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INDEXING PENSIONS—PROTECTING POSTRETIREMENT PURCHASING POWER

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ABSTRACT

Inflation has proved particularly resistant to public and private efforts to control it. Although many pension plans for government employees provide some protection against inflation (in the form of indexation), the private sector, on the whole, has been reluctant to respond to the challenges presented by inflation to preserving postretirement income. This paper discusses the difficulty in measuring inflation and indicates the wide range of options available to corporate sponsors to lessen the impact of inflation on pensioners. It discusses the cost impact of various approaches, and indicates that costs may not be quite so formidable as supposed. The paper concludes with a discussion of related public and private issues, and offers our recommendations for corporate sponsors with differing philosophies and financial resources.

I. THE PROBLEM—INCREASING RATES OF INFLATION

The purpose of a pension is to provide a suitable standard of living in the postretirement years. If there is no inflation or a very low rate of inflation, provision of a suitable income at the point of retirement will serve this purpose throughout the postretirement years. Let us assume that an employee retires at age 65 and can expect to live about eighteen years. If the annual rate of inflation is 2 percent, after nine years his purchasing power is reduced by only 17 percent, and after eighteen years it is reduced by 30 percent. This is an appreciable decrease in purchasing power but it is at least somewhat manageable. As a matter of fact, for the period 1951–72, the average annual rate of increase in the Consumer Price Index, a measure of the increase in the cost of living, was 2.3 percent. However, for the period 1972–78, the average annual rate of increase in the Consumer Price Index was 7.5 percent. At this rate of increase, after only nine years purchasing power is cut in half, and after eighteen years it is reduced by 73 percent. Since 1978 the economy has been subject to

double-digit inflation. Because of these increasingly high rates of inflation, employers are facing increasing pressure to deal with the problem of helping retirees cope with the corrosive effects of inflation. Broadly speaking, the defense against inflation as a permanent feature of our economy is to index pensions at retirement to a measure of the increase in the cost of living. A measure generally used is the Consumer Price Index published monthly by the Bureau of Labor Statistics.

II. CONCEPTUAL PROBLEMS WITH THE CONSUMER PRICE INDEX AS A MEASURE OF THE COST OF LIVING

The Consumer Price Index (CPI) published monthly is based on personal consumption by urban workers. Personal consumption patterns of retired citizens differ considerably from those of urban workers. However, what is needed is not a measure of the absolute level of the cost of living but rather a reasonably accurate measure of the increase in the cost of living. No studies to date have indicated that the rate of increase for a price index constructed specifically for retirees would differ appreciably from that of the CPI. Consequently, if the CPI accurately measures the increase in the cost of living for urban workers, then we can probably use it as a reasonably good measure of the increase in cost of living for retirees.

There is, however, considerable dissatisfaction with the CPI as a measure of the increase in the cost of living. Consumers adjust their buying patterns to changes in the relative prices of items that they purchase. The Bureau of Labor Statistics, however, is slow to adjust the relative weights of the items purchased by urban consumers that go into the market basket of goods used in determining the CPI. The bureau is also slow to recognize improvements in the quality of the items being purchased. A recent and more serious problem is the CPI's distorted treatment of increases in the cost of shelter. The index overemphasizes the costs of purchasing new housing (for example, mortgage rates and new-home prices) at the expense of the services derived from shelter and the operating costs involved in homeownership. Since only a small number of households buy homes in any given year, the potential for overstating the inflation rate during periods of rapidly rising mortgage rates and home prices is quite large. This has been especially true since 1978. The Department of Commerce publishes a quarterly price index based on personal consumption expenditures (PCE) which reflects consumers' actual spending mix in any particular period and which employs more appropriate treatment of the cost of shelter. This index has in recent years shown a rate of increase in the cost of living of 1 to 2 percent below that of the CPI. In October 1981 the

Bureau of Labor Statistics responded to criticism of its treatment of the cost of shelter by announcing that it would use a rental equivalency approach to measure the cost of shelter for homeownership beginning in 1983.

The indexing of pensions is intended only to protect retired employees from inflation caused internally by monetary expansion, fiscal deficits, or wage increases in excess of productivity increases. It is not intended to protect against increases in prices imposed from abroad, such as increases in the price of imported oil or increases that result from shortages of raw material and energy. Such increases in prices reduce living standards for active workers as well as retired workers, and there is no reason to single out retirees for protection from such decreases in living standards.

The CPI is still the most popular and widely known price index and the one generally used to index pensions. Because this index may overstate the increase in the cost of living, plan sponsors who choose to use it may wish to use a modification of it. A reasonable approach might be to use only 80–90 percent of the increase in the CPI and to allow any further increases in pensions to depend on ad hoc studies of the accuracy from year to year of this index as a true measure of the increase in the cost of living.

III. SOURCES OF PENSION INCOME—THE ROLE OF THE PRIVATE PENSION MOVEMENT

Broadly speaking, the sources of pension income are social security, private pension benefits, and individual savings or retirement programs. This is the familiar three-legged stool of retirement security. To date, individual employee savings outside of tax-sheltered private pension plans have not been a significant source of retirement income. Employee contributions, primarily in the smaller pension plans, can be a significant source of retirement income; however, such contributory plans are in the minority (most plans are noncontributory). Employee contributions account for only 10 percent of pension contributions to plans funded with insurance companies. Most workers, therefore, especially those earning less than the social security wage base, save very little for their retirement years. Consequently, we must look to social security and private pension benefits as the main sources of retirement income.

For the low-paid worker earning the minimum hourly wage, the primary social security benefit will replace about 55 percent of final salary. For the average-paid worker earning about $1,000 monthly, social security will replace about 45 percent of final salary. For the worker whose earnings are equal to the social security wage base, social security will replace

about 28 percent of final salary. The primary insurance benefit does not include, for a married couple, the additional benefit of 50 percent of the primary benefit payable to the spouse. This additional spouse benefit is generally justified on the basis of social adequacy. Private pension benefits are generally designed to supplement the primary social security benefit without taking into account the spouse benefit. As a practical matter, integration rules do not permit consideration of this benefit in the private pension benefit formula (although the spouse benefit can affect the design of ad hoc cost-of-living supplements to retirees).

Social security benefits are designed to provide a floor of protection for retired employees. The social security program has virtually universal coverage, and its benefits are fully indexed in accordance with the increases in the CPI. The advantages of the social security system compared with the private pension sector are its virtual universal coverage and its full indexation of retirement benefits. However, social security is primarily a transfer mechanism whereby income is transferred from the active worker population to the retired population. Only small contingency reserves are maintained. The social security system is not a source of investment funds for either private industry or government.

The most attractive feature of the private pension sector is its prefunding of retirement benefits, and the accumulation of pension reserves that are a source of investment capital and increase the productive capacity of the economy. It is from this productive capacity that all benefits, public or private, ultimately must be provided. Since social security benefits have been designed basically to provide a floor of protection only, there is adequate scope for supplementation by the private sector. The goal of the private sector should be to provide benefits that, in combination with social security benefits, allow a reasonable standard of living during retirement. Proper benefit design should reflect the fact that after retirement, work expenses are eliminated and personal income taxes are generally lower. Consequently, full replacement of final salary is not necessary. Generally the accepted goals for replacement of salaries are about 80 percent for the low-paid worker, 60–70 percent for the average-paid worker, and perhaps 50–55 percent for the high-paid worker. After taking into account the primary insurance benefits under social security, there is considerable room left for supplementation by private pension benefits.

There has been a considerable increase in the number of people covered by private pension plans, and there has also been a substantial trend toward final average benefit formulas, which provide adequate incomes at the point of retirement. However, to date, most of the private pension sector has not addressed the problem of protecting purchasing power after

the employee retires. Presently, only about 5 percent of private pension plans have some sort of indexation at retirement. Private industry (including the insurance industry) is conducting campaigns to bring about government fiscal and monetary policies that will reduce if not eliminate inflation. However, a realistic assessment of the future is that some degree of inflation will be a long-run feature of our economy. There is increasing concern in government circles and in the press that the private pension movement, unlike social security, will not be able to protect the purchasing power of employee pensions. Even the social security system may face increasing problems, especially in the twenty-first century, in meeting its obligations. If the alternative to the private sector's failure in this area is expansion of the social security system, then perhaps the private pension sector should now come to grips with the problem of indexing pensions for its retirees.

IV. ALTERNATIVE METHODS OF PROTECTING ANNUITANT PURCHASING POWER

The greatest security for employees and the greatest cost for employers is full indexation (see Sec. A below). There are several alternatives for limiting such indexation and controlling employer costs, as discussed in Sections B–H. Finally, employees may share in the costs of risks of indexation as discussed in Sections I–K.

A. *Full Indexing*

Under this approach, the pension benefit at retirement is indexed to an appropriate measure of the increase in the cost of living due to general inflationary conditions in the economy. Because of current deficiencies in the construction of the CPI, a reasonable measure of the current increase in the cost of living is about 80 percent of the increase in the CPI.

The advantage of full indexing is that it provides the greatest security to employees. Retired employees are assured that their pensions will be increased automatically. Active employees know that they will have the same protection when they retire. The disadvantage of the full-indexing approach is the cost aspect to employers. Since it is assumed by many that these costs may be excessive, a close examination of the impact of full indexing on plan costs is necessary.

If the pension plan costs have been determined without any provision for indexing, and a realistic interest assumption reflecting the assumed long-run rate of inflation has been used, the approximate costs of full indexing for a new pension plan, for retirement age 65, are as shown in the tabulation on the following page. It should be noted that, for existing

plans where present costs are partially met by existing assets, the costs of indexation are higher. For example, if existing assets have funded 25 percent of plan funding levels, the additional cost of full indexing is one-third greater than shown.

Average Yearly Increase in Cost of Living	Percentage Cost Increase for Full Indexing
1%	7%
2	14
3	23
4	33
5	44

If a pension plan has been valued on a consistent set of actuarial assumptions that excludes inflation from both the salary scale and the interest rate, and a shift is made to actuarial assumptions incorporating inflation, a reduction in cost will result that can be utilized to finance the indexing of pension benefits. For example, let us consider the valuation of a final salary type of plan under which we increase the assumed rate of increase in salaries and the valuation interest rate by the same amount, namely, 2 percent. The result will be a reduction in the required funding contributions of the plan because the increase in the interest assumption will remain in effect until the employee dies, whereas the increase in the salary-scale assumption will have effect only to age 65, the assumed retirement age. If we now index pensions by 2 percent per year to match the assumed rate of inflation, plan costs will be approximately the same as they were under static economic assumptions without incorporating the 2 percent rate of inflation in the actuarial assumptions and without indexing pensions. To the extent that the increase in the assumed interest rate is less than the assumed rate of inflation, there will initially be increased funding outlays associated with the indexing of pensions. (The actuary may choose conservatively to increase his interest assumption somewhat less than his increase in salary-scale assumption when introducing inflation into his set of actuarial assumptions.) However, should investment yield actually keep pace with inflation, then these additional funding margins will not be necessary and the cost of the plan will be the same as that under static economic conditions.

Of course, additional costs for indexing will result if the actuary has already reflected some degree of inflation in his actuarial assumptions (with respect to the interest rate and the salary scale) when the plan contains no provision for indexing. Such action, of course, is contrary to

the goal of providing an adequate standard of income in real terms throughout the retirement period. Plan sponsors who have accepted such a change in actuarial assumptions have in effect utilized inflation (the erosion of real pension benefits) to reduce their plan costs. Many, including actuaries, would say that such action is not socially responsible.

Today, most pension valuations are being performed on the basis of an interest rate in the range of 6–7 percent. So it appears that most actuaries have been restrained in factoring inflation into their assumptions and have not fully reflected the high degree of inflation present in the economy now and likely in the future. This may reflect their uncertainty as to the permanence of inflation over the long run, or it may reflect anticipation of mandated social change in the form of indexing of private pension benefits. If the actuary has already factored only a modest degree of observed inflation, such as 2 percent, into his assumptions, and a plan sponsor now wishes to index pensions 2 percent per year, the additional funding outlays for a new plan would be about 16 percent. For plans that have been in existence for a number of years, the initial cost will be somewhat greater because the funding should have begun from the inception of the plan and liabilities will already have accrued for these years. For example, if a plan is now 25 percent funded, the additional costs, instead of being 16 percent, would be about 20 percent.

If one considers that a typical pension cost is perhaps 8–12 percent of payroll, an additional 20 percent represents about 2 percent of payroll. Many would judge this a reasonable cost for an improvement in the overall fringe benefit package likely to be highly valued by employees. Further, if the plan sponsor wishes to index pensions fully, and the actuary assumes that the long-run average annual increase in the CPI will be 5 percent, and the expected investment yield is an additional 3 percent above the present interest assumption, there may be no further cost to provide indexing above the 2 percent level. Thus, indexing pensions up to 5 percent per year could result in an additional cost of only 20 percent. Contrast this with a pension plan that had already factored a 5 percent rate of inflation into its assumptions without providing for any indexing at all where the additional cost (funding contributions) could be 50 percent. (Of course, as noted above, the actuary might initially raise his interest assumption somewhat less than the increase in his salary-scale assumption and as a conservative margin recommend somewhat larger funding levels initially. But should the actual interest yield keep pace with inflation, these margins will not be necessary and the long-run costs will remain at 20 percent.)

Since most pension plans have not as yet factored an excessive degree of inflation into their actuarial assumptions, now is clearly the time to consider indexing pensions. An actuary should not assume very high rates of inflation in the salary scale and interest rate without carefully discussing with the plan's sponsor the potential for magnified costs in the future when the pressures for maintaining retired-life purchasing power become even greater. In this way (i.e., not assuming high rates of inflation), margins will exist in the future, to meet the costs of indexing retired-life pensions, if inflation continues at high levels.

Full indexing offers the most security to retirees. Since the financial resources of the plan sponsor may not be sufficient to provide full indexing, other alternatives with more limited potential cost could be considered, as discussed below.

B. *Indexing with a Deductible*

Under this approach, the plan might provide that the pension be increased only after the cost of living goes up by more than a specified percentage, say 2 percent. The retiree bears the inflation burden up to 2 percent, and the employer takes care of everything after that. This approach is especially suitable when pension benefits at retirement are sufficiently liberal to withstand the erosion of a 2 percent rate of inflation. In the case of plans already funded with a 2 percent inflation assumption, there would be no additional funding outlays under this method for further indexation if the actuary increases his interest assumption to the same degree that he increases his inflation assumption.

C. *Indexing with a Cap*

This method would limit the cumulative increase to a specified percentage compounded each year, such as 3 or 4 percent. This guards against the possibility of runaway costs. In this situation the actuary may recommend limiting the recognition of inflation in the interest and salary-scale assumptions to the cap, so that benefit increases that are associated with cost-of-living increases in excess of the cap could be implicitly funded through margins retained in the actuarial assumptions.

D. *Indexing with a Delayed Starting Date*

Under this approach, the retiree would get no increase during, say, the first three to five years after the normal retirement date, but thereafter the pension would be adjusted upward prospectively in proportion to the increase in the cost of living. This approach is most suitable when pension

benefits are generous to begin with. A delayed starting date reduces the costs of full indexing. If indexing is delayed to age 68, with the first increase at age 69, the costs of full indexing are reduced by about 30 percent for a new plan. A delayed starting date can also be used with other forms of indexing to reduce costs.

E. *Partial Indexing*

The pension benefit could be increased by only, say, 50–60 percent of the increase in the cost of living. If this policy is adhered to, the cost will be lower than for full indexing.

F. *Dollar-Limit Coverage Indexing*

This approach would index only a portion of the initial pension, for example, the first $300 or $500 of monthly pension. Since social security is already fully indexed and replaces proportionately more preretirement income for the lower-paid worker than for the higher-paid worker, this approach further emphasizes social adequacy as opposed to individual equity. So far as the higher-paid workers are concerned, further supplementation could be considered as resources permit.

G. *Performance Indexing*

Under this approach, retired-life pension increases are indexed to the investment performance of assets specifically designated as retired-life reserves. Investment earnings in excess of the rate of "true interest" are used to increase retired-life pensions. Basic to this approach is the concept of "true interest" that can be earned on a risk-free basis in the absence of inflation. Under the performance-indexing approach, retired-life pensions are increased each year by a percentage equal to the excess of the total annual investment return on retired-life assets over the true interest rate. To the extent that this excess percentage closely approximates the annual rate of inflation, full indexing is essentially achieved. The plan sponsor's costs are controlled because indexing is limited to that which can be provided by excess annual interest earnings.

The Rockefeller Foundation pension plan, which uses performance indexing, has set 3 percent as true interest and uses investment earnings above 3 percent to increase pensions. Studies by the Federal Reserve Bank of St. Louis have shown true interest to be between 3 and 4 percent. In setting the true interest rate, plan sponsors may choose to take into consideration other factors that influence long-term investment yield. For example, insurance company private placements earn ¼–¾ percent more

than public issues. Studies have shown that the inflation-adjusted long-run yield on common stocks is 5–6 percent. Thus, the true interest rate might be defined to be 3–5 percent if we eliminate the requirement that it be risk-free.

Central to the concept of indexing is the use of "true interest" to determine pension costs under the assumption of an economy with no inflation and no indexing of pensions. Consider a plan valued on a static basis using a "true rate of interest" such as 3 percent, for which a shift is made to dynamic assumptions incorporating inflation of, say, 5 percent; that is, both the interest rate and the salary scale are increased by 5 percent. The result will be a reduction in the funding outlay of the plan expressed as a percentage of payroll if no provision is made for the indexing of pensions after retirement. If pensions are indexed 5 percent per year, plan outlay will remain approximately at the same level as in a static economy if the investment yield does in fact increase by 5 percent. This approach, namely, indexing retired-life pensions to the same extent as the degree of inflation reflected in the funding assumptions, appropriately recognizes inflation but does not use it to reduce pension costs at the expense of the purchasing power of retired-life pensions.

Full benefit indexing can therefore be achieved at little or no additional funding outlay if plan investment yields do in fact keep pace with true interest plus the rate of inflation. Performance indexing serves to limit the plan sponsor's liability—and, of course, the protection afforded pensioners—if investment performance falls short of this objective. Therefore, for performance indexing to be effective, it is essential that the yield earned on retired-life assets closely track the rate of inflation plus the true rate of interest.

The Rockefeller Foundation plan invests retired-life assets in short-term commercial paper that has achieved this goal (so well that the plan now indexes pensions to the prime rate in lieu of actual investment performance). It is probable that most plans trying performance indexing will utilize short-term commercial paper as an investment medium, perhaps through the cash money management accounts offered by mutual funds and insurance companies. Long-term investments, although they generally offer a higher yield over the long run, do not consistently track true interest plus the inflation rate on a year-to-year basis. If retired-life assets are to be invested in long-term investments, the yield should be averaged over four to five years, the typical business cycle, or some other suitable investment cycle. To retain any increase in investment earnings above the true rate of interest plus the inflation rate, pension indexing may be limited to the cumulative increase in the cost of living.

H. *Discretionary (Ad Hoc) Adjustments*

Under this approach, supplemental benefits are paid to existing retirees on an ad hoc or discretionary basis, that is, without any commitment to their continuation beyond the current year. There are a number of methods of determining the amount of these discretionary increases, including a flat dollar amount for all retirees; a percentage increase, such as 3 or 4 percent for each year since retirement; a flat percentage for all employees; or a percentage of the increase in the CPI from the year of retirement to the present year.

The employer has full control over the costs of this program. However, if the employer makes these ad hoc adjustments on a fairly regular basis, even if he is not committed to make them, the retirees may come to expect such adjustments annually. Therefore, the employer should consider carefully the long-term cost implications of prefunding these benefits as discussed above.

Under the ad hoc approach, an amendment may be adopted each year guaranteeing in full the benefit then granted. The cost would then be amortized over a period of ten to fifteen years. Alternatively, the increased benefits granted might be subject to annual approval thereafter, becoming in effect, a pay-as-you-go approach without any guarantees whatsoever to the retirees.

Under these two funding approaches the annual outlays are fairly similar. However, if the intent of the employer is to make these ad hoc supplements on a fairly regular basis, future costs are not being recognized as they accrue over the working lifetime of an employee. Moreover, this approach creates little appreciation among active employees, who see no long-term commitment on the part of the employer to protect them against future increases in the cost of living when they retire.

I. *Cost-of-Living Option*

Another approach for maintaining pension adequacy in an inflationary environment is an optional settlement at retirement called the cost-of-living option. The employee may elect to take a reduced pension initially with a provision that it will automatically increase each year by a stated percentage. Since the yearly percentage increase can be designated and the initial pension actuarially reduced accordingly, this approach involves no additional cost to the employer because the employee is paying for his inflation protection by taking a reduced pension initially. If the employer does not wish to require a full actuarial reduction but wishes to subsidize this option partially, the cost of protecting against inflation will be shared by the employer and the employee.

J. *Employee Contributions*

The cost of providing inflation protection may be met by incorporating a requirement for mandatory employee contributions. For example, if the additional costs of providing inflation protection were 2–4 percent of payroll, the employees could be required to make this contribution. Such an approach would be more palatable if the private pension sector could secure favorable federal legislation making employee contributions tax-deductible.

If a mandatory approach is not considered desirable, one of two other approaches may be used, either noncontributory profit-sharing plans or contributory thrift plans. Under a profit-sharing plan, employer contributions would be subject to available profits, and no secure guarantees would be provided to pensioners. The actuary can be helpful in making projections as to what profit-sharing balances might accumulate under alternative formulas and predicting the degree of inflation protection that will be available to employees in various age brackets. The employee's account balance could be converted to an increasing annuity at retirement. Under a thrift plan, the employer agrees to match a percentage, usually 25–100 percent, of the employee's contribution. This can be a very economical way for a plan sponsor to secure his employees' cooperation in providing inflation protection.

Such plans, however, will not meet the needs of those already retired or of older workers approaching retirement. Whereas an employee aged 35 might have to contribute 2 percent of pay to meet a 3 percent cost-of-living protection, an employee aged 50 would have to contribute over 4 percent. Consequently, the needs of the older employee and retiree would still have to be met through discretionary ad hoc increases.

K. *Variable Annuity*

The variable annuity is a defined contribution rather than a defined benefit approach to protecting against inflation. Various benefit formulas may be used to determine contributions to individual account balances for each employee. These account balances are incremented by actual fund earnings up to retirement. At retirement, the annuitant may elect a fixed benefit option or he may elect to let his annuity payments fluctuate with the investment results of the fund. If this approach is used from the employee's date of hire to his date of death, then dollar averaging may produce results that are favorable in the sense that they meet the cost of protecting employee pensions from inflation.

This approach should be carefully distinguished from a variable annuity option at retirement in a defined benefit plan. Under this option an ac-

tuarial reserve based upon a target rate of interest such as 5½ percent is transferred to a variable annuity fund. The employees' benefits will then vary as the fund earns more or less than the target interest rate.

This approach shifts the entire investment risk in the postretirement years to the annuitant. The success or failure of this annuity option is extremely dependent on the timing of the individual's retirement. For retirements occurring in the early 1970s, this annuity option proved to be somewhat disastrous. Consequently, we would caution against its use in a defined benefit plan. If it is used, the additional costs will be about 8 percent for each percentage point that the postretirement interest assumption is less than the preretirement interest assumption.

V. PUBLIC AND PRIVATE POLICY ISSUES

Before we set forth our recommendations below, some general observations should be made.

1. We should do everything possible as corporate and private citizens to encourage government to pursue policies that bring inflation under control. The approaches recommended here for maintaining the purchasing power of retired-life pensions treat the symptoms of inflation; it is obviously preferable to find a cure.
2. Absent such a cure, it is desirable that the private pension industry adopt sound measures to deal with the erosive effects of inflation, lest we witness a significant expansion of the social security system or other government-imposed solutions. We believe that the private pension industry is better able to provide for the savings and capital formation so necessary for expanding and improving the productive capacity of the economy from which all pension benefits ultimately derive.
3. We should encourage the establishment of a price index that more adequately reflects increases in the cost of living for pensioners in particular. In the meantime, a more appropriate measure of the cost-of-living increase than the CPI is probably represented by 80 percent of the CPI increase. The private sector should also pursue passage of legislation allowing for tax-deductible employee contributions to pension plans so that employees will be encouraged to contribute for their own retirement protection.
4. A key ingredient in the viability (in terms of cost) of the approaches we are recommending is the investment of plan assets in funding vehicles that can, over the long run, produce investment returns that keep pace with inflation. If this cannot be accomplished, then there will be a very significant cost impact on private pension plans. Plan investments, except short-term commercial paper, perform at best erratically in an inflationary environment. Since the plan sponsor is better equipped to withstand the fluctuations of investment return under conditions of inflation than the individual pensioner, an indexing approach to providing for postretirement cost-of-living increases is preferable to

one based strictly on investment performance. However, performance indexing can be an effective approach, with the added advantage of cost control, especially if retired-life assets are invested in short-term commercial paper or investment yield is suitably averaged over an investment cycle.

5. The private pension sector should undertake to provide reasonably adequate pensions at retirement, but not so generous as to be at the expense of preserving purchasing power after retirement. Proper plan design should allow for the accumulation of funds to protect the real value of pensions.

VI. SUMMARY AND RECOMMENDATIONS

Absent governmental policy to control inflation completely, plan sponsors and employees have a broad range of alternatives for coping with the problems of inflation in the retirement years. If the firm's financial resources permit, we would recommend adopting the full-indexing approach. We would index to 80 percent of the increase in the CPI. In order to avoid a completely open-ended commitment as to future cost, we would also recommend a cap of 5 percent cumulative per annum.

For a plan in which the funding assumptions have already incorporated a 2 percent rate of inflation (probably true of many plans), the additional funding outlays would be approximately 16 percent for a new plan and a somewhat larger percentage, depending on the degree of funding already accomplished, for an established (older) plan. In addition, we probably would introduce a ¼ percent margin for each percentage point of protection in excess of 2 percent provided. Thus, for a 5 percent cap, we would introduce a ¾ percent interest margin. For active members of a final salary type of plan, this might increase initial funding outlays by about an additional 15 percent. However, if the fund investment yield should fully match the increased inflation assumed, the actuary could remove this interest margin and its associated funding outlays. Of course, the converse may also be true; that is, should the fund fail to earn the investment yield expected by the actuary, plan costs could increase beyond the level mentioned above. In other words, the full investment risk up to the 5 percent cap is placed on the plan sponsor.

Alternatively, the plan sponsor who is unwilling to undertake such an open-ended commitment may choose to use performance indexing. Post-retirement pension increases could be limited to the excess of the yield on retired-life assets over the true rate of interest. For a plan in which the funding assumptions as to salary scale and interest rate have not already considered inflation, there may be no long-run increase in funding outlay. In a new plan, for each 1 percent of inflation already factored into the funding assumptions, long-run funding outlays will increase by 7–8 percent

when performance indexing is adopted. For existing plans where present costs are partially met by existing assets, the funding outlays will increase by a larger percentage, depending on the size of the actuarial accrued liability and the degree to which it is already funded.

There should be no additional cost increases unless the fund fails to earn at least the assumed true rate of interest. If the plan sponsor does not wish to shift the entire investment risk to the annuitants but is willing to accept some of the investment risk himself, he can guarantee indexing for the first 1–4 percent of the increase in the cost of living independent of investment performance (as does the Rockefeller Foundation pension plan).

Some employers may believe that they have already used cost reductions from increased investment yields to liberalize their benefits at retirement more than is required for an adequate standard of living. Other employers may wish to establish somewhat liberal pensions at the point of retirement such that they might withstand, for example, a 2 percent rate of inflation and still remain adequate. Thus, the plan sponsor would not have to supplement the pensions once granted as long as inflation did not exceed 2 percent. This would, of course, simplify administrative procedures. In such a case, we would recommend indexing up to a 5 percent cap with a 2 percent per annum deductible. For the plan that has already included a 2 percent inflation rate in its assumption, funding outlays might be increased initially because of the adoption of an interest margin in the actuarial assumptions. Again, should the investment yield fully match the increase in inflation assumed, the additional costs will not materialize.

If the plan sponsor wishes to provide some protection against inflation, but is unwilling to guarantee full benefit indexing or to offer performance indexing, then we would recommend benefit indexing using a lower cap such as 3 or 4 percent, indexing to, say, 50 percent of the increase in the cost of living, delaying the starting date by three to five years, or providing a partially subsidized increasing annuity option. These alternatives may be used singly or in combination. Costs will be lower than the full-indexing approach, and the sponsor may make additional ad hoc adjustments as his resources permit.

Some plan sponsors or their employees may find it necessary or desirable for both employer and employees to share the cost of protecting against inflation in the retirement years. For such firms, we would recommend inclusion of mandatory or voluntary employee contributions or the adoption of a profit-sharing or thrift plan.

The ad hoc approach is especially useful in treating employees who have already retired. However, we would recommend the use of this

approach only where the firm's resources are initially very limited but prospects for greater availability of financial resources to meet the accruing pension costs in the future are favorable. The plan sponsor who does adopt an ad hoc approach should fully discuss with his actuary the implications of larger costs in future years. A possible alternative to the ad hoc approach would be to apply the formula approach for active members retroactively to existing retirees.

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DISCUSSION OF PRECEDING PAPER

CHARLES E. CHITTENDEN:

Recent high levels of inflation make indexing pensions a topic of great importance. The authors provide a useful survey of indexing approaches. However, I disagree with their analysis of the effects of indexing on pension funding.

The authors state that if a pension plan's actuary changes his assumptions to recognize inflation to some extent in both his interest rate and salary scale assumptions, "a reduction in cost will result that can be utilized to finance the indexing of pension benefits." I believe this sentence and the paragraphs immediately following it are incorrect.

Ultimately, pension cost depends on the amount of money paid under the terms of a plan for benefits and expenses. It is not affected by actuarial assumptions or methods. Actuarial assumptions and methods are tools to determine appropriate current contributions to fund ultimate pension cost. That is, assumptions affect only the incidence of pension contributions. A change in assumptions may indeed reduce this year's contribution, and contributions for several years to come. But in the long run, it is the real experience and provisions of the plan that determine cost, not the actuary's assumptions.

One can argue that, considering all investments of an employer, a long-term profit from conservative pension funding will result if investments in the pension fund compare favorably to other investments after taxes. However, this situation is uncommon today. Added investment income of a conservatively funded pension plan is generally offset by forgone income from other investments.

The distinction between pension cost and current contributions is much more than semantics. A change in assumptions affects contributions but not cost, while the adoption of an indexing amendment affects both. The combined effect on current contributions of an amendment providing indexing and of a change in actuarial assumptions may be small. Nonetheless, an actuary who persuades an employer to adopt an indexing amendment on this basis is doing the employer a disservice. The actuary should inform the employer of his best estimate of the true long-range cost of adopting the amendment. Because of the amendment's very large potential cost, the actuary might provide an open-group projection of

pension contributions over a twenty- or thirty-year period, with and without the amendment, with and without the change of assumptions, and reflecting a range of possible experience, varying such factors as rate of return on investment, mortality, CPI increases, and the size of the active work force. The employer then might see that the effect on contributions of a change of assumptions is temporary, whereas the effect of the indexing amendment is permanent. The employer also might perceive the sensitivity of his contributions to actual investment, mortality, and inflation experience and to changes in the work force. Open-group projections permit the employer to make an informed decision as to whether he can afford the financial risk of adopting the indexing amendment. The authors seem to feel that it is enough to compare current contributions determined before the amendment and before the change of assumptions ("before before" contributions) with those determined after the amendment and after the change of assumptions ("after after"). I believe such a comparison is misleading. Employers informed only of "before before" and "after after" contribution amounts may adopt indexing amendments mistakenly believing them to be affordable. Such employers may be forced to terminate their plans at some future date solely because of this confusion of pension cost and current contributions, a confusion that presents itself throughout this paper.

I believe the authors also confuse the issue of how actuarial assumptions are chosen and when and why assumptions should be changed. Actuarial assumptions are chosen to represent an enrolled actuary's "best estimate of anticipated experience under the plan" (in the language of ERISA, and attested annually by the enrolled actuary's signature on Schedule B, Form 5500). The enrolled actuary should change his assumptions when they no longer meet the "best estimate" criterion. For example, an actuary might properly change his retirement age assumption if a plan is amended to provide subsidized early retirement, because his best estimate of retirement ages under the plan has changed. Do the authors contend that their best estimates of interest rates and salary scales change if an employer decides to provide indexing? Why change assumptions? Would the authors, who write of implicit funding "through margins retained in the actuarial assumptions," and who recommend a "¼ percent interest margin for each percentage point of protection" in their choice of interest assumption, sign Schedule B? Actuaries may disagree as to whether 5 or 8 or 12 percent is the "correct" best estimate interest assumption. However, if an actuary's assumptions include margins for conservatism, he is not using his best estimate assumptions, as required by law.

The reduction in this year's contribution brought about by a change in actuarial assumptions could be used for any purpose, not just to fund indexed pensions. Employers must decide whether to spend money on retired employees, active employees, equipment, supplies, or anything else. The authors suggest that an indexing amendment and an assumption change are linked, and that plan sponsors who "accept" changes in assumptions to reflect inflation when no indexing amendment is in effect are "not socially responsible." I believe this is inaccurate. Actuaries decide on assumptions and employers decide whether to adopt indexing or to spend their money in other, perhaps even more responsible, ways.

The authors appear to have discovered that they have been funding for indexed benefits all along. Under their conservative assumptions, gains have occurred each year and the resulting reserve can now be partially released to reduce current contributions for an indexed plan.

There are two major flaws in this approach. Contributions determined as though indexing provisions were in effect may not be deductible, since benefits which are not part of the plan cannot be considered in determining deductible limits.

Second, the authors' approach gives misleading advice to employers. Important management decisions are based on actuaries' pension cost estimates. If actuaries routinely overstate contributions through conservative assumptions, employers may adopt needlessly inadequate pensions, or they may be unable to provide cash compensation or welfare benefits needed to compete for employees. They may go bankrupt. If actuaries understate the cost of indexing by sugar-coating it with a change of assumptions, employers may make commitments the true cost of which they realize only too late.

PETER C. HIRST AND ROBERT L. BROWN:

The authors must be thanked for their timely and topical discussion of the different possible methods of protecting postretirement purchasing power of pensions.

The authors point out "if a pension plan has been valued on a consistent set of actuarial assumptions that excludes inflation from both the salary scale and the interest rate, and a shift is made to actuarial assumptions incorporating inflation, a reduction in cost will result that can be utilized to finance the indexing of pension benefits. . . . because the increase in the interest assumption will remain in effect until the employee dies, whereas the increase in the salary-scale assumption will have effect only to age 65, or the assumed retirement age. . . . Plan sponsors who have

accepted such a change in actuarial assumptions have in effect utilized inflation (the erosion of real pension benefits) to reduce their plan costs." One could perhaps add "or to increase the benefits for active employees more than would otherwise have been the case."

To the extent that a higher interest rate assumption reduces apparent costs, that reduction reflects a reduction in the purchasing power of the pension benefits received by retired persons or those given deferred vested benefits. If the paper had one deficiency, it was the fact that it failed to point out strongly enough the very serious erosion of deferred vested benefits by inflation. Thus, any method that is to be used to protect the purchasing power of pensions must also be capable of responding to the need of those holding deferred vested benefits. Many of the methods the authors suggest would suffice.

"Indexing" to many people implies tying the purchasing power of one's pension to an outside index, usually assumed to be the Consumer Price Index. But, as the authors point out, "we should do everything possible as corporate and private citizens to encourage government to pursue policies that bring inflation under control. The approaches recommended here for maintaining the purchasing power of retired-life pensions treat the symptoms of inflation; it is obviously preferable to find a cure."

Hence indexing of pensions to the CPI is to be avoided. If no one suffers from inflation, what incentive is there to find a cure? The rate of inflation in Israel (now at 135 percent, which is not at all unusual) seems to be at least partial proof of that. Unfortunately, at the moment, the only people who are truly immune from inflation with respect to their pensions are our (Canadian) federal civil servants and politicians—exactly the people who should not be immune! Further, few, if any, private sector plan sponsors will be willing to sign the blank check required for a plan indexed to the CPI.

There is a method that satisfies all requirements laid down thus far. It can be used for deferred vested benefits and retirement benefits. It does not decrease the incentive to reduce inflation. It can be applied without the plan sponsor signing a blank check with respect to costs. The method is method G in the paper, which is referred to as performance indexing. We prefer to call this the "excess interest" approach.

There is no question that the excess interest concept has gained popularity in Canada. As reported in the published proceedings of the National Pensions Conference (March 1981), a major conference sponsored and organized by the Canadian federal government, this approach received the most support in the workshop discussions on inflation protection. It also has received the endorsement of the Canadian Association of Pension

Supervisory Authorities (CAPSA) and the Province of Ontario's Select Committee on Pensions, both of which recommended that legislation be developed using this approach for both retirement and deferred vested benefits. The Canadian Life and Health Insurance Association (CLHIA) has recommended the use of the excess interest approach using 6 percent as an initial "net rate of return" with the hopes of lowering that floor as costs become manageable.

Mutual Life of Canada has introduced a new pension plan for their own employees that uses an excess interest approach for both retirement benefits and deferred vested benefits assuming a 4 percent net rate of return. Finally, Sun Life has introduced an excess interest annuity called the Sun Escalating Annuity, which increases annually on the basis of the yield on ninety-day Treasury bills over 2 percent. This is not a variable annuity since payments can never decrease, even if the yield on Treasury bills drops below 2 percent. (Sun Life assumes that risk.) Thus, excess interest annuities now are available for any plan sponsor wishing to transfer his risk.

Most people look at the excess interest approach as being the one which increases benefits annually according to the difference between the actual rate of return on an investment fund and the floor rate of (say) 3–4 percent. We refer to this as solution 1. This is not the only possible solution, however. In fact, for pensioners it may be the worst of four possible solutions that we examine. It immediately raises questions of how you measure actual returns, what you do about negative returns, which part of the fund you use for this, what you do about unfunded liabilities, and so on. Furthermore, it imposes on the pensioners the risk of adverse performance. In many respects, it resembles the money purchase approach, but provides no opportunity for the smoothing out of investment returns over long periods of time.

Our solution 2 relates the pension increases to the excess of three-month Treasury bill yields over a floor rate. This method has considerable appeal. In the first place, it would be easy to administer and communicate. Second, Treasury bills tend to track inflation rather closely. Third, savings account rates, and rates on similar funds that individuals are interested in, tend to be closely related to Treasury bill rates. Finally, the risk of adverse pension fund performance would remain with the sponsor, but would continue to be just as manageable as that for any defined benefit plan.

This is particularly so when one recognizes that Treasury bills are essentially a risk-free investment. Because of this, many investors and fund managers regard them as the floor from which performance should

be measured. If fund management is to be worth anything, fund returns should, over reasonable periods of time, exceed the returns on Treasury bills. Thus, the sponsor still could give his fund manager considerable scope to manage, in the reasonable expectation that his funds will earn more than Treasury bills.

Of course, if the sponsor should prefer to immunize this particular liability, he can simply invest the appropriate funds in Treasury bills. Furthermore, as pointed out above, a product now exists, issued by a private insurance company, that would accommodate the plan sponsor who prefers to purchase pensions at retirement, rather than pay them out of the fund.

The third possible solution (solution 3) would be to fix every five years the pension increases for each year's block of retirees. The annual increase would be the excess of the yield available on five-year *residential* mortgages over the floor rate.

The reason for using five-year residential mortgages is that most people by the time they retire have suffered the agonies of having a mortgage, so communication should be relatively easy. The pensioner would in fact be in a position almost exactly the same as if he were now the owner of the mortgage. Furthermore, mortgages operate like annuities. Residential mortgage rates have also tended to track inflation in the past and, of course, have produced substantially higher returns than Treasury bills.

However, this approach would be somewhat more complex to handle and is more likely to have an adverse effect on capital markets. Might it not result in an overabundance of residential mortgage money, with a corresponding reduction in funds required for other capital projects? And might this not also result in lower yields on mortgages?

Finally, let us look at solution 4. In some ways, this is the logical extension of solutions 2 and 3. We move from fixing the annual pension increases every year (the Treasury bill approach) through fixing them every five years (the five-year mortgage approach) to fixing them forever at the point of retirement—the long-term government bond approach. Under this last approach, the annual increases are fixed permanently for each member at the end of the year of retirement as being the amount that long-term government bond yields for the year exceeded the floor rate—that is, the "true" or "real" interest rate.

This approach really does define the benefit at the point of retirement. The pensioner knows exactly what his pension is going to do. It is easy to fund, and the liability can reasonably easily be immunized if the sponsor wishes this. The appropriate insurance product also would be easy to develop.

It seems like a fine solution but it does not work! In periods of rising inflation, even though interest rates were also rising, the pension increases would tend to fall far short of inflation. This would have been the situation over pretty well the whole postwar period. Of course, the reverse would tend to be true in periods of falling inflation.

To see how each of these last three solutions would have worked in the past, we developed some numbers from the CIA's latest Report on Economic Statistics covering the period 1924–80, which are shown in Table 1. The figures for mortgages must be viewed in light of the fact that five-year mortgages came into existence only in the late 1960s. This, of course, would have created a funding problem if the sponsor had wanted to immunize this particular liability.

We looked at the situation of pensioners retiring at the end of each quinquennial year starting in 1945, 1950, 1955, and so on, through to 1975. We then looked at what real value their pensions would have under the various possible solutions, at five-year intervals after retirement. For this purpose we used a floor rate of 0 or 1 percent for Treasury bills (solution 2), 2 percent for long-term government bonds (solution 4), and 4 percent

TABLE 1

REAL VALUE OF $1.00 PENSION

	No Inflation Protection	3-Month T Bills −0%	3-Month T Bills −1%	Long-Term Bonds −2%	Mortgages −4%
1946–50	$ .73	$ .74	$ .71	$ .75	N/A
–55	.64	.70	.64	.68	N/A
–60	.59	.76	.65	.64	N/A
–65	.54	.84	.69	.61	N/A
1951–55	.88	.94	.90	.94	$ .95
–60	.80	1.00	.92	.91	.96
–65	.74	1.00	.97	.89	1.00
–70	.61	1.00	1.00	.78	1.00
1956–60	.91	1.00	1.00	.99	1.00
–65	.84	1.00	1.00	.99	1.00
–70	.69	1.00	1.00	.88	1.00
–75	.49	1.00	.99	.67	.98
1961–65	.92	1.00	1.00	1.00	1.00
–70	.76	1.00	1.00	1.00	1.00
–75	.54	1.00	.96	.84	.97
–80	.35	1.00	.97	.64	.92
1966–70	.83	1.00	1.00	.99	.99
–75	.58	1.00	.91	.83	.90
–80	.38	1.00	.92	.65	.86
1971–75	.70	.92	.87	.89	.91
–80	.46	.97	.88	.74	.87
1976–80	.66	1.00	1.00	.93	.95

for mortgages (solution 3). We also used the CPI as the measure of inflation.

None of the approaches would have worked very well during the years following the war. This was the era of cheap money, the Korean War, and high inflation. The only other period which would not have worked out too well was the first half of the 1970s. In all other periods (particularly the 1955–65 period), the Treasury bill and mortgage approaches would have worked well. As already mentioned, the long-term bond approach would have been something of a failure.

In the analysis we assumed that the maximum pension increase would be inflation, unless the pension increases had fallen behind, in which case a catch-up was allowed. Any excess returns over what was needed to keep pace with inflation were banked for future use, if needed. While this study is somewhat crude, it does tend to suggest that the system could be made to work reasonably well for pensioners. (It also should be recognized that there are many possible variations on the approaches that we have examined.)

Two questions remain. What about the deferred vesteds, and what about the transition problems? The Treasury bill approach could easily be applied to deferred vesteds, but we feel that the employer and/or the employee should have the option of transferring the actuarial reserve to a locked-in RRSP (IRA in the United States). This reserve would be calculated on, say, a 3 or 4 percent interest basis. You really then have the application of solution 1, but without all its difficulties. At retirement, the funds would have to be applied to purchase a pension consistent with whatever approach is adopted for pensioners.

There is no question, therefore, that a workable "excess interest" system can be developed. However, the transition problems are fairly considerable and must be carefully thought through. Obviously, one of the transition problems will be the increase in costs for plan sponsors who have included significant levels of inflation in the determination of plan contributions. This problem might be overcome by assuming a fairly high net rate of return initially (say 6 or 7 percent), thereafter lowering it in a manageable fashion to a more typical net rate of return (say 2–4 percent). In fact, that is exactly what the CLHIA, CAPSA, and others have suggested. Another solution is to adjust benefits with a delayed starting date, as the authors discuss under heading D.

Interestingly, many employers in Canada are in fact granting ad hoc increases to pensioners that, on average, offset about two-thirds of inflationary losses. Strangely, many of these same employers have expressed strong opposition to any legislation forcing them to do what most of them

are already doing. It would appear that they are justifiably concerned about the blank check costs of the type of indexing given to our federal civil servants. As we have shown, the excess interest approach does not carry with it the same open-ended cost implications. The option of not bearing these costs at all does not really remain any longer. The choice now is between bearing these costs within the private free-enterprise system or through an increased government-designed system (in Canada, an expanded Canada Pension Plan). Given these limited options, the choice surely is clear.

ANNA M. RAPPAPORT:

The authors are to be congratulated for contributing a practical paper on a subject of immediate concern.

Some additional considerations are in order. The vast majority of larger plans have granted ad hoc increases in recent years so that the picture is better than it would appear on the surface.

The authors discuss the CPI and how much indexing is needed for living standards to be maintained. If we focus on the private plan only, two additional factors must be considered. First, social security is fully indexed, and, in fact, benefit levels have increased more than the CPI. Second, social security benefits are tax free. In combination, these forces change the indexing needed in the private pensions. This issue is explored in the paper by Berin and Richter.

The authors favor indexing, and the paper could be used in support of mandated indexing. The arguments for automatic indexing are quite reasonable when the pension system is viewed by itself, but are less favorable when the pension is viewed as part of the total compensation package in the current economic climate. If benefits are indexed so that the cost to fund increases by 2 percent of payroll, then one of the following will happen:

1. Another part of the compensation package will decrease so that total compensation will be unchanged.
2. Total compensation will increase, and the increase will be shifted to the consumer in the form of higher prices.
3. Total compensation will increase, and the increase will be reflected in lower earnings for shareholders.

In our current economic climate, none of these results is very desirable. The problems facing employers and employees include the following:

1. No increases in after-tax family income even though there are more earners;
2. A slowdown in productivity growth;

3. Uncontrollable and very large increases in health care costs;
4. The acceptance of reductions in compensation packages by employees and unions;
5. High unemployment;
6. Disappointing stock market performance.

Many American businesses, including some that are very large, are involved in a fight for survival. Under these conditions, many employers will decide that it is the wrong time to commit to automatic indexing. For them, ad hoc increases provide a far better solution in light of current conditions.

In the United States, at both a government and an employer level, we must look at what we have promised people, what it will cost, and whether we are willing to pay that price. It appears that in many cases we may not be.

CHARLES WALLS:

Having just spent the last weekend grading actuarial examinations and trying to make sense out of the meanderings of students, I am coming to this paper with a more than usually jaundiced eye. I would think seriously of putting parts of the paper on the exam syllabus so my committee could have a fertile field to pick through, making up questions such as, "Discuss what is wrong with the following statement: An actuary can provide for the cost of increased benefits in a pension plan by changing assumptions." Unfortunately, the students are confused enough by the present syllabus. Almost all of them answered this year's question on choosing interest assumptions by including the thought that the tax authorities do not permit funding for benefits that are not legally part of the pension plan but that the actuary can cleverly do just that by choosing interest rates which are "conservative" but clearly not "best estimate." Unfortunately, my first reader on this question, also thinks that these are valid points and has put them in her marking outline.

With all this in mind, I have torn myself away from Russell Baker's *So This Is Depravity* to labor in the vineyards of actuarial truth. The paper bumps along for a bit uttering the usual commonplaces about three-legged stools and such. We then come to this sentence: "If a pension plan has been valued on a consistent set of actuarial assumptions that excludes inflation from both the salary scale and the interest rate, and a shift is made to actuarial assumptions incorporating inflation, a reduction in cost will result that can be utilized to finance the indexing of pension benefits." Simply amazing! Perhaps the authors should be introduced to Mr. Furnish, who in the same set of galley proofs appears with our old familiar *C* +

$I = B + E$ and goes on to remark that "the right-hand side of the equation, benefits plus expenses, represents the ultimate cost of the plan and is a function of plan design." I thought we used to teach these old verities.

The next item one might be tempted to introduce the authors to is ERISA and the IRS rules that seem to say something about using best estimates in valuations of pension plans. There even seem to be some accountants lurking in the underbrush with some of these wild-eyed ideas, as well. It is not entirely clear from the paper whether the authors are advocating that actuaries use other than their best estimates for assumptions in valuing plans that do not have indexing. Nonetheless, someone is being blamed for being "not socially responsible," and it would seem that the actuary is at least an accessory. The *Record* reporting the Ottawa meeting in 1981 sheds a bit more light on this. One of the authors is quoted: "My company has taken a position that we will not adopt an explicit interest assumption . . . for plan sponsors who are not willing to adopt some kind of explicit post-retirement indexing." I assume we can read "best estimate" for "explicit assumption." I suppose some parts of ERISA are just more socially responsible than others.

In Section V, recommendation 4, the authors have an idea that reality has something to do with the costs of a pension plan and some of their conclusions and recommendations seem quite sensible.

(AUTHORS' REVIEW OF DISCUSSION)
GERALD RICHMOND AND MARK L. ROSEN:

Mr. Chittenden takes exception to our terminology or definition of "cost" as "pension plan contribution." We meant to use "cost" as "pension plan contribution" or "normal cost plus amortization payment." Inadvertently, we also used "cost" to mean ultimate cost as defined in Jeff Furnish's paper "Pension Plans in an Inflationary Environment." Mr. Furnish refers to the equation $C + I = B + E$ and states that $B + E$ (that is, benefits plus expenses) represents the ultimate cost of the plan. Mr. Furnish refers to the left-hand side of the equation $C + I = B + E$ as representing incidence of cost (that is, pension plan contribution).

Mr. Chittenden objects to the sentence "If . . . a shift is made to actuarial assumptions incorporating inflation, a reduction in cost will result." (Here, cost is to be interpreted as pension plan contribution.) This is a theoretical statement that must be tested against reality. The paper clearly states several times that the increased benefits to be paid as a result of indexing may be financed out of increased investment yields so that pension plan contributions may not need to be increased *if* the increased

investment yield is actually earned. For example, we state the following in the last section of our paper: "Again, should the investment yield fully match the increase in inflation assumed, the additional costs will not materialize." (Here, the word *costs* is to be interpreted as referring to pension plan contributions.)

Mr. Chittenden agrees with us that a change in assumption alone (such as an increase in the interest assumption) can not reduce the actual pension plan contributions needed to finance the ultimate cost $B + E$. Mr. Chittenden, however, never did address the contention that an actual increase in investment yield I mirroring or matching the increase in the interest assumptions and consistently realized over the future will reduce "cost" (that is, required pension plan contributions). He was trying to emphasize that it is the actual or "real experience" and not the assumptions that determine "cost," and he agrees that if actual experience matches assumed experience, then, and only then, is there a reduction in "cost."

Nevertheless, Mr. Chittenden objects to our statement that if the interest assumption is increased, there is a reduction in pension plan contribution. We were using "pension plan contribution" or "cost" to mean the theoretical periodic contribution assigned to the current period on the basis of a set of theoretical assumptions (as well as a cost method and amortization period selected by the plan sponsor). The periodic contribution is an apportionment to the current period of Mr. Chittenden's total actual contributions over the life of the plan, known only when the plan is wound up. Whereas our periodic "cost" is only an estimate, his lifetime "cost" is actual. We were not saying that an increase in the interest assumption reduced actual contributions over the life of the plan, but rather that it reduced the estimated contribution for the current period. The resolution between our concepts of cost is that if actual experience matches the actuary's assumptions, then the sum of the periodic contributions will converge to the contributions actually needed over the life of the plan. We did caution that theory must be matched by actual experience if actual (lifetime) contributions are to be reduced. It will be an increase in actual investment yield, not in the interest assumption, that reduces total contributions over the life of the plan.

Mr. Chittenden asserts that "employers may be forced to terminate their plans at some future date solely because of this confusion of pension cost and current contributions, a confusion that presents itself throughout this paper." Mr. Chittenden's "pension cost" (that is, the actual contributions over the life of the plan) has no monopoly on "cost," which may also mean theoretical contribution for one period. We do not increase our interest assumption unless we believe that actual investment yield also

will increase, in which case the theoretical conclusions will hold up in fact.

The confusion arises from the choice of terminology. First, "pension cost" is not used in actuarial literature to mean $B + E - I$. The term $B + E - I$ is an ultimate cost, and, to complicate matters, ultimate cost is defined as either $B + E - I$ or $B + E$, the former meaning pension outlays or contributions and the latter forgone cost or both contributions and investment income forgone or sacrificed to finance benefits plus expenses to be paid. Mr. Chittenden never does say unequivocally which is his definition, and he introduces more terminology, "true long-range cost" and "potential cost," which we interpret to be the best estimate of long-range incidence of pension plan contributions, and benefits that may be paid under the indexing amendment, respectively.

Mr. Chittenden states the following (emphasis added): "Ultimately, pension cost *depends on* the amount of money paid under the terms of the plan for benefits and expenses." Here he might mean "ultimate cost" as defined by Mr. Furnish, $B + E$. If so, Mr. Chittenden should have said "ultimate cost represents the benefits plus expenses actually paid over the life of the plan." That pension cost is dependent on $B + E$ could mean that pension plan contributions (or their incidence, a la Furnish) depend on $B + E$ in an undefined way. We do not know how Mr. Chittenden will define or use "pension cost." We know only what it depends on.

Mr. Chittenden states that "assumptions . . . are tools to determine appropriate current contributions to fund ultimate pension cost." First, Mr. Chittenden tells us that we do not through our assumptions determine ultimate cost, but now we do determine appropriate current contributions. Loosely speaking we do, but gain and loss analysis of emerging actual experience often leads to revision in assumptions, so *estimate* is a better word than *determine*. We are always trying to "true up" our estimate of pension plan contributions needed to meet the benefit outgo. We do not fund "ultimate pension cost" (wherever or whatever it is), we fund for the benefits and expenses ultimately to be paid ($B + E$). Since "ultimate pension cost" is undefined both by Mr. Chittenden and in the actuarial literature, we are confused by Mr. Chittenden's statements. Mr. Chittenden states that "it is the real experience and provisions of the plan that determine cost, not the actuary's assumptions." Here we have that offensive word *cost*—which Mr. Chittenden has failed to define.

Real experience, according to Mr. Furnish, does not affect ultimate cost, $B + E$, which is a function only of plan design. The provisions of the plan, according to Mr. Furnish, do. On the other hand, Mr. Chittenden seems to be saying that what determines "pension cost" is the real ex-

perience, meaning actual as opposed to assumed experience. Well, "real experience" could include I as well as the $B + E$ term. Actual investment yield does not affect $B + E$, but it is real experience. Experience such as salary increases can be expected to affect B. If real experience includes I, then Mr. Chittenden is defining pension cost as $C = B + E - I$. Surely if actual investment yield increases, pension cost C is reduced. To complicate matters, ultimate cost could be interpreted as $C + I = B + E$ by elaborating upon I as "forgone income." (Study Note 9E2-2-66 gives us two definitions.) This means that both $C + I$ are forgone to finance $B + E$. Actually, Mr. Chittenden was trying to emphasize only that an increase in the interest assumption not matched by an increase in actual investment yield will not reduce "cost," which he does indeed define as $B + E - I$. If Mr. Chittenden had said, "No matter what assumptions as to interest and salary scale the actuary makes, the ultimate cost (that is, actual benefits and expenses to be paid from plan assets) cannot be affected or changed," we would have wholeheartedly concurred. We were merely saying that an increase in $B + E$ could be financed by an increase in either C or I. Even though pension or ultimate cost $C + I$, identical to $B + E$, is not affected by a mere change in actuarial assumptions nor even by a change in actual experience, there can be a reduction in the pension plan contributions if actual investment yield, I, increases because of an inflation premium. This was what was being demonstrated in theory by our analyzing the theoretical consequences of an increase in the interest assumption.

In Mr. Chittenden's fifth paragraph he states, "The distinction between [Mr. Chittenden's] pension cost and current contributions is much more than semantics." Although the Final Report of the Committee on