment return, are determined, the mathematical calculations are relatively precise in determining the particular contribution requirement needed to meet that future experience.

Under these conditions, management should develop policies which integrate the actuarial requirements with the investment policies controlling the assets of the pension plan. Furthermore, since risk is unavoidable, they should select a tolerable level of risk both as to their ability to withstand volatility in the capital values of the assets in the portfolio, and as to the possibility that there will be a combination of future investment return/inflation rate experience that will render their current contribution rate inadequate.

Finally, management should adopt a reasonable test of performance so that the developing actual experience can be tested against the initial policy decisions, and any needed adjustments to the investment strategy and/or employer contribution rate can be made long before serious problems and major changes in cost levels are required.

The Range of Pension Contribution Requirements

The first step in developing these policies and standards is to grasp the wide range of possible contribution levels, depending on the particular investment return, inflation rate experience that actually develops. This range of contribution levels are presented in terms of a percentage of payroll that combined with the investment return will provide for the benefit payments and accumulated sufficient assets to fund the developing obligation. Expressing the employer cost in terms of a percentage of payroll, expected to remain invariant regardless of future experience, is useful because it automatically adjusts to the greater dollar amounts generated under inflationary conditions and because of growth in the size of the group.

Most of the factors affecting calculation of the percentage contribution requirement are relatively stable and predictable. For example, the mortality factor tends to be highly predictable and changes very modestly over the longer term. Furthermore, if variation is encountered, the changes in the pattern tend to offset one another. Thus, turnover can fluctuate greatly depending on economic conditions. If it declines (increasing pension costs) there is a tendency for the rate of salary increase also to decline (decreasing the cost of the plan) at the same time. Overall, averaging past experience to project these factors entering into the contribution requirement has proved relatively satisfactory.

The major exception to the validity of using past experience to project the future, is found in the variability of the rate of inflation. Up until the last decade, inflation in American currency, was primarily related to war-time conditions. While these represented short, sharp increases in the level of the cost of living, they were often offset by deflationary periods correcting the prior excess. Furthermore, being averaged over longer periods of time, they did not represent a significant experience loss in terms of an annual increment, particularly when combined with experience gains from other sources.

In recent years, inflationary conditions have appeared in peace-time, primarily as a result of downward wage inflexibility because of union activity and the deficit financing practices of the federal government. This has led to persistent and increasing rates of inflation, culminating in double digit inflation in the early 1970's. This persistent high rate of inflation, in turn, has led to significantly higher perceived rates of inflation for investment purposes, a doubling of the fixed income interest rates, and severe dislocation in the financial markets reflected in the most significant downturn in common stock prices since the 1930's.

In actuarial terms, the problem of inflation has received increasing attention. The usual practice has been to sharply increase salary scales, with or without accompanying increases in the expected rate of investment return. The impact of such

procedures can be easily seen from a review of the level percentage contribution requirements shown in Table 1. These percentage contribution requirements have been developed by projecting the employer contribution requirements for the same set of employees and with all other assumptions held constant, varying only the investment return and the annual rate of inflation.

It is significant to note that the range of possible levels of contribution vary from 1% to 21% of payroll, with the only difference being the level of investment return and rate of inflation. For example, if the company's investment policies could generate 10% a year with 0% inflation, the company contribution could be reduced to 1%. If on the other hand, the company policies generated a net yield of only 2% in 6% inflationary conditions, the required contribution would be 21% of payroll.

Developing the figures in this context makes it clear that, regardless of where the company's contribution is set, there is a combination of investment return/future inflation circumstances, however unlikely, which would render that contribution inadequate. Short of limiting the benefits to defined amounts (which will become inadequate in inflationary conditions) there is no way in which a plan sponsor can absolutely guarantee that his financing program will be adequate against all sets of future circumstances.

TABLE 1

PENSION CONTRIBUTION REQUIREMENT - PERCENTAGE OF PAY

ANNUAL INVESTMENT RETURN	Annual Rate of Inflation						
	0%	1	2	3	4	5	6%
2%	13.7	14.9	16.1	17.3	18.5	19.8	21.2
3%	11.8	12.9	14.0	15.1	16.3	17.5	18.7
4%	10.0	11.1	12.2	13.4	14.5	15.6	16.7
5%	8.3	9.4	10.4	11.5	12.6	13.7	14.9
6%	6.7	7.8	8.8	10.0	11.1	12.2	13.5
7%	5.1	6.1	7.2	8.2	9.4	10.5	11.7
8%	3.7	4.7	5.6	6.7	7.7	8.7	9.8
9%	2.4	3.3	4.2	5.2	6.2	7.2	8.3
10%	1.1%	2.0	2.9	3.9	4.8	5.8	6.9%

Consequently, the first step in developing a reasonable financing policy is to establish the extent to which management can rule out possible future investment return/inflation rate combinations as being too unlikely to merit further consideration in setting the financing plan. This step involves a decision concerning the extent to which management wishes to rely on the thesis that, over the longer run, investment yields will adjust to, and offset inflationary trends, i.e., that there is a net real rate of return that will be earned after allowing for inflation.

The "real rate of return" is defined for purposes of this memorandum as the net return after allowing for inflation. For example, if the gross investment return was 8% and the rate of inflation is 3%, the real return would be 5%.

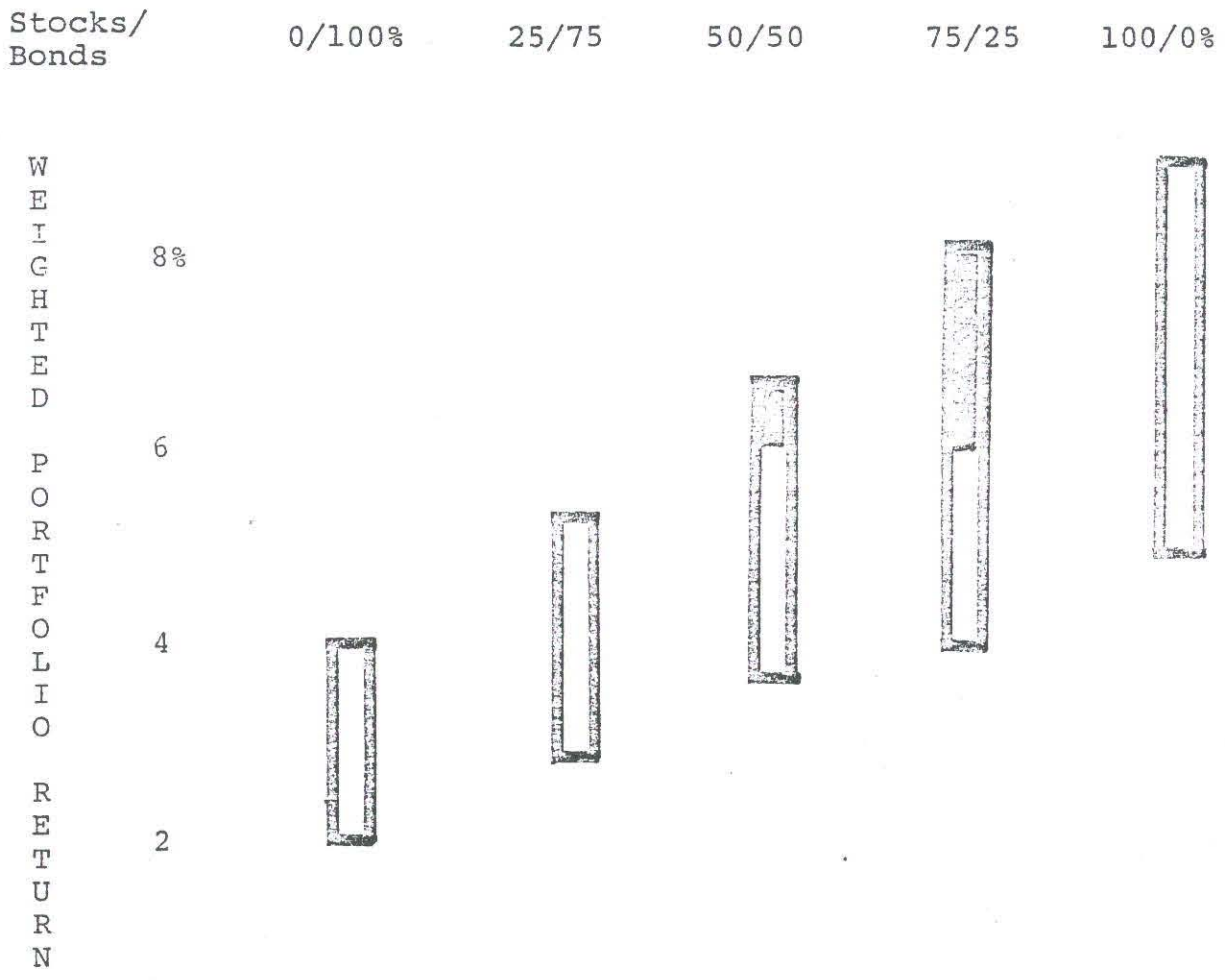
If there is a real rate of return attaching to the different categories of investment, then the next step is to estimate the acceptable range of real return for each category. In Table 2, an example of the range of expected rate of real returns are shown for stocks and bonds for illustrative purposes. In that table, the assumption is made that the rate of real return on corporate bonds will lie between 2% and 4% a year. Similarly, the range of return for common stocks has been estimated as filling between 5% and 9%.

