PENSION PLANS IN AN INFLATIONARY ENVIRONMENT

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ABSTRACT

This paper analyzes the design and funding of privately sponsored retirement programs in an inflationary environment. It is argued that inflation-conscious sponsors will prefer benefit designs that deliver appropriate benefits to employees while minimizing financial risk to the sponsor. The paper develops such designs, and also suggests valuation techniques that should accurately reflect the financial condition of pension plans in an inflationary environment.

I. INTRODUCTION

Inflation, as the term is popularly used, refers to the tendency of wages and prices to increase in tandem. Two aspects of these increases have been particularly noteworthy in recent years—the unprecedented and sustained high level of increase in the United States and the highly erratic fluctuation over short periods. The prime rate, a commonly used measure of the price of capital, has hovered around 20 percent, an unthinkable level as recently as five years ago, and has repeatedly moved several percentage points in a matter of days. It is these aspects of recent inflation in America on which this paper will focus.

II. INFLATION AS IT AFFECTS THE PENSION ACTUARY

The financial structure of retirement programs has been algebraically described by the following equation: $C + I = B + E$. In words, plan contributions plus investment income will equal benefits paid plus expenses over the life of the retirement program. The right-hand side of the equation, benefits plus expenses, represents the ultimate cost of the plan and is a function of plan design. The left-hand side of the equation, contributions plus investment income, also reflects the incidence of plan cost adopted by the sponsor, which is a function of the actuary's valuation methods and assumptions. Ultimate cost and incidence of cost are separate issues, and will be analyzed separately.

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III. ULTIMATE COST: DESIGN CHOICES REGARDING INFLATION

The design of a privately sponsored retirement income program is dependent upon the sponsor's goals for benefit delivery to employees and the sponsor's ability to finance those goals. Inflation threatens not only the financial strength of retirement plans, but that of the sponsors as well. Sponsors necessarily will seek to minimize the financial uncertainties created by inflation, which would include the risks associated with retirement programs, since such programs are frequently a corporation's largest current labor expense after payroll.

The minimum financial risk would be to have no retirement program, to provide no structured retirement benefits. For most employers, this is unacceptable for a number of reasons. Employees have a real need for income replacement in their retirement years and for the promise of future security that retirement programs give them during their active employment. Employers who fail to provide these tax-favored programs may find themselves at a significant disadvantage in attracting and retaining personnel. It is reasonable to assume that most employers will continue to find it in their best interests to provide retirement benefits to employees.

An employer who decides to provide retirement benefits will find the alternatives specified to a considerable extent by federal law. With the exception of certain management plans, the Employee Retirement Income Security Act of 1974 (ERISA) requires that pension plans be funded, and United States tax policy strongly favors funding. While asset accumulation is the only choice currently available in the United States, alternative approaches have been successfully employed abroad. The book-reserve approach has been used in countries having high inflation rates (Argentina) and capital formation needs (Germany). Appropriate United States fiscal policy in this regard is a political and economic issue deserving of further study, but beyond the scope of this paper.

Retirement benefits in this country are generally provided by defined benefit or defined contribution programs. Under a defined benefit plan, the sponsor agrees to fund benefits promised by a formula usually based on each employee's years of service and salary history. Under a defined contribution program, the sponsor makes an annual contribution (which may be either discretionary or based on a specified formula), which is then allocated to individual employee accounts, usually on the basis of current salary levels.

The relative advantages and disadvantages of the defined benefit and defined contribution approaches are dependent on one's frame of reference. Therefore, it is useful to review each approach's characteristics from the standpoint of a sponsor seeking to minimize financial risk in an

TABLE 1

CONTRASTING CHARACTERISTICS OF DEFINED BENEFIT
AND DEFINED CONTRIBUTION PROGRAMS

Defined Benefit	Defined Contribution
Employee's benefit is defined	Employer's contribution is defined
Employer takes experience risk	Employee takes experience risk
Benefits usually paid monthly at retirement	Benefits usually paid in a lump sum at termination
Unfunded liability	Fully funded benefits
Unallocated assets	Individual accounts
Vesting at ERISA minimums	Vesting more rapid than ERISA minimums
Past service can be fully recognized	Past service is not significantly recognized
Significant integration with social security	Limited integration with social security
Benefit delivery strongly favors older workers	Benefit delivery slightly favors older workers
Benefits can be adjusted after retirement	Benefits cannot be adjusted after retirement

inflationary environment. Table 1 provides a list of contrasting characteristics of the two arrangements.

It is immediately apparent that the sponsor looking to minimize financial risk is better served by a defined contribution program. Under a defined benefit plan, the sponsor assumes funding risks dependent on such factors as future salary increases, investment return, employee turnover and mortality, and changes in social security benefits; he may face significant unfunded liabilities at plan inception or as experience develops; and he must meet ERISA's minimum funding standards. Under a defined contribution program, the risks of future experience rest with the employee; benefits are fully funded; and contributions may be totally discretionary.

The inflation-conscious sponsor is therefore led to prefer defined contribution programs, and may be expected to use a defined benefit plan to solve only those problems of benefit delivery that cannot be met under a defined contribution arrangement. The characteristics of potential benefit delivery under both approaches must therefore be considered.

In reviewing our list of characteristics, some of the limitations on defined contribution programs are more apparent than real. While current defined contribution plans frequently deliver a lump sum benefit at termination, it is certainly permissible to make monthly annuities an optional, normal, or mandatory form of benefit payment. Although benefits paid as a lump sum would not be subject to postretirement adjustment, it is at least conceivable that the sponsor could make additional contributions to adjust defined contribution benefits paid as annuities. Again, while

current defined contribution plans usually are not coordinated with social security, such a design is sanctioned under present regulations.

The more rapid vesting of benefits that the Internal Revenue Service requires for defined contribution plans means that relatively more dollars are spent on termination benefits. While the level of this expense will vary from sponsor to sponsor, it has been estimated that under a defined benefit plan, the additional expense of full vesting after five years over that of full vesting after ten years will be in the neighborhood of 3–5 percent of total contributions.

There is, however, an additional factor to be considered in relation to vesting. Table 1 also notes that benefit delivery favors older workers to a greater extent under defined benefit plans than under defined contribution plans. Since most turnover occurs among younger employees, termination benefits will be relatively larger under defined contribution plans than under defined benefit plans. The inflation-conscious sponsor must evaluate these costs for the particular plan involved to determine if the additional cost of termination benefits is an acceptable price to pay to limit the financial risks of inflation.

Another advantage commonly ascribed to defined benefit plans is the ability of the formula approach to provide a direct and predictable relationship between anticipated benefits and final pay. To determine the significance of this advantage, we must analyze the ability of defined contribution plans to deliver benefits related to final pay. Since annual employer contributions under these plans normally are allocated based on salaries paid during the year, it is sometimes assumed that benefit delivery is similar to that under a career average pension formula—that is, that benefits reflect an average of career earnings. This view is inaccurate because it ignores the effect of interest, as illustrated in the following example.

Suppose an employer contributes 5 percent of covered payroll annually to a defined contribution plan which allocates the contribution based on salary levels. Jones, who earned $\$X$ during the year, will receive a contribution of $0.05X$ for the year. Also assume that pay increases and investment return are equal, say 8 percent annually. The following year, Jones's allocated contribution will be $0.05(1.08X)$, which will be identical to the previous year's allocation plus interest. In fact, if we assume Jones works until his retirement n years later, his pay in his final year of employment will be $F = (1.08)^n X$, and his account balance will be

$$\sum_{i=0}^{n-1} [0.05(1.08)^i X](1.08)^{n-i} = 0.05 Fn .$$

In other words, under these assumptions, the account balance is a function only of final pay, the employer's contribution rate, and the employee's years of service. When this account balance is converted to a straight life annuity, the monthly payment will, of course, be dependent upon the absolute level of the interest rate. If, however, for purposes of inflation protection, an increasing annuity is purchased, and the annuity increases at the rate of interest, the present value of the resulting benefit is described by

$$\frac{1}{D_r} \sum_{j=0}^{\omega-r} (1 + i)^j D_{r+j} = \frac{1}{D_r} \sum_{j=0}^{\omega-r} v^r l_{r+j}$$

$$= \frac{1}{l_r} \sum_{j=0}^{\omega-r} l_{r+j} .$$

It is apparent that the present value of this increasing annuity is independent of the interest rate.

Extending this analysis to the level of integration available under defined contribution programs, the limits prescribed by Revenue Ruling 71-446 are seen to be of much less consequence in the current inflationary environment than when the ruling was issued. Section 15.02 of the ruling allows defined contribution plans to allocate annually to higher-paid employees up to 7 percent of qualified compensation above a chosen integration level. At an interest rate of 10 percent, a person aged 65 can convert a lump sum of 7 percent of qualified pay to a straight life annuity of about 1 percent of pay above the integration level. Assuming an integration level that floats with inflation, an employee receiving average salary increases and annual allocations of 7 percent of qualified pay will receive a straight life annuity of about 1 percent of qualified pay for each year of service; this is comparable to the allowable integration limit for final pay defined benefit formulas.

The inflation-conscious sponsor can therefore achieve defined contribution benefit delivery closely related to final pay by making annual contributions that are stable as a percentage of payroll and by following an investment strategy designed to meet or exceed average pay increases. The major potential shortfall of this approach seems to be failure to meet assumptions. In particular, the relationship of benefit delivery to final pay breaks down if salary increases significantly exceed investment return. Obviously, this is most likely to occur on a group basis when the investment strategy fails to meet its goal. This is precisely the type of risk our inflation-conscious sponsor may wish to transfer to the employees.

Assuming, however, that an effective investment strategy is implemented, it is likely that some individuals still will not receive appropriate benefits. Specifically, in most organizations it is likely that some employees will receive promotions resulting in substantial salary increases. The later in one's career that promotion occurs, the greater the gap in benefit delivery, since there are fewer years at the "promoted" salary level.

Table 2 provides another list, this one reflecting benefits available under defined benefit plans that are difficult or impossible to duplicate in the defined contribution environment. Several comments are in order concerning these benefits. First, the need for these benefits is not universal, so the inflation-conscious sponsor need not look beyond a defined contribution plan if he is not interested in delivering these benefits. Second, not all sponsors will find it necessary to install a defined benefit plan to deliver these benefits. If the problems that these benefits address rarely arise, the sponsor may use nonqualified payments rather than a formal plan. Some problems, particularly additional past-service benefits for promoted employees, may be problems that apply primarily to management employees. In this case, ERISA specifically sanctions unfunded management plans and exempts them from all ERISA requirements other than a one-time notification to the federal government. Third, the results of this analysis should hardly be taken as signifying the decline of defined benefit plans. The characteristics of retirement plans in relation to inflation is our primary consideration; sponsors will maintain defined benefit plans for historical, political, competitive, and other reasons beyond those listed in Table 2. The design of defined benefit formulas that minimize the sponsor's financial risk must therefore be considered on a broader basis than the characteristics listed in Table 2 would suggest.

Formulas generally define benefit based on some combination of service, salary level, and social security benefit levels. There are three categories of benefit formulas in relation to salary: flat dollar, career average, and final pay. In terms of benefit delivery only final pay plans automatically

TABLE 2

FORMULA BENEFITS DIFFICULT TO DELIVER UNDER
DEFINED CONTRIBUTION PLANS

Past-service benefits
Early retirement subsidies
Increased benefits for retirees with short service (frontloading)
Increased benefits for promotions
Postretirement benefit adjustments

adjust benefit to final pay levels (usually a highest three- or five-year average). Flat dollar formulas (e.g., $X times years of service) are most frequently used with hourly paid employees where pay levels do not vary significantly (i.e., the formula produces about the same result as a pay-related formula), and the dollar level is generally increased every two or three years in response to inflation. The increases generally apply to both past and future service. These plans are particularly popular in the Taft-Hartley environment, as they allow the union to claim bargaining credit for inflationary increases that occur automatically under pay-related plans.

Career average formulas (e.g., for each year of service, annual benefit equals X percent of pay for that year) also require periodic adjustment to deliver benefits appropriately related to final pay. The technique used, known as "updating," chooses pay from one year or an average of years to be used in calculating benefits for all preceding years—for example, benefits for years before 1979 will be based on 1979 pay. In this example, a person retiring in 1982 would receive a benefit based on his pay in the years 1979 through 1982—in other words, on late-career pay, which should bear a close relationship to final pay.

In practice, each type of formula is adjusted to deliver benefits related to final pay. Yet the future benefit promises under the various formulas are quite different and of considerable interest to the inflation-conscious sponsor. The career average and flat dollar plans respond to inflationary increases by periodic amendment, while the final pay plan does so automatically. In other words, increases that are automatic under a final pay arrangement are discretionary with the plan sponsor under career average and flat dollar arrangements. The recent action of AT & T in moving from a final pay to a career average formula puts the company in the position of declining increases it cannot afford and earning employee-relations credit for the increases it does adopt. The sponsor can deliver appropriate current benefits while minimizing the promise of uncertain future benefits.

We may reach a similar conclusion by considering the nature of service. At any given time, the amount of past service is known; future service is unknown. Under flat dollar and career average plans, potential future benefits based on past service are known and the actual benefits are dependent only on future mortality and nonvested turnover. Any other change would be based on a consciously adopted amendment. However, under final pay plans, potential future benefits based on past service are unknown because they are dependent on ultimate final pay. Recognizing that retirement benefits actually delivered are based on completed careers—i.e., past service—the sponsor can control current benefit delivery by manipulation of past-service benefits. This process necessarily involves

greater uncertainty under a final pay formula than under a career average or flat dollar plan.

The same logic argues for ad hoc increases in postretirement benefits rather than a cost-of-living escalator. Indeed, automatic cost-of-living escalators are relatively rate in United States pension plans. Each percentage point of automatic escalator will increase projected liabilities by about 10 percent, so that an 8 percent annual escalator would increase projected liabilities by 80 percent. Ad hoc increases, which represent a benefit grant to an existing retiree population based on known past service, generally entail considerably less additional liability and financial uncertainty.

Regarding the integration of defined benefit plans with social security, Revenue Ruling 71-446 authorizes two alternative methods. Under the offset method, the formula contains a subtraction term based on a percentage of actual or estimated social security benefits. Under the step-rate method, a higher percentage of benefits is paid on salary above a specified level ("breakpoint"), which may be either fixed (e.g., $10,000) or floating (i.e., the dollar amount changes from year to year, usually based on changes in the social security maximum taxable wage base or covered compensation level). Final pay formulas usually use the offset method, while career average formulas normally employ the step-rate method. Flat dollar plans are not directly integrated, since benefits are not pay-related.

The structure of Revenue Ruling 71-446 assumed rough equivalence between the step-rate and offset methods. However, the experience of the last ten years has disproved this assumption. Under the stress of inflation, the social security system has been beset by financial difficulties. There are two solutions to these difficulties—raise inflow (taxes) or reduce outgo (benefits). Congress has used both approaches in recent years, and more of the same can be expected. Reduction of social security benefits does not affect the step-rate formulas, but requires offset plans to provide larger benefits than originally anticipated. Increases in tax rates do not affect either type of formula; increases in the wage base do not affect offset formulas but reduce benefits available under step-rate formulas with floating breakpoints. The sponsor will minimize his financial risk by selecting a step-rate formula with a floating breakpoint.

Our inflation-conscious sponsor has now been led to prefer defined contribution programs, to use defined benefit plans only to solve certain problems, and to prefer flat dollar formulas or career average step-rate formulas with floating breakpoints and periodic updating. Let us now

consider how our sponsor can coordinate the defined contribution and defined benefit approaches.

Our analysis has suggested that the defined contribution plan provide the basic benefit delivery, with the defined benefit formula acting as a supplement to solve specific benefit delivery problems. This philosophy is most closely met by the floor-plan approach. Before 1976, the Internal Revenue Service did not allow qualified defined benefit programs to offset defined contribution benefits in computing benefits, on the theory that the defined benefit plan would not produce definitely determinable benefits. Revenue Ruling 76-259 reversed this position. Although the ruling speaks only of profit-sharing offsets, this is a reflection of 1976 terminology; the IRS has approved offsets of other defined contribution benefits, such as stock bonus programs.

Floor plans consist of a defined benefit and a defined contribution portion, each portion representing a separate qualified plan. The defined contribution portion operates as other defined contribution plans, although it typically includes a method for converting the account balance to a monthly annuity. The defined benefit portion includes a typical benefit formula. For a retiring or terminating employee, benefits under the formula are compared with the annuity generated by the defined contribution portion of the plan. If the annuity is larger, no benefits are payable from the defined benefit plan; if the annuity is smaller than the formula benefit, the defined benefit plan provides the difference, resulting in a total benefit equal to the formula benefit. In other words, total benefit delivery for each employee will be the larger of the formula benefit and the account benefit.

Let us compare the floor-plan approach with a defined benefit plan standing alone. If the two programs use an identical defined benefit formula, doesn't the sponsor run identical financial risks under the two approaches?

Since ultimate real cost is a function of benefits plus expenses, identical benefit promises reflect identical ultimate cost. In fact, since benefits under the defined contribution portion of a plan may exceed the formula benefits, and frequently will vest more rapidly, the floor plan's ultimate cost probably is greater than the defined benefit formula standing alone. However, financial risk is also a function of incidence of cost. The floor plan provides considerably greater short-term control over the incidence of cost than does the defined benefit approach. The range of contributions under the defined benefit plan is prescribed by ERISA and requires payment of normal cost plus an amortization payment on the unfunded accrued liability—thirty- or forty-year funding as a minimum, ten-year fund-

ing as a maximum. Since the minimum funding standard account operates on a cumulative basis, some increase in the range may develop over time if credit balances develop. It is clear, however, that the discretion available is considerably less than in the floor-plan environment, where the defined contribution portion of the plan may receive employer contributions of between 0 and 15 percent of covered payroll in any year. While the defined benefit portion of the plan is subject to the ERISA requirements described above, this portion of the plan is expected to deliver only the difference between the formula benefit and the projected defined contribution benefit, and it is only this projected difference which must be funded according to ERISA's constraints. When the sponsor raises or lowers the annual contribution to the defined contribution portion, there is a roughly off-setting decrease or increase in projected benefits under the defined benefit portion. This change in liabilities is then spread over the appropriate funding period under the actuarial funding method in use. There is not an immediate offsetting effect on the defined benefit contribution level, allowing the sponsor considerable short-term discretion in terms of total annual contribution to the floor plan.

It is instructive to step back from the focus on inflation momentarily to review the appropriateness of floor plans when other factors are considered. Floor plans are not widely used at the present time. As such plans have been allowed only since mid-1976, this is not surprising. Companies such as Xerox, Hewlett-Packard, and Georgia-Pacific have adopted floor plans in recent years. These companies previously had defined contribution programs standing alone and wished to provide a minimum guaranteed benefit to employees. There are other situations, however, that suggest the use of a floor plan.

Table 1 notes that defined benefit plans favor older workers to a greater extent than do defined contribution programs. Both programs favor older workers to some extent since benefits frequently are based on salary, and older workers tend to occupy more highly paid positions. However, the defined contribution plan allocates capital to employee accounts while the defined benefit plan promises an annual benefit deferred to some retirement date. Obviously, the deferral period is shorter for older workers, making the benefit promise more valuable to them. This difference in value escalates rapidly as interest rates rise. Table 3 quantifies these effects by comparing the value of age 65 pension benefits for employees whose current ages are 55 and 25. The ratio of annuity factors, which is just D_{25}/D_{55}, reflects the very rapid drop in the age 25 deferred annuity factor as the interest rate rises. Other factors, such as vesting schedules, increase the favoritism toward older workers.

These facts demonstrate that a pension accrual is not a particularly valuable benefit to young employees in an inflationary environment, reinforcing the strategy of delivering adequate current benefits with a minimum of future benefit promises. However, Table 3 also points out a significant advantage of a floor-plan arrangement in an inflationary environment; namely, that while the ultimate benefit may be identical to that of a defined benefit plan standing alone, benefit accrual is tilted to be less adverse to younger employees. This is often a significant plus in employee relations, especially for employers concerned about the threat of unionization.

On the other hand, more dollars are diverted to termination benefits. To analyze this characteristic, it is useful to compare career benefit delivery under defined benefit formulas with delivery under defined contribution or floor-plan arrangements. Obviously, each type of plan can be designed to deliver adequate benefits for an employee spending his entire career with the sponsor. Since such an employment pattern is becoming quite rare, benefit delivery to employees holding several jobs in their careers is the issue requiring primary attention.

As we have seen, defined contribution accounts are updated by interest accumulation. Thus, if all employers have identical defined contribution plans and the employee is fully vested whenever he changes jobs, his total retirement benefit will be essentially identical whether he spends his career with one employer or with several. Under a defined benefit plan, however, rights are fixed at termination. The updating of past service to current pay levels, whether automatic or discretionary, does not extend beyond termination. Thus, if all employers have identical defined benefit formulas related to final pay, an employee who has several employers is at a disadvantage compared with the employee who spends his entire

TABLE 3

COMPARATIVE VALUE OF RETIREMENT BENEFIT PROMISE

INTEREST RATE	DEFERRED-TO-65 ANNUITY FACTORS*		RATIO
	Age 55	Age 25	
0%	13.3571	12.2272	1.09
2	9.0930	4.5953	1.98
4	6.3478	1.7916	3.54
6	4.5299	0.7220	6.27
8	3.2954	0.2998	10.99
10	2.4382	0.1279	19.06
12	1.9590	0.0599	32.70
14	1.5004	0.0270	55.57
16	1.1626	0.0124	93.76

* UP-1984 Mortality Table.

career with one employer, and the disadvantage increases with inflation. This problem can be solved to some extent by "frontloading" the benefit formula, that is, designing the formula to deliver more benefits per year of service for the earlier years of service than for the later years. However, frontloading is usually based on twenty-five or more years of service and usually is stripped from termination calculations by projecting a normal retirement benefit and then prorating it over the employee's entire potential career. Thus, frontloading is helpful only at one's final employer, and solves the problem fully only for those who complete the entire service period of frontloading with the final employer. As the number of employees changing jobs after age 40 increases, frontloading becomes a less effective solution.

An alternative solution for management employees is to use an unfunded management plan. Since these plans are not subject to ERISA's constraints, an infinite variety of nontraditional formulas can be used to deliver appropriate benefits. For example, the formula could provide a supplemental benefit giving each executive a minimum of 75 percent of gross pay from all sources (social security, retirement plans of this and other sponsors, and so on), regardless of years of service.

In any event, the floor-plan approach provides termination benefits in much the same manner as defined contribution plans. If these plans were used universally by American sponsors, the benefit delivery problems for employees who change jobs in an inflationary environment would be greatly alleviated. Since the great majority of American workers work for several employers during their lifetime, this analysis has significant implications concerning United States tax policy toward defined benefit and defined contribution programs.

In summary, a floor plan may offer significant advantages over a defined benefit plan standing alone in terms of funding discretion and benefit delivery to younger employees. Sponsor interest in these plans can be expected to increase.

IV. INCIDENCE OF COST: THE CHOICE OF ASSUMPTIONS AND FUNDING METHOD

When a sponsor has established an appropriate plan design, ultimate real cost has been established. The sponsor now faces the question of incidence of cost. No sponsor wants financial surprises; actuarial funding methods strive to establish a stable contribution pattern. These facts are no less true in an inflationary environment. In this section, attention is focused on the uncertainties that may develop under present actuarial techniques, and on alternative techniques that will define or eliminate these uncertainties.

A primary function of consulting actuaries is to compute the range of deductible employer contributions to defined benefit programs. The techniques used for this purpose are limited to those approved by the Internal Revenue Service. As will be seen, the approved methods require certain unrealistic assumptions. This does not mean that the sponsor must accept these inaccuracies in implementing a plan. One alternative is to develop a contribution pattern based on the most realistic assumptions available, and then fit these results as closely as possible within an approved method. While it may be argued that development of two sets of numbers is wasteful, it seems prudent to comply with the current tax code but not allow compliance to limit one's methods unrealistically.

This discussion will first review the overall realism of standard valuation techniques, and then review the selection of individual assumptions. The mathematics of pension funding are well developed and do not require a noninflationary environment for validity. This section of the paper will consider the structure of assumptions appropriate for an inflationary environment.

The commonly used funding methods generally assume that appropriate contributions can be set by applying a limited number of decrements to the present employee population and benefit formula (with projected benefits limited to the current ERISA benefit maximum). It is more realistic to estimate the potential future growth or contraction of the work force, to consider expected future plan amendments (whether or not they are intended to respond to inflation), and to assume future cost-of-living increases in the current ERISA benefit maximum. This is especially true for the inflation-conscious sponsor, as each of these items (except contraction of the work force) will increase projected liabilities.

Regarding the selection of individual assumptions, two approaches are commonly used—the explicit approach, which requires each assumption standing alone to be reasonable, and the implicit approach, which requires only that the assumptions in the aggregate produce a reasonable result. Available information suggests that the implicit approach probably is the dominant approach at the present time: it is certainly in widespread use.

Only rarely are implicit assumptions actually tested against explicit assumptions. Also, while implicit and explicit assumptions may produce similar current contribution levels, they will produce a different pattern of gains and losses. For example, suppose the assumptions are designed so that salary scale losses are offset by investment gains. Since the salary scale applies only to the working lifetime, while the interest assumption applies over the entire lifetime, salary scale losses necessarily will appear earlier than investment gains in closed-group methods. This suggests that while a particular set of implicit and explicit assumptions may prescribe

identical current contribution levels, they will prescribe a different pattern of future contributions under a given set of closed-group experience and, therefore, they are not fully comparable.

Implicit assumptions are often defended using one or more of the following arguments: first, that the inherent conservatism represents an appropriate margin for error; second, that explicit assumptions are overly influenced by current market conditions and therefore lead to frequent change and unstable contribution patterns; third, that a "realistic" salary scale would encourage higher wage demands from unions; and fourth, that implicit assumptions are widely accepted in the profession and therefore subject to limited criticism. Responses to these arguments might include the following: first, that a "margin for error" seems inconsistent with the spirit of ERISA's "best estimate" requirement; second, that the ability to maintain an implicit interest rate assumption suggests that explicit interest rates can also be maintained in the face of current market fluctuation; third, that in many cases, union wage demands are not an issue in setting assumptions, and the actuary's projections are likely to be given little or no credence at the bargaining table; and finally, that the profession's wide acceptance of implicit assumptions in the past is only one factor to be considered in the discharge of one's professional duties.

To sum up, the inflation-conscious sponsor should be aware that implicit assumptions insert unnecessary confusion into an already uncertain process. At the same time, the financial uncertainties of inflation create doubt as to whether any one set of assumptions can truly be considered explicit. The sponsor may therefore be interested in projecting valuation results under a range of assumed future experience. This process will identify the relative sensitivity of the plan to the experience under each of the assumptions, which in turn may suggest design changes to minimize the potential impact of adverse experience.

In examining the individual assumptions used in the valuation process in relation to inflation, attention focuses on salary and interest assumptions. It is often said that over the long term, investment return will averge 3 percentage points over inflation (representing real return) and salary increases will average between 0 and 2 percentage points over inflation (representing merit and productivity increases). This has led to the common practice of focusing on the spread between the salary and interest assumptions as a measure of their reasonableness.

The experience of recent years has brought the validity of these economic assumptions into serious question. Moreover, since the interest rate applies over the entire remaining lifetime of the employee population while the salary scale applies only over the remaining working lifetime,

a general working rule is that a 1 percent increase in the interest rate assumption requires a 2 percent increase in the salary scale to produce comparable contribution levels. Even assuming that the spread is an appropriate test for explicit assumptions, it follows that the spread is not an appropriate measure of implicit assumptions.

Another serious effect of inflation's uncertainty is the significant difference between short-term and long-term interest rates in the marketplace. For example, Pension Benefit Guaranty Corporation (PBGC) rates for immediate annuities have hovered around 10 percent during 1981, while rates for deferral periods of over fifteen years have remained constant at 4 percent since 1979. The solution adopted by PBGC, select and ultimate interest rates, deserves wider use in the valuation process. The contribution range used for deduction purposes allows funding over ten years as a maximum and thirty or forty years as a minimum. The sponsor usually selects the funding period internally. Since economic expectations may vary widely over this range, select and ultimate interest assumptions should produce a more realistic measurement of the range.

Besides salary and interest assumptions, other valuation methods and assumptions are affected by an inflationary environment. Asset valuation methods often adjust the market value of assets. For example, market value may be averaged over some period (say five years) to reduce the impact of market-value volatility on the stability of the contribution level. Of course, movement away from current market value necessarily introduces short-term unreality. However, in an inflationary environment, market values should tend to increase in dollar amount from year to year. The averaging method described above will understate asset values when market values consistently rise. Since this difficulty arises from attributing inflationary increases to asset appreciation, one solution is to project asset values based on the assumed rate of inflation, and calculate appreciation or depreciation based on these projected values. This approach measures volatility against real, rather than nominal, rates of return.

Employee turnover may also be affected by sustained inflation. Some employees may leave because salaries available in the marketplace are rising more rapidly than salaries offered by the current employer. Other employees may stay longer because of financial uncertainty. In any event, turnover assumptions can be modified to respond to these uncertainties.

First, it is useful to consider how projected liabilities weight the turnover assumption. To illustrate, consider a floor plan with an integrated defined benefit supplement and a nonintegrated profit-sharing base plan. It is quite possible that virtually all of the lower-paid employees will have no projected benefit under the defined benefit supplement, and therefore generate

no liability under the defined benefit plan. Clearly then, turnover among these employees is irrelevant and should be ignored in setting the turnover assumption. By extension, it is clear that an appropriate turnover assumption under a defined benefit plan must be a weighted average of group experience, and that the weights should relate to the projected benefit liability associated with each employee.

It is common practice to set turnover assumptions by age, and to set salary assumptions as an annual percentage increase. The next level of sophistication would be to set turnover assumptions by age and service, and to set salary-scale assumptions by age. While in many cases there is insufficient experience to justify the more detailed level of assumptions, the more detailed structure has the subtle effect of increasing contribution stability in periods of economic uncertainty. Specifically, the more detailed assumptions seem to address more accurately the liabilities associated with older, longer-service employees. Under most plans, this is where the bulk of liabilities is concentrated. The more detailed assumptions also tend to assign smaller amounts of liability to the benefits of those employees who are most likely to be hired in periods of expansion and most likely to be terminated in periods of economic contraction. Therefore, the more detailed assumptions tend to increase stability in contribution levels. An alternative approach would be to set turnover assumptions in relation to salary level, although this approach must be taken cautiously, as IRS might consider such a turnover schedule as evidence that the plan is discriminatory in operation.

In summary, the development of individual valuation assumptions can respond to the realities of inflation within the framework of methods approved for tax deduction purposes. A more complete economic picture of the plan's financial condition will require valuation techniques that recognize future changes in the work force, benefit level, and ERISA benefit maximums, and analysis of the plan's sensitivity to adverse experience.

V. CONCLUSION

In an inflationary environment, sponsors of retirement programs will seek to minimize the financial risks they take. Consulting actuaries can effectively assist sponsors through a review of appropriate benefit goals and development of plans that meet these goals with the least financial risk. Available valuation techniques will effectively assess the financial risk as long as methods and assumptions realistically reflect the dynamics of inflation.

DISCUSSION OF PRECEDING PAPER

DWIGHT K. BARTLETT III:

It was a great pleasure to read Mr. Furnish's outstanding paper. He is to be congratulated for its excellence.

Toward the end of Section III of the paper, Mr. Furnish describes several ways in which a defined benefit pension plan can attempt to cope with the problems that employees have who change employers several times during their careers and accumulate fixed-dollar vested pensions, which are subject to serious erosion by inflation. The solutions that Mr. Furnish describes assume that it is the responsibility of the employee's final employer to provide the appropriate remedy. As a practical matter, that may be true, but I believe that is an inappropriate premise as a matter of social policy. Plan sponsors should assume more responsibility for maintaining the purchasing power of the vested pensions of their terminated employees, just as they are beginning to recognize their responsibility with respect to their retired employees. To fail to recognize this responsibility is to ask their terminated employees with vested pensions to subsidize the cost of the pension plan. To place the burden on the final employer misallocates the cost of the total pension.

KENNETH A. STEINER:

While most employers desire to provide their employees with financial security at retirement, the adoption of a retirement program is rarely the result of purely altruistic motives. Although there are a number of valid reasons for establishing retirement programs, generally it is the cost/benefit relationship that motivates employers to provide these benefits. By providing a retirement program, the employer hopes that each dollar spent on benefits will, in the long run, increase productivity, and therefore the sponsor's bottom line, by more than one dollar. In economic terms, the employer will find it profitable to increase retirement benefit expenditures until the marginal increase in productivity resulting from such expenditure is equal to the marginal cost.

It is argued that retirement programs (both defined contribution plans and defined benefit plans) will increase productivity in the following ways:

1. By increasing employee retention, thus allowing the employer to spend less on replacement training programs;
2. By attracting better, more productive employees;

3. By allowing less productive employees to retire;
4. By improving employee morale because employees may experience less anxiety about retirement and because retirement of older employees may create possibilities for more frequent promotions; and
5. By maintaining a good public image for the company, and avoiding the public censure that would result if employees were terminated after years of hard work with inadequate or no retirement income.

Mr. Furnish argues that "sponsors [of retirement programs] necessarily will seek to minimize financial uncertainties created by inflation," that "it is immediately apparent that the sponsor looking to minimize financial risk is better served by a defined contribution program" (as opposed to a defined benefit program) and that "the inflation-conscious sponsor is therefore led to prefer defined contribution programs." I disagree with each of these statements, and believe that a realistic evaluation of the cost/benefit relationship under both types of plans will lead the cost-conscious sponsor to select a defined benefit plan as the primary vehicle for providing retirement benefits during inflationary periods.

Sponsors will not necessarily seek to minimize financial uncertainties; as Mr. Furnish points out, if a sponsor truly wished to minimize financial risk he would provide no retirement program at all. In fact, most employers would not even be in business if they were motivated solely to minimize financial risk. Instead, as discussed above, sponsors will tend to provide retirement programs as long as these programs can be expected to be cost-effective. Increased financial risk is merely one factor to be considered in the determination of the cost of a retirement program. To quantify this factor, employers will estimate the probability of the event at risk and multiply this probability by its expected cost. For example, assume a sponsor is considering possible adoption of either a defined contribution plan that will cost 8 percent of pay or a defined benefit plan that is expected to cost 5 percent of pay with a 1 percent chance that the cost will be either greater than 7 percent or less than 3 percent. If both plans will provide the sponsor with the same anticipated increase in productivity, the defined benefit plan should be chosen even though the cost of the defined contribution plan is known with certainty.

Does the sponsor really minimize his financial risk be adopting a defined contribution plan instead of a defined benefit plan? In my opinion, the risk may actually be increased. Generally, the risk associated with adopting a defined contribution plan is that the cost of the program may not produce the desired increase in productivity. This may occur because of the following reasons:

1. If benefits are too large, employees may be encouraged to retire too early

(especially employees hired at very early ages, if the contributions are designed to be adequate for employees hired at later ages).

2. If benefits are too small, employees may remain employed longer than desired.
3. Productive employees in their forties or fifties may be encouraged to seek employment with companies that provide defined benefit plans, because, in Mr. Furnish's words, "benefit delivery [in a defined benefit plan] strongly favors older workers."
4. Employees may be motivated to terminate employment to obtain their account balances.
5. Poor investment return may result in decreased employee morale.
6. Female employees may feel that they are not being provided with equivalent benefits.
7. Nonunion employees may unionize because unions generally negotiate defined benefit plans.
8. Lump-sum payments at retirement or earlier distribution may be squandered by employees, resulting in possible public censure if employees are unable to provide for their own needs.

Will the "inflation-conscious" sponsor prefer defined contribution programs over defined benefit plans? It is difficult to predict what an inflation-conscious sponsor will do, but the cost-conscious sponsor should prefer a defined benefit plan if he desires to provide *retirement* benefits in the most cost-effective manner.

Table 1 below shows the pattern of benefit accrual for an employee hired at age 30 with a salary of $10,000 under a defined benefit plan (providing 0.75 percent of final five-year average pay per year of service

TABLE 1

ACTUARIAL PRESENT VALUE OF BENEFIT ACCRUED UNDER A DEFINED
BENEFIT PLAN VERSUS ACCOUNT BALANCE ACCUMULATED UNDER
A DEFINED CONTRIBUTION PLAN AT VARIOUS AGES
FOR AN EMPLOYEE HIRED AT AGE 30

AGE	NONINFLATIONARY ECONOMY			INFLATIONARY ECONOMY		
	Defined Contribution 7% per Year (1)	Defined Benefit (0.0075 × Final 5 × Years) (2)	Ratio (1) ÷ (2)	Defined Contribution 7% per Year (3)	Defined Benefit (0.0150 × Final 5 × Years) (4)	Ratio (3) ÷ (4)
35	$ 3,833	$ 1,712	2.27	$ 5,535	$ 293	18.89
40	8,577	4,203	2.04	17,431	1,461	11.93
45	14,211	7,776	1.83	41,177	5,496	7.49
50	20,934	12,914	1.62	86,478	18,557	4.66
55	28,915	20,422	1.42	170,295	59,665	2.85
60	38,349	31,651	1.21	321,993	187,990	1.71
65	49,459	49,114	1.01	592,012	593,071	1.00

in a noninflationary economy or 1.50 percent of final five-year average pay per year of service in an inflationary economy) versus a defined contribution plan providing an annual contribution of 7 percent of pay.

In order to make "apples to apples" comparisons, both types of plans were designed to provide about the same value of benefits at the assumed retirement age of 65. The assumptions used to develop these figures are outlined in Table 2.

As can be seen in Table 1, if the employer experiences any turnover of employees who are vested, the defined benefit plan will be a more cost-effective vehicle for providing retirement benefits than the defined contribution plan, in either inflationary scenario. Depending on the age distribution of the employee population, rates of turnover, and the plan's vesting provisions (also considering that defined contribution plans generally provide for faster vesting), a defined contribution plan could conceivably cost the sponsor four times or more what the defined benefit plan would cost if the inflationary economic assumptions in Table 2 are realized. It is evident that the cost savings gained by adopting a defined benefit plan would, in most cases, justify assuming an increased financial risk.

But what are the risks associated with adopting a defined benefit plan? The sponsor establishes a benefit formula, the actuary makes certain assumptions that impact cost incidence, and failure to meet these assumptions could increase the sponsor's cost. In terms of actual risk, however, the sponsor is at risk only for vested benefits that have accrued to date. If costs increase to untenable levels, sponsors will generally have the ability to reduce benefits with respect to future service. Although reductions in benefit levels may not receive warm acceptance by plan participants, the fact remains that since sponsors can amend the plan, they have control over the risk assumed.

It is not uncommon today for plans to have accumulated assets far in excess of the present value of all accumulated benefits. If this is the case,

TABLE 2

ASSUMPTIONS USED IN TABLE 1

	Noninflationary	Inflationary
Investment return.....	2.5% compounded annually	10% compounded annually
Salary increases	1.5% per year	9% per year
Mortality.............	1951 Group Annuity Mortality Table (unloaded), projected 14 years by Scale C.	Same
Miscellaneous	Defined contributions made at the beginning of each year.	Same

an employer has zero amount at risk, because, generally, he has the ability
to terminate the plan at any time. (However, the IRS may disallow prior
deductions if he does not have a valid business reason.)

Mr. Furnish implies that there are two aspects of inflation that increase
the financial risk associated with adoption of defined benefit plans. The
first aspect is "the unprecedented and sustained high levels of increase"
(in inflation). Since higher levels of inflation generally can be expected to
result in increased investment returns as well as increases in employee
salaries, and since most employers do not provide for automatic cost-of-
living increases, costs may reasonably be expected to decrease in real
dollar terms as inflation increases. As discussed above, higher levels of
inflation will tend to increase the cost disparity between defined benefit
and defined contribution plans.

The second aspect of inflation that concerns Mr. Furnish is "the highly
erratic fluctuations over short periods" (in inflation). He cites fluctuations
in the prime rate as an example of the risk of fluctuation in inflation. While
such fluctuations may be expected to impact the cost of funds borrowed
by an employer, it is difficult to see how erratic movements in the prime
rate will impact the cost of a defined benefit plan. Increases in salaries
(which often do have an impact on plan costs) are not nearly so removed
from the employer's control as the prime rate.

With respect to the risk associated with having to contribute to a defined
benefit plan in accordance with ERISA during unprofitable years, it is not
uncommon for employers to build up sizable credit balances in their fund-
ing standard accounts which can be used to reduce future contributions
in poor profitability years. While such flexibility is available with a profit
sharing plan, it is generally unavailable with a money purchase defined
contribution plan.

Mr. Furnish claims that since employees now tend to be more mobile,
"benefit delivery to employees holding several jobs in their careers is the
issue requiring primary attention," and that if defined contribution plans
or floor plans "were used universally by American sponsors, the benefit
delivery problems for employees who change jobs in an inflationary en-
vironment would be greatly alleviated." With the tendency in an infla-
tionary environment for many terminating employees to spend distributions
rather than save them for retirement, I see no significant alleviation of
the retirement benefit delivery problems as a result of adoption of these
types of plans, only increased costs to sponsors in providing benefits for
employees who terminate before retirement.

There is no question that defined contribution plans provide greater
"benefits delivery" to younger employees than do defined benefit plans

(see Table 1). If an employer feels that the additional cost associated with such a program will increase productivity among his younger employees (or even his older employees), then perhaps he should adopt a defined contribution plan (or adopt a defined contribution plan as a supplement to his defined benefit plan). For this reason, many sponsors have adopted investment savings plans and will consider adopting such arrangements utilizing Section 401(k) salary reductions to encourage increased employee savings at relatively little additional cost to the employer.

To summarize, an employer who desires to provide adequate *retirement benefits* to his employees efficiently will adopt a defined benefit plan. If such plans are conservatively designed and funded, the risk assumed by the plan sponsor need not be greater and may even be less than the risk associated with adopting a defined contribution plan.

<div align="center">GERALD RICHMOND:</div>

I am in total agreement with the main thrust of the paper. My comments deal first with connecting up the total benefits and expenses, $B + E$, to the actuarial valuation process for estimating the incidence of contributions, and, second, with the pension terminology used.

The quantity $B + E$, which the author defines as "ultimate cost," is known only after the plan is finally wound up (terminated) at the end of its existence when "$C + I = B + E$" is a truism or identity. But each year the actuary must estimate it and, if appropriate, develop the actuarial present value before he can determine (or rather estimate) the pension plan contribution, which the author defines as "incidence of cost."

Having been less careful than this author to define the term "cost" in the paper "Indexing Pensions—Protecting Postretirement Purchasing Power," also published in this volume of the *Transactions*, I became aware, as I read the discussions of that paper, of the variety of ways in which actuaries use the term "cost," and the confusion this causes. I therefore urge all authors to use the pension terminology recommended by the Joint Committee on Pension Terminology.

That recommended terminology does not even include the term "cost." Nevertheless, if actuaries choose to use "cost" they should never assume their audience will define it as they do, and they should be careful to define "cost" and use it consistently. If Mr. Furnish can use ultimate cost and incidence of cost as clearly and consistently as he has in this paper (with one exception—an inadvertent slip to ultimate "real" cost instead of ultimate cost on page 40), then I have no strong objection to his continuing to do so. Nevertheless, I would hope that he might sacrifice some precision of language (as he sees it) for the greater ease of communication that a common terminology offers.

JOHN W. PENNISTEN:

Mr. Furnish has presented an excellent overview of the status of private pension plans in the current inflationary environment.

One item in the paper that deserves further emphasis is the use of select and ultimate interest rates, both for annual plan valuations and benefit calculations at retirement, particularly lump-sum options. The general public has great difficulty understanding the use of a 6 or 7 percent interest rate for pension plans when long-term United States government bonds are yielding 15 percent. With modern high-speed computers able to perform millions of calculations per second, and the cost of computer hardware declining each year, commutation functions no longer need to be the general method for performing pension plan calculations. In addition, with current computers, one may use select and ultimate salary scales, as indicated below.

For each individual person included in the valuation, or each valuation cell, active, inactive, retired, or survivor beneficiary, the present value of benefits may be represented by the sum of terms of the form $v^t {}_t p_x q_{x+t} B_{x+t}$, where, for active or inactive cells, B_{x+t} may include a salary projection, as discussed below. If the calculations are made on a computer using this format, it is easy to vary v^t by duration. Similarly, for nonretired individuals, the present value of future salaries may be represented by the sum of terms of the form $v^t {}_t p_x (s_{x+t}/s_x)(\text{Salary}_x)$, where v^t may vary by duration as for benefit valuation above. Further, similar to v^t, the salary projections (s_{x+t}/s_x) may vary by duration, as well as by age, to include future inflationary expectations. Gain and loss analysis, with interest and salary assumptions varying by duration, may still be handled by an analytical or algebraic approach, similar to that presented in [1].

As with annual plan valuations, one may use select and ultimate interest assumptions in the calculation of optional benefit forms. Plan participants have the greatest difficulty understanding that the 6 or 7 percent interest rate used for annual plan funding calculations cannot also be used for their benefit options, particularly lump-sum commutations.

The above is not intended to be an exhaustive study of select and ultimate interest and salary assumptions for pension plans. The main point is that although commutation functions have long been a most efficient method for pension calculations, other methodologies may be more appropriate in the current environment to promote better understanding of retirement plans by the general public.

REFERENCE

1. ANDERSON, ARTHUR W. "A New Look at Gain and Loss Analysis," *TSA*, XXIII (1971), 7.

My thanks to Messrs. Bartlett, Steiner, Richmond, and Pennisten, and the other members of the Society who have called or written concerning the paper. The paper's objective was to stimulate thoughtful response to today's inflationary environment, and that objective has been amply achieved.

In regard to Mr. Bartlett's comments, our present defined benefit structure does place the burden of adequate income replacement on a mobile worker's final employer, if indeed the burden is to be carried at all. I agree that such a social policy is inappropriate; however, plan sponsors probably will not voluntarily make cost-of-living improvements in the benefits of persons who have left their employ. Potential legislative solutions are mandatory cost-of-living improvements in defined benefits for terminated vested employees, or encouragement of defined contribution plans in relation to defined benefit plans. The latter solution seems more politically realistic; hence, the paper's reference to the United States tax policy implications of the analysis. As Mr. Steiner correctly observes, under present tax laws, employees can spend lump-sum distributions rather than save them for retirement. Given the tax-favored status of retirement programs, greater restrictions on the availability and use of lump sums may be in order to assure that retirement programs accomplish their purpose.

Mr. Steiner's development of retirement benefits in order to maximize employee productivity is a novel idea, but not one I have seen directly applied in practice. Similarly, quantitative analysis of the potential variance of a defined benefit plan's annual contribution requirement is theoretically intriguing, but generally unknown in current practice. My "inflation-conscious" sponsor and Mr. Steiner's "cost-conscious" sponsor agree that termination benefits represent an added ultimate cost of defined contribution plans. The inflation-conscious sponsor, however, will consider paying this premium to limit the financial risks associated with incidence of cost.

The terms "ultimate cost," representing plan benefits plus expenses over time, and "incidence of cost," referring to annual contributions over time, are my own; Mr. Richmond has pointed out that "cost" is sometimes a loosely used term in our profession. Uniform terminology is certainly a valid and important goal of our profession; the Joint Committee on Terminology is to be congratulated on its progress in this area. However, as nearly everyone outside the profession is interested in the "cost" of

pension plans, we should strive to create precise usage of "cost" within the profession so that our views can be clearly communicated and understood.

Mr. Pennisten's discussion provides a good mechanical framework for select and ultimate interest calculations. While the paper recommends broader use of select and ultimate interest assumptions, certain cautions should be applied to this endorsement.

The use of select and ultimate rates gives the appearance of greater accuracy than a flat rate, and predicts change in future investment return. It is useful to identify those situations in which the apparent accuracy of predicted change is appropriate.

Several situations seem appropriate for the select and ultimate approach: (1) if future rates of return are known, and change over time; (2) if select and ultimate assumptions are examined as one possible future scenario; and (3) if present assets are valued on an amortized basis at a return different from expected investment return on funds invested or reinvested in the future. These situations, however, all involve special circumstances; in the general case, when would the actuary choose select and ultimate financial assumptions as valuation assumptions?

The usual rationale is to consider investment return as composed of a "real" rate of return on assets plus an inflation factor. Theoretically, either of these components could be assumed to change over time; in practice, it is usually the inflation factor that is assumed to vary. This frame of reference describes the salary scale as composed of merit and productivity increases, longevity increases, and an inflation factor; the changing inflation factor would also imply a select and ultimate salary scale. The spread (the difference between the interest and salary assumptions) will be constant if it is assumed that the other components are constant from year to year; the actuary should consider whether this is appropriate in conjunction with changing rates of inflation.

As there is presently no economic theory known that accurately predicts future rates of inflation, why assume *changes* in future rates of inflation? One rationale is that current rates of inflation are substantially different from long-term historical rates. If a return to the historical levels is assumed, select and ultimate assumptions can be developed based on assumptions concerning the length of the select period and the nature of change in rates during the period.

As a practical matter, much of the current attention on select and ultimate interest rates relates to the divergence between current interest rates and the flat rates being used by many actuaries for valuation purposes. Specifically, the 1981 surveys of actuarial assumptions for large

corporate plans by the Wyatt Company and by Greenwich Research Associates both indicate an average long-term interest assumption of 6.3 percent, a rate considerably below 1981 short-term and long-term market rates. Many actuaries are therefore looking to the select and ultimate as a partial solution to the questions plan sponsors and accountants raise concerning this divergence, and perhaps as a shield for conservative interest assumptions.

Let us consider an actuary using a 6 percent interest assumption who faces a 15 percent current market return. The actuary therefore decides to use select and ultimate assumptions, beginning with 15 percent and decreasing 1 percent per year until reaching the ultimate rate of x percent. If x percent is set at 6 percent, the return over thirty years will be equivalent to a flat annual rate of 7.7 percent, so that the change has significantly raised the average rate of return. Conversely, if x percent is set so that the 30-year average rate of return is 6 percent, x percent will be just under 4 percent. Under many plans, benefit liabilities on a weighted basis will become due in less than thirty years, suggesting even lower ultimate rates to produce results comparable to the 6 percent flat rate assumption.

Several observations may be made about this analysis. First, the actuary who is under pressure to change a 6 percent interest assumption in the face of current rates may end up with select and ultimate rates that either in effect raise the interest assumption or have an ultimate rate so low that it also generates pressure for change. Second, the actuary who uses a 6 percent assumption under current conditions must be assuming at least one of the following scenarios: (1) present rates will drop sharply in the near future; (2) rates in the more distant future will be significantly less than 6 percent; (3) the plan's assets will not achieve market rates of return over time; or (4) gains due to this actuarial assumption will be offset by losses on other assumptions, such as the salary scale.

Select and ultimate assumptions cannot be recommended as a shield for conservatism in interest assumptions. In response to Mr. Steiner's question about the relationship of the prime rate and annual pension contributions, the more short-term flexibility the sponsor has in making plan contributions, the less borrowing he must do at the prime rate. Conservative assumptions represent a transfer of cash flow from the plan sponsor to the retirement plan, a historic actuarial practice that may be inappropriate in the consulting environment.

The actuarial profession developed in the life insurance industry, which remains today our major employer. Conservative assumptions have great appeal in this environment. They increase the insurance company's financial stability, improve chances for profitability, and generate additional

assets to manage. It was natural to carry this attitude into the insured pension area. Most insured pension programs are small plans, where the variation between actual and assumed experience is likely to be much greater than in the large plan.

The consulting pension actuary generally works in the self-insured large plan environment. Here, many sponsors have substantial debts to be serviced at relatively high interest rates. Less divergence is likely between actual and assumed experience. And most significantly, since 1974 there has been an *external* insurer of pension benefit delivery—the Pension Benefit Guaranty Corporation (PBGC)—which has required the same per-head premium from all plans regardless of the size or nature of the benefit delivery risk.

In the case of a corporation with substantial indebtedness, conservative assumptions are not in the sponsor's best interest, as they artificially reduce corporate cash flow. Conservative assumptions are also not necessarily in the best interests of most plan participants, as they do not increase benefit security (PBGC covers that) but may reduce job security by weakening the sponsor. The only parties who benefit from conservative assumptions are the plan's asset manager and PBGC.

This analysis is not to suggest that assumptions be "liberally" estimated to select against PBGC. Pension actuaries must recognize ERISA's "best estimate" constraints, and understatement of expected experience could lead to instability in annual contribution requirements, which is probably not in the best interests of the sponsor or plan participants.

The practical problems created by conservative assumptions can be seen in the activity surrounding the Great Atlantic & Pacific Tea Company (A & P). A & P, which has been in financial turmoil in recent years, has terminated its defined benefit pension program, to be replaced by a defined contribution plan. Assets are considerably in excess of plan liabilities, and A & P hopes to have the surplus returned. Some plan participants have filed suit to obtain distribution of the surplus to participants rather than to A & P. Whether less conservative assumptions would have substantially improved A & P's financial condition is debatable, but clearly the participant suit and the legal and employee relations problems it entails could have been avoided.

My understanding of select and ultimate interest assumptions has benefited significantly from discussions with Arthur Anderson and work with the Society's Committee on Pensions. The committee is currently involved in a detailed review of this area; its work should provide all of us with a better understanding of this most timely topic.