It is not within the scope of this memorandum to establish the legitimacy of these real return percentages, or to justify

CHART 1

REAL RATE OF RETURN

BY PORTFOLIO DISTRIBUTION



RANGE OF REAL RETURN BY INVESTMENT CATEGORY TABLE 2

	Bonds	Stocks
High	4%	9%
Median	3	7
Low	2	5

the greater return credited to common stock. The particular returns on which the plan sponsor wishes to rely should be developed in consultation with investment experts and economists. We should state, however, that these rates of return appear to us reasonable based on statistical analysis of past results.

Once the range of real rates of return by investment category have been determined, then a composite rate can be developed based on management's asset distribution policy. Depending on the range of the rate of real return to be expected from the various investment categories, management's decision on the proportion of stocks and bonds to be held in the portfolio will define the range of future investment return/inflation experience. This, in turn, will be the background for determining the adequacy of a particular contribution rate to meet expected future conditions.

To make this line of reasoning explicit, consider the result for a plan sponsor who accepts the range of real returns shown in Table 2/Chart 1, and who determines that his overall distribution policy will be set at 75% common stocks, 25% in high-grade corporate bonds.

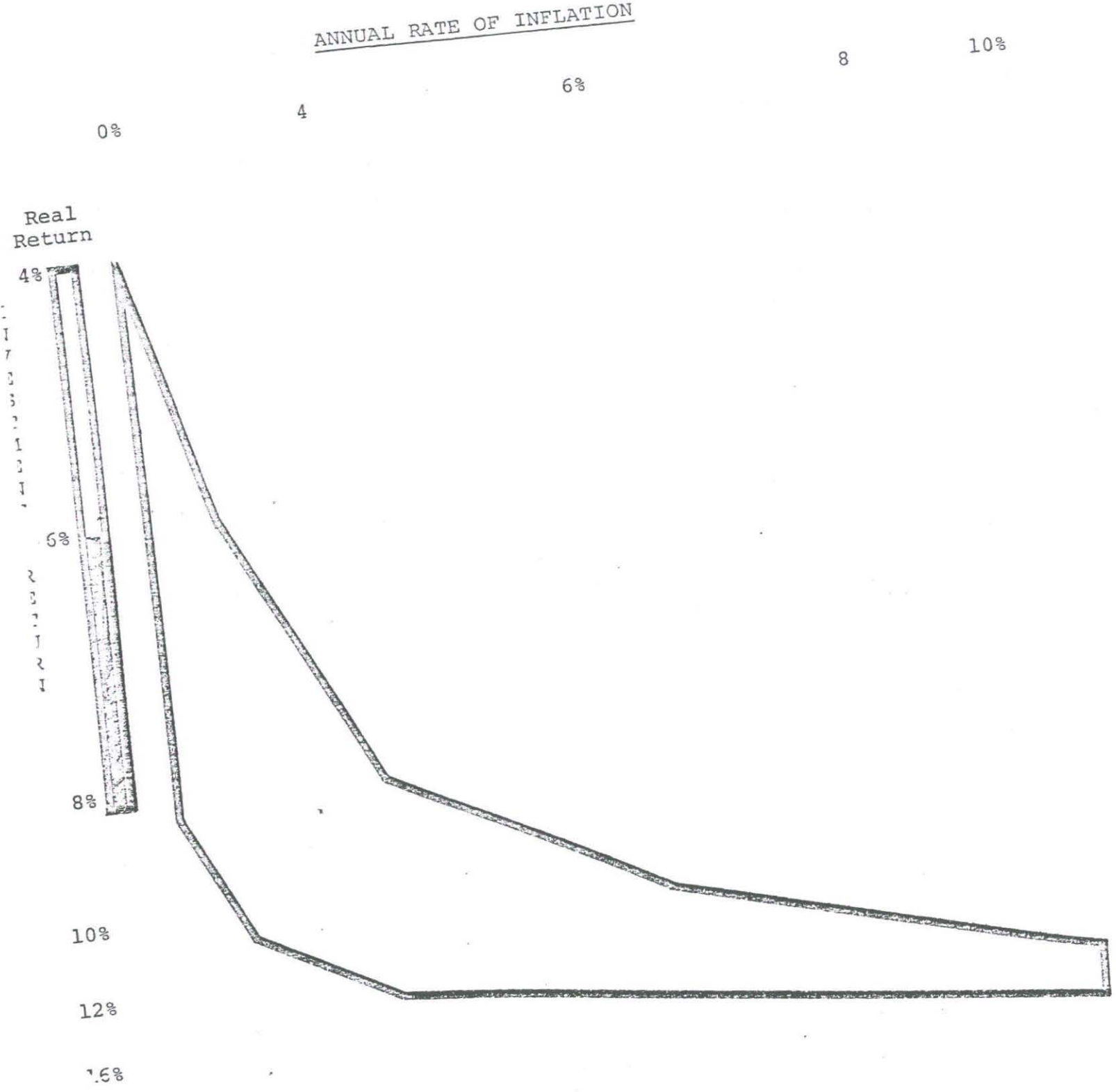
The Range of Future Experience
And Resulting Contribution Percentage Adequacy

The decision to distribute the portfolio in a 75% common stocks/25% bond ratio in conjunction with the expected real returns shown in Table 1 in effect determines that the expected real return from the portfolio will range between 4% and 8%. These investment results represent the expected range in non-inflationary conditions and enable the definition of the universe of possible future investment return/inflation rate combinations. As shown in Chart 2, if there is no inflation, the investment return may range between 4% and 8% (see the left-hand column). In inflationary conditions, the expectancy is that we will earn our real return plus the rate of inflation. For example, if the annual rate of inflation is 6%, our minimum expected investment return is 10%, i.e., a 4% real return plus the 6% rate of inflation. If the annual rate of inflation is 10%, the expected minimum investment return becomes 14%. By joining these combination of points together, Chart 2 delineates an area which encompasses all of the possible investment return/rates of inflation combinations that stem out of the range of real rates of return and distribution of investments initially selected by the employer.

Chart 2 introduces another dimension for visual purposes. In Chart 2, both the annual rate of inflation and the expected real return have been spaced to approximate a probability distri-

CHART 2

Distribution of Possible Future Investment/Inflation Experience Combinations
(Portfolio: 75% Stocks, 25% Bonds)



bution. For example, on the rate of inflation, the recent Ibbotson and Sinquefield study* has indicated an expected mean future inflation of 6.4%. We have distributed the annual rates of inflation around that figure roughly in proportion to normal distribution, i.e., the expectancy that inflation will fall between 4% and 8% is given greater weight than if it falls below or above these levels. While this produces an elongated diagram, it has the merit of producing relationships that visually approximates the underlying probabilities.

Having defined the area of probable future investment return/inflation rate combinations, consideration can be given to the adequacy of a given percentage of payroll to cover these combinations. The difficulty here is that the change in the percentage contribution range is not proportional to the change in the rate of inflation. In other words, in the usual situation, the higher the rate of inflation, the lower the required contribution.

The reason for this is a substantial portion of the pension fund is related to the retired life obligation which does not change in inflationary conditions. Consequently, if the investment return increases proportionately to the rate of inflation, the excess investment income on the retired life reserves is available to offset the increased active life obligation based on

* Stocks, Bonds, Bills and Inflation: Simulations of the Future (1976-2000). Roger G. Ibbotson and Rex A. Sinquefield. Journal of Business of the University of Chicago, No. 3, Vol. 49, July, 1976.

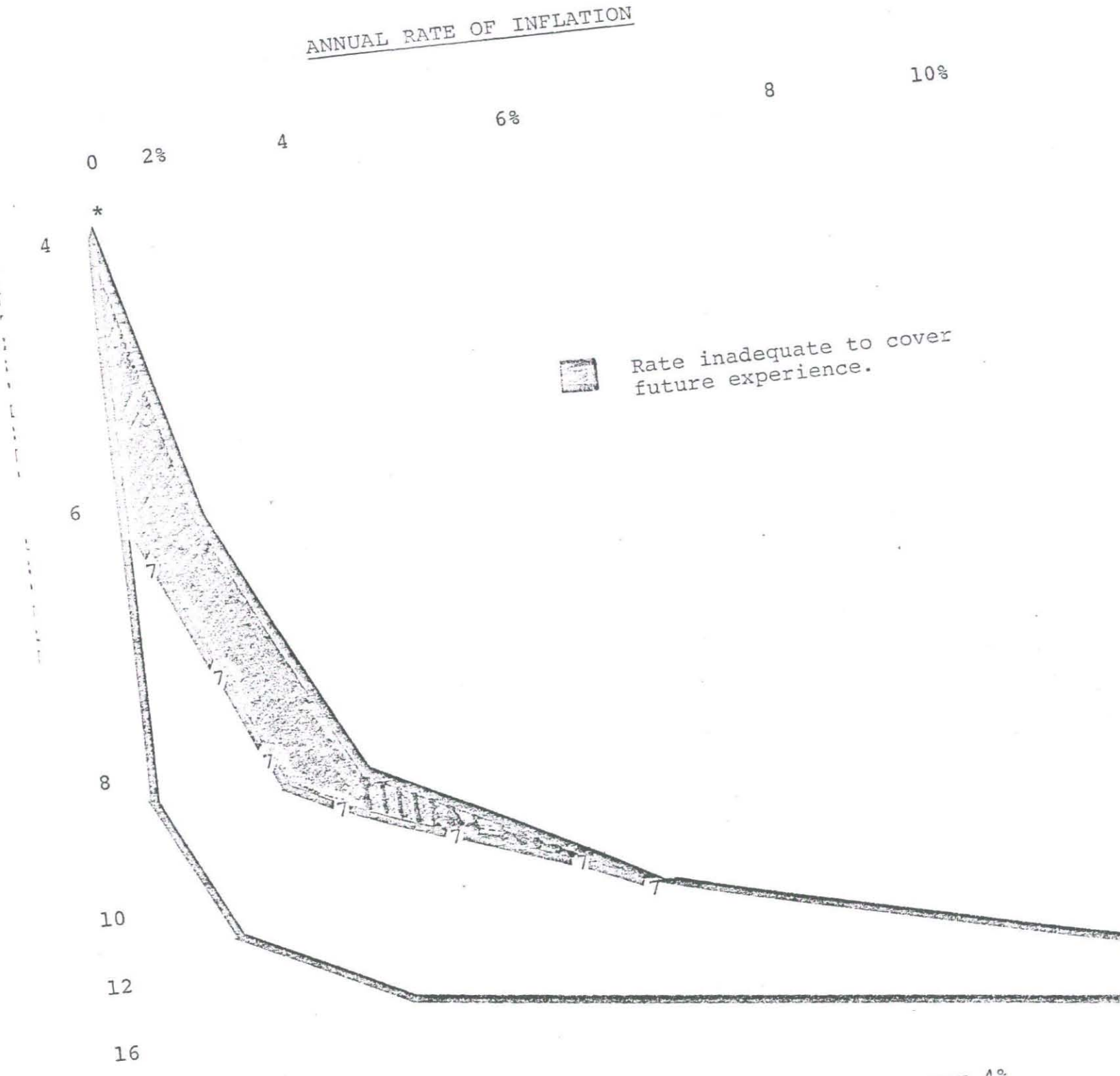
salary increases. This, in turn, means that the increase in contribution required to offset the increase will be smaller than the inflation rate.

Each pension plan must be analyzed to determine the extent to which it is "inflation-prone" since this in turn will determine the degree to which the percentage contribution requirement will not be proportional to the investment return/inflation rate conditions.

In our example, we have assumed that the retired life obligation does not adjust to inflation. Consequently, the higher the rate of inflation, and consequently the rate of investment return, the more adequate any given contribution rate. Thus a second management decision is to determine how many, if any, of the future combinations of experience it does not wish to allow for in its current percentage contribution rate. That this becomes an important decision is shown by Chart 3. In this chart, which is based on the results for Table 1, we have shown the area of combinations of future experience that would be left not covered if the corporation adopted a 7% of pay contribution rate.

In other words, if the corporation based its financing policy on the assumption that it was going to earn a 6% real rate of return, it would be covering most of the possible future experience. Nonetheless, if it actually turned out that future experience developed a 4% annual inflation rate and the nominal

Adequacy of 7% of Pay Contribution to Meet
Future Investment/Inflation Experience Combinations
(Portfolio: 75% Stocks, 25% Bonds)



* Percentage Contribution required to cover 4% return/2% inflation = 10% of pay

rate of return to the portfolio were only 8% the 7% contribution would be inadequate.

Some risk in this regard is justified because the additional contribution rate to cover all possible ranges of future experience is disproportionate to the additional security that is gained. For example, to cover all of the different possibilities that are generated by the initial real rate of return range of 4% to 8% a 10% of pay contribution rate would be required. A 50% jump in the pension contribution is required to offset a relatively narrow range of future possible events.

This point calls into play two further considerations. First, management should recognize that the choice of the range of "real rate of return" and the assumption that inflation rates and investment returns will be proportional are, at best, only approximations of the result expected over long period of time. While the best estimate of these relationships is useful to narrow the range of experience variation to a point where it is closer to, and commensurate with, other estimates of experience, some difference between what actually happens and the range of expected future experience must always be allowed for.

A second consideration is to further refine the risk area by giving increased weight to the most probable range of future experience. In this example, the most probable range of future experience is selected in Chart 4 and expanded in Chart 5. By

CHART 4

Adequacy of 7% of Pay Contribution to Meet
Future Investment/Inflation Experience Combinations
(Portfolio: 75% Stocks, 25% Bonds)

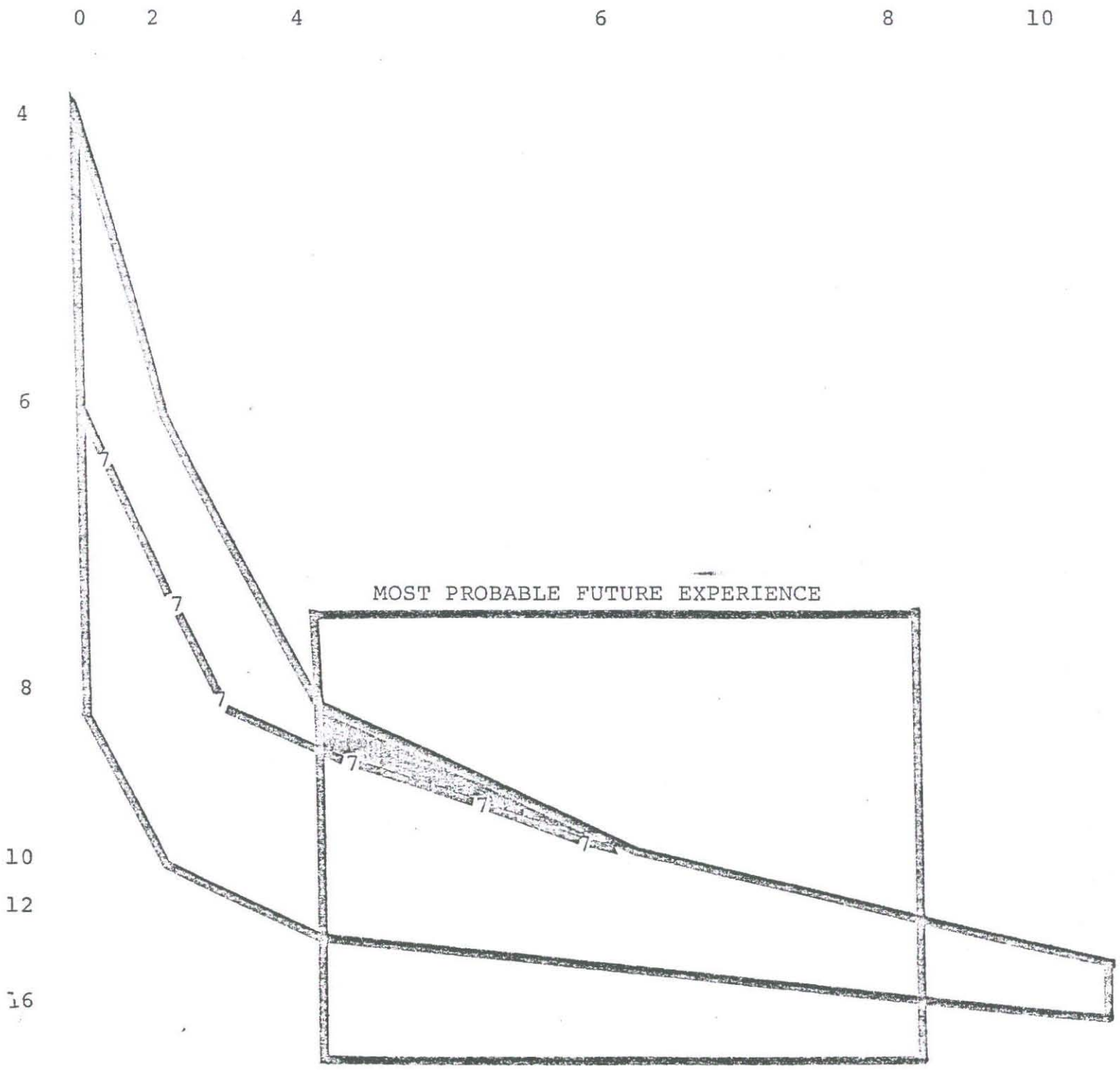
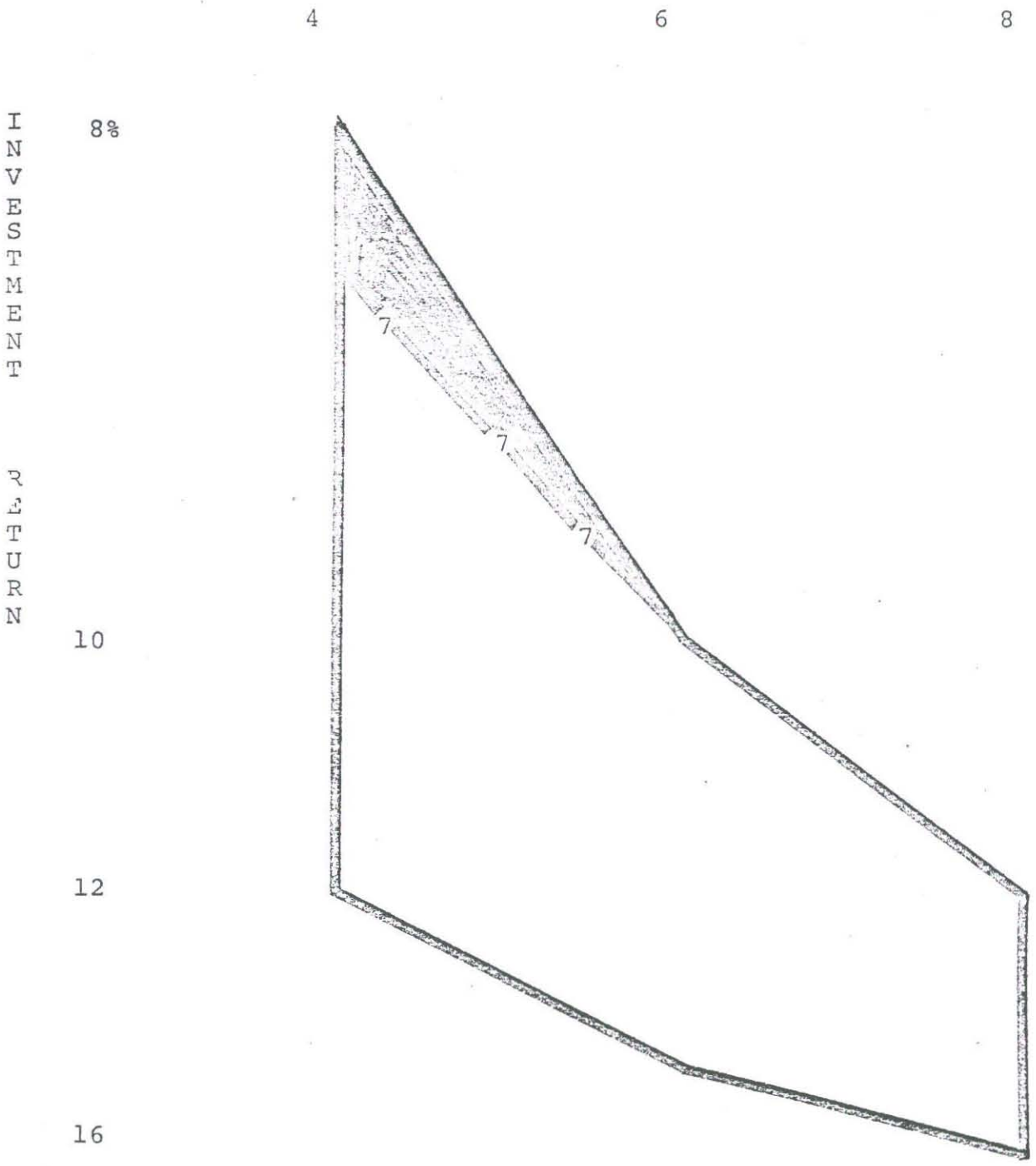


CHART 5

Adequacy of 7% of Pay Contribution to Meet Most Probable Future Investment/Inflation Experience Combinations (Portfolio: 75% Stocks, 25% Bonds)



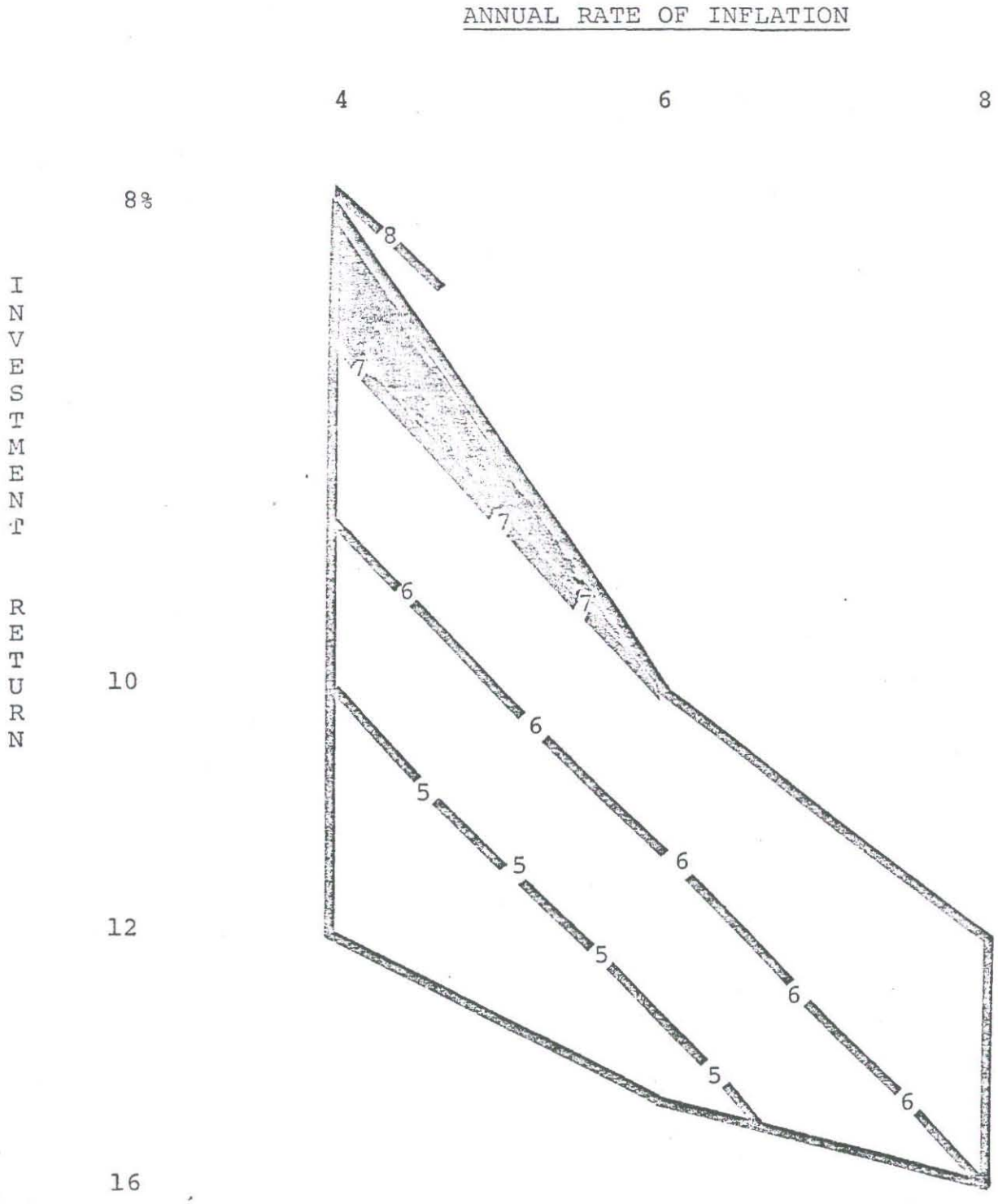
further narrowing the range to the most probable future experience, the implications of selecting a 7% contribution rate can be clarified and the risks of inadequacy limited to the point where the initial judgment appears as a reasonable business decision.

A second aspect of this narrowing of the range of future experience considered is illustrated by Chart 6. In this chart, the risk exposure is shown for contribution rates ranging from 5% to 8% of pay. In other words, if management determined that they wish to contribute 8% of payroll, and invest it 75% common stocks and 25% bonds, they would be covering all of the possible future contingencies of inflation rates of four percent or greater, provided that the initial real rate of return can be earned. This would still leave a modest area of risk if lower rates of inflation are experienced and the real return falls in the lower range. Again, the key decision is the area of risk that management feels is reasonable to undertake in preference to preserving their working capital.

Lower rates of contribution are also shown in Chart 6. A contribution level of 6% of pay would expose the corporation to roughly a 50/50 chance of inadequacy under the most probable expected future experience conditions. A 5% rate of return is probably sufficiently unlikely to be adequate as not to be acceptable to management.

CHART 6

Relative Adequacy of Various Percentage (5.8%) Contributions
To Meet Most Probable Future Investment/Inflation
Combinations
(Portfolio: 75% Stocks, 25% Bonds)



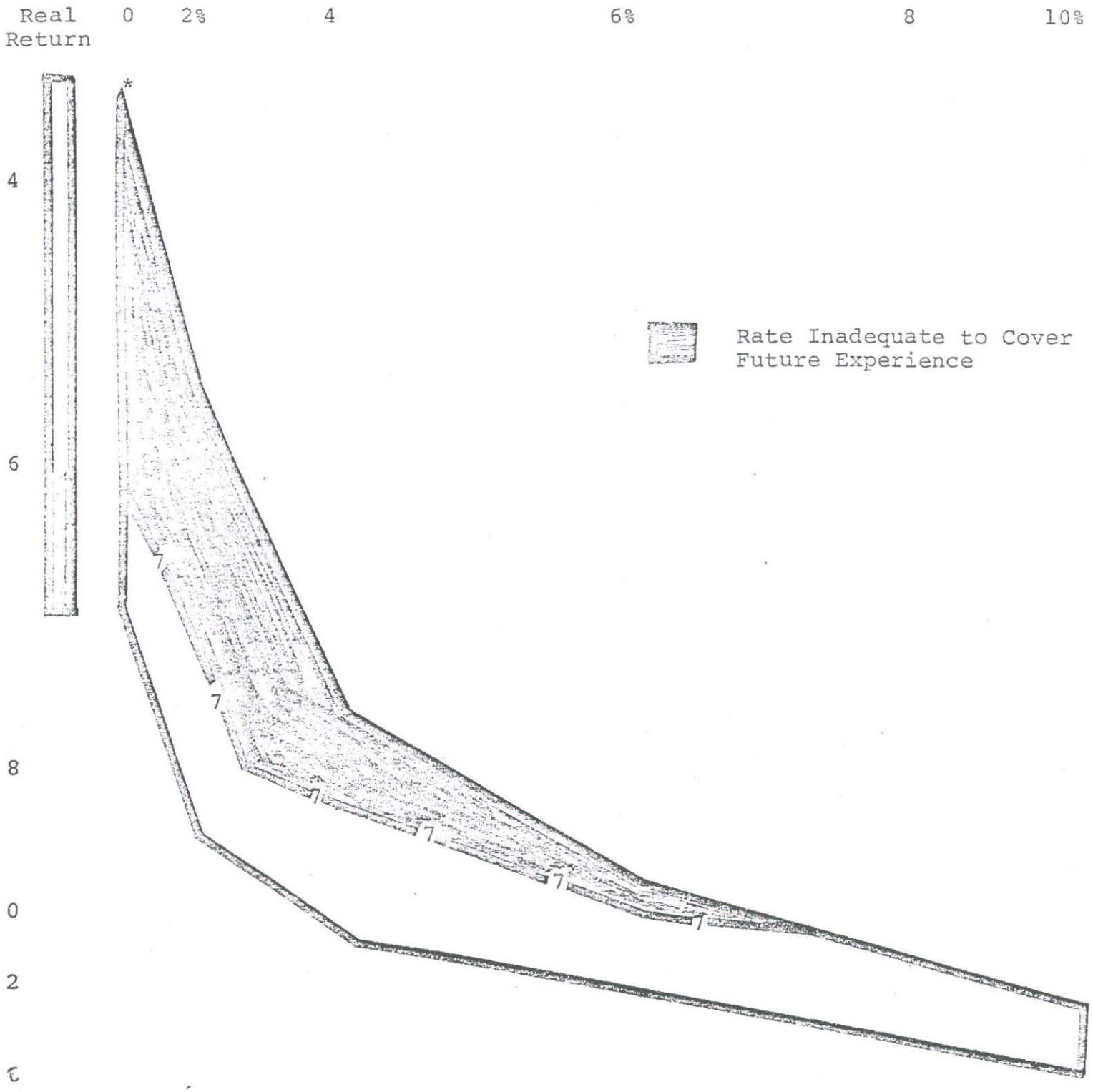
At all times it must be kept in mind that these results are probabilistic in nature. Changing any one of the elements entering into the illustration, i.e., the range of real rates of return, the distribution of investments, or the probability accorded future combinations of investment/inflation experience, will change the area of the future expected experience, increase or decrease the risk of inadequacy, and in particular, change the visual representation of the risk and management's appraisal that a particular percentage of contribution is reasonably justified.

To illustrate this, Chart 7 shows the results for the same line of reasoning, but modifying the portfolio distribution to 50% common stocks and 50% bonds. In these circumstances, the range of real return lies between 3-1/2% and 6-1/2%. This, in turn, expands the area of expected future investment return/inflation rate combinations. The result is that when the 7% of pay employer contribution rate is sketched in, the area of risk, i.e., where the rate is inadequate to cover the future experience, becomes substantially larger and the percentage contribution required to cover all of the possible combinations increases from 10% to 13% of pay. Clearly adoption of a 7% of pay contribution level is less defensible under these conditions.

Defining the future experience in this way clarifies the relationship between decisions on the portfolio distribution and, implicitly, the expected real rate of return by investment category and the adequacy of the employer percentage contribution

CHART 7

Adequacy of 7% of Pay Contribution to Meet
Future Investment/Inflation Experience Combinations
(Portfolio: 50% Stocks, 50% Bonds)



* Percentage Contribution Required to Cover
3-1/2% Return/2% Inflation Combination = 13% of Pay

rate, all as qualified by the extent to which the employer is willing to underwrite a risk of inadequacy in his initial contribution level.

Monitoring The Developing Experience

Under these conditions, where management must first determine a range of real rate of return and then make a decision concerning the trade-off between the level of percentage contribution requirement, and the number of possible future investment return/inflation rate experience combinations left uncovered, it is vital for management to have a continuing check to determine whether the experience that actually develops has been allowed for by the contribution rate that is being utilized.

Since the particular combination of future investment return and inflation that will be experienced is difficult to predict from past experience and since the rate of inflation and investment return tend to vary substantially from time-to-time, the only realistic policy that can be adopted by management is to check the developing relationship between the obligation and the asset accumulation from one year to the next. This, in turn, requires a definition of management's funding objective, i.e., the reason for accumulating assets in the pension fund.

The usual reason for accumulating assets in a pension fund, is to provide for the benefits in the course of payment and being earned by the active employees if the plan is terminated. The capital accumulated in the plan will be used after termination to continue payments for the retired employees and to provide for

the benefits earned before termination to active employees as they come due.

Thus, one measure of the adequacy of the asset accumulation is whether or not it will be sufficient to provide for the benefits that are being paid retired employeed and have been earned to date by the active employees. In almost all cases of termination of a pension plan, the benefits payable to the employees are based on their service and earnings to the date of termination and no future benefit credits are earned by continued service or by new employees. This result makes the definition of the benefits earned to date quite explicit, since both the amount and the time of payment are known, and the obligation has only to be discounted for future investment return and possibly mortality.

The rate of discount of the obligation becomes important and different from an on-going plan. A continuing plan has a flow of incoming employer contributions to even out and adjust to, developing circumstances. Because there is very little reliance on maturing issues to make benefit payments, capital volatility has little or no significance. Consequently, a continuing plan portfolio is usually expected to be heavily invested in volatile, higher yielding investments such as common stocks.

If a plan is terminated, however, not only is there no longer any employer contribution to adjust to, and to make up for investment losses, but increasing reliance must be placed on

utilizing the capital accumulation to make benefit payments. In consequence, the fund can no longer rely on investments with volatile capital values. Thus, the traditional way of investing a terminated plan portfolio is to convert it relatively quickly to fixed investments with appropriately scheduled maturities.

If the company has, as one of its objectives, securing the employees benefits earned to date if the plan is terminated, that security must be in terms of the expected yield on a fixed investment portfolio at some unknown future point of time. The yield from this type of portfolio will be substantially different from the investment return expected from a continuing program. The future investment return need not, however, be reduced to the "real return" bond levels because of the probability that bond yields will incorporate some elements of perceived, future inflation at the time of termination of the plan.

An offsetting factor is the benefits earned to date will be fixed at the time of termination no longer subject to inflationary increases. This will operate at least as a partial trade-off against the lowered investment return expectancy. As a result, the determination of this "benefits earned to date" standard is generally in terms of a lower interest rate and measured against an obligation without a prospective inflation element.

The important point is to recognize that the calculation of the obligation on termination of the plan involves significantly different considerations and procedures from those used to determine an appropriate percentage of pay to finance a continuing plan.

Once these adjustments have been taken into account, it is possible to make a very precise determination of the obligation for benefits earned to date. This obligation can then be compared to the assets on an adjustable cost basis and a funding ratio developed.

This relationship should be distinguished from the current position of the fund. Any measurement of the termination obligation at the present time must be made in terms of the current market value of the assets. At the same time, single premium annuity rates that are currently available can be utilized to determine the obligation.

While this is an appropriate check on current adequacy, it is not useful for purposes of determining the developing trend of funding the potential future termination obligation because of the volatility of current market values and the change in single premium annuity rates reflecting changing interest conditions. For this reason, a projected rate of return on fixed investments for termination at an unknown future point in time and an adjusted cost basis of the assets present a more appropriate compari-

son and develop trend lines on which a judgment as to the adequacy of the contribution level can be based.

The principal point is that, if the experience actually developing is being covered by the contribution rate, then the percentage of the termination obligation that is funded should be steadily increasing or the plan should be continuing in a fully funded condition. Chart 8 exhibits the expected future pattern of funding if the 7% of pay contribution were made and the future experience reflected a 6% investment return and no inflation.

The point of this comparison is highlighted by Chart 9. In this illustration, the same 7% of pay is contributed, but the future experience is sharply different, i.e., a 10% investment return and a 4% inflation rate. While the dollar amounts are strikingly different and larger, it is significant to observe that the progress of funding is approximately the same.

As a result, it is unnecessary to have to specify what future investment return, inflation rate combination will actually be experienced. By using the funding ratio between the benefits earned to date and the asset accumulation, a determination can be made as to whether the actual experience is being appropriately covered by the percentage contribution rate or not.

To make this clear, Chart 10 illustrates the progress of funding if the future experience is not covered by the employer

CHART 8

Progress of Funding
(Future Experience - 6% Investment Return, 0% Inflation)

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OBLIGATION AND ASSET ACCUMULATION

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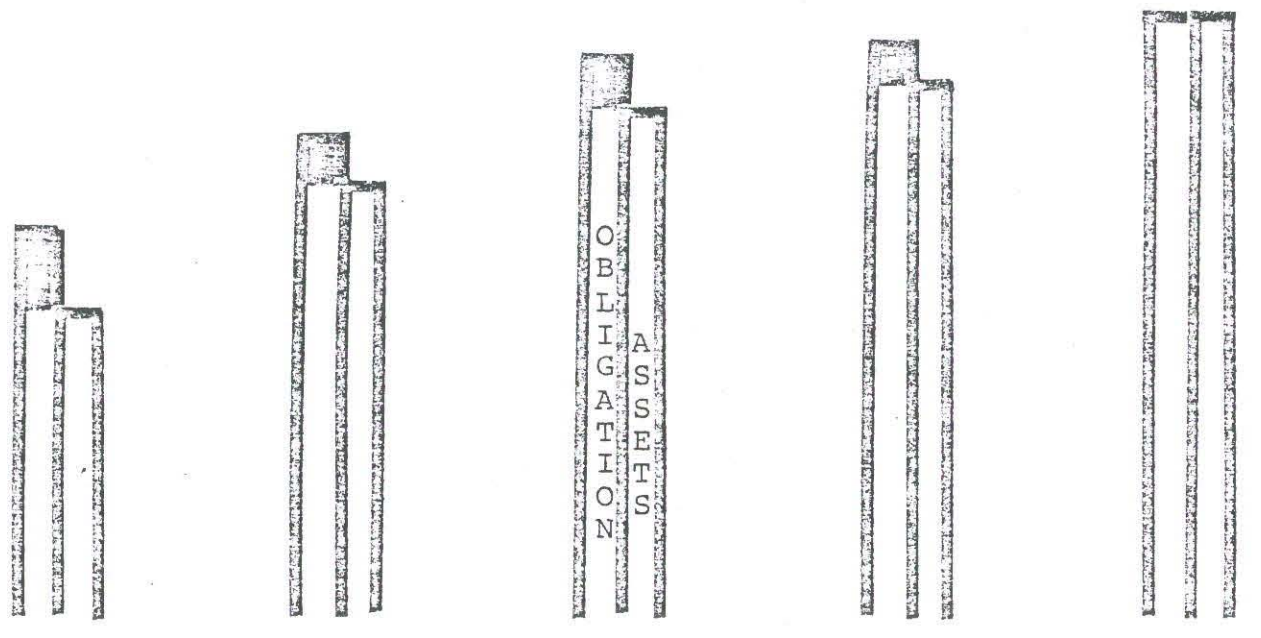

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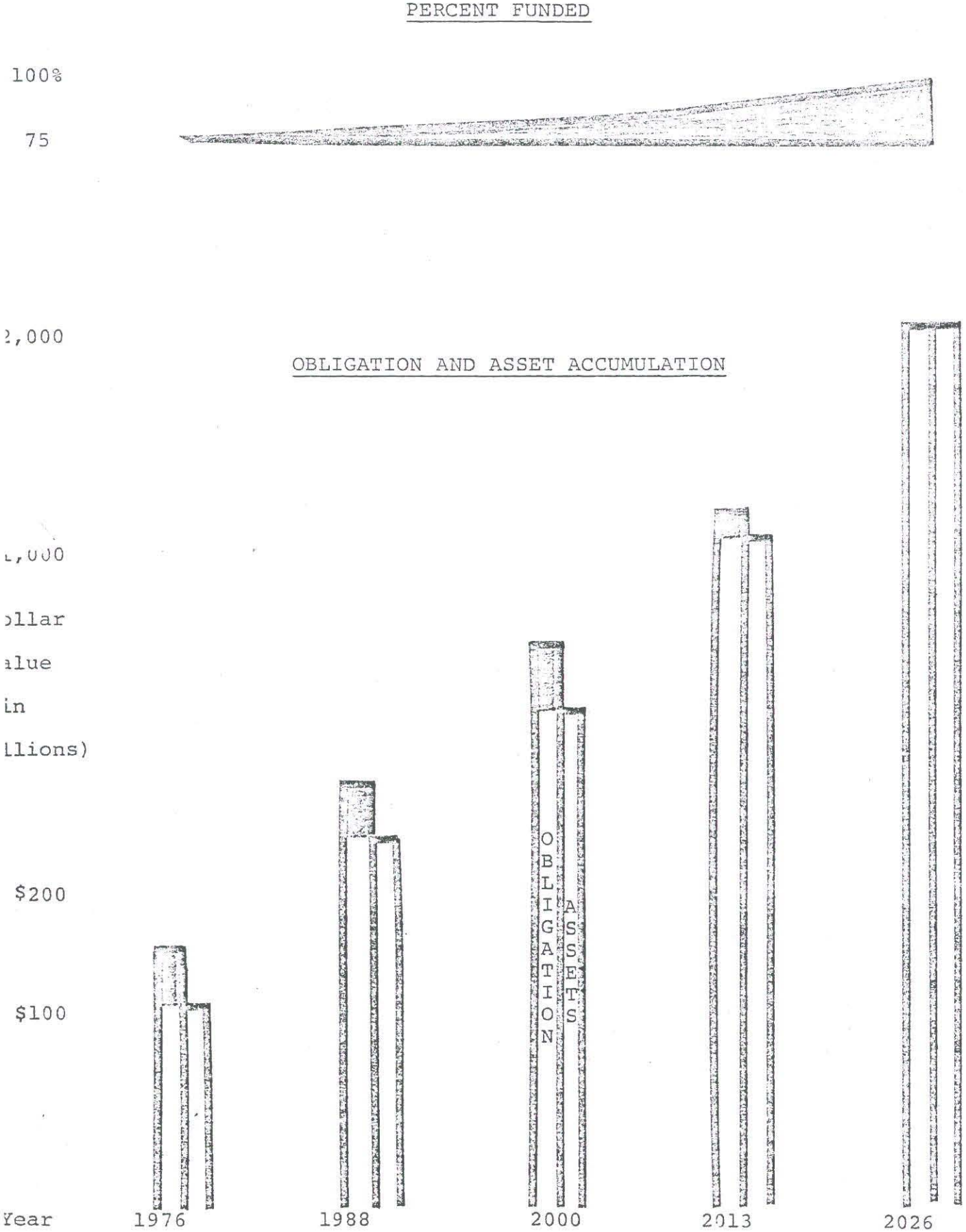
CHART 9

Progress of Funding
(Future Experience -10% Investment Return, 4% Inflation)



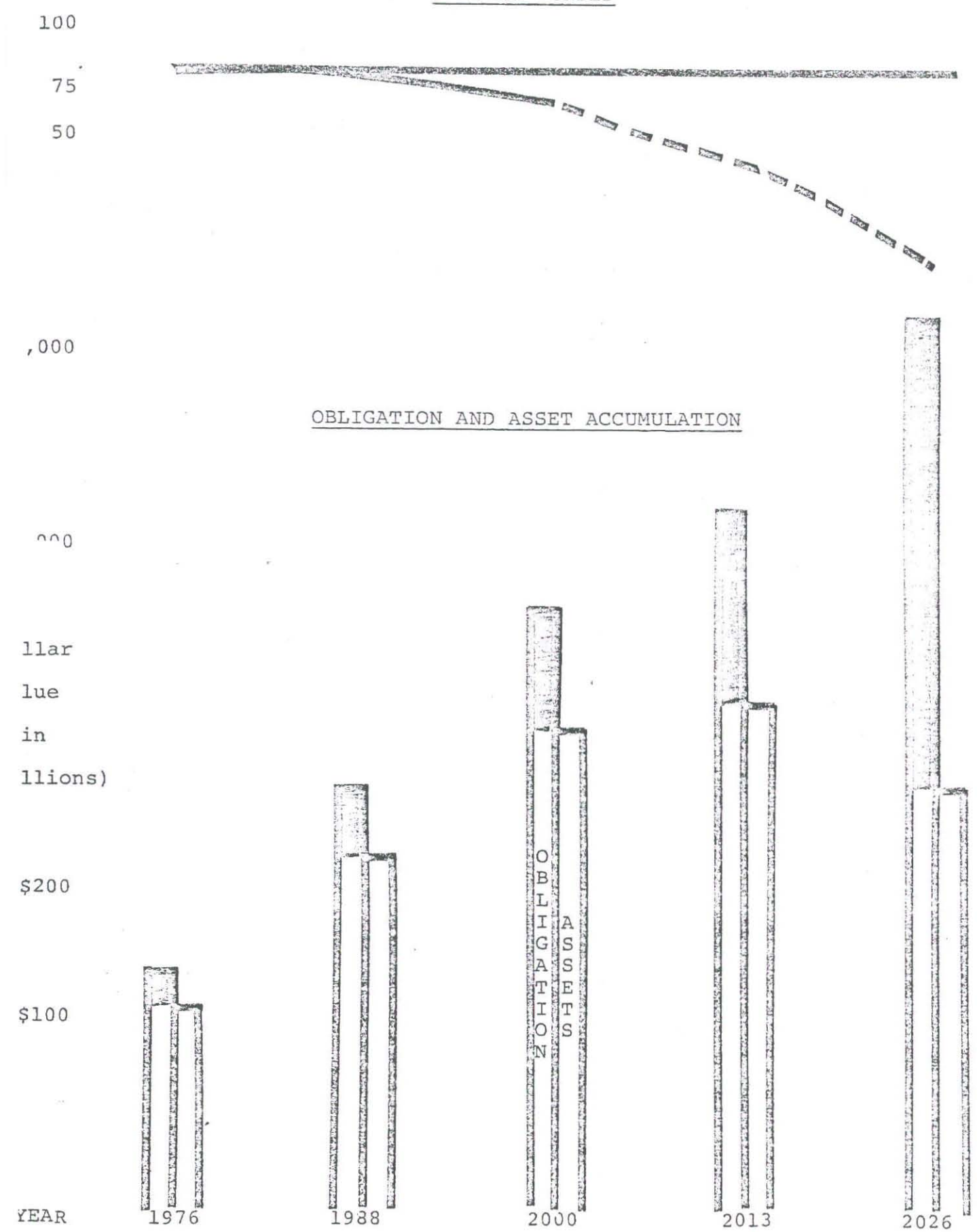
contribution rate. In this exhibit, a 7% of pay contribution is combined with an 8% investment return and 4% inflation. As shown by Chart 3 (and Table 1), this combination of future experience is not covered by 7% of pay. This inadequacy quickly becomes apparent by the deviation of the progress of funding trend from that expected. As shown in Chart 10, the percentage of the obligation that is funded sharply declines over time instead of increasing to the fully funded objective.

In other words, it is expected that the funded ratio will steadily advance toward 100%. In fact, however, the funding ratio starts to decline immediately, and continues to decrease steadily. This ratio, then, becomes a clear signal that the percentage contribution rate is inadequate and the underlying policy decisions as to real rates of return and distribution of investments have been inappropriate.

The question then arises as to when a correction would be made and the extent of the adjustment. With regard to when an adjustment would be made, company policy can be that a review of the investment and contribution policies will be undertaken whenever a decline in the funding ratio occurs in three or five successive years. This will trigger a review of the financing policies long before any serious inadequacy occurs and at a time when the fund still has substantial assets.

CHART 10

Progress of Funding
(Future Experience - 8% Investment Return, 4% Inflation)



With regard to the extent of the adjustment, the appropriate contribution rate would have been at the 8% of pay level. However, since some time has elapsed before the inadequacy became clear, it is likely that the rate necessary to meet these developing experience conditions and make up the asset accumulation difference over the funding period, would fall between 8% and 8-1/2%.

Thus, the size of the adjustment anticipated if adverse experience develops, is of the order of 1% to 1-1/2% of payroll. This level adjustment should not constitute a problem in most cases, particularly since it can be introduced at an appropriate time within a five year period. Consequently, the plan sponsor can make realistic judgments to the current level of his contributions and the degree of risk he wishes to undertake without subjecting himself to a large, unexpected drain on capital or an unmanageable future increase in contribution requirements as a percentage of pay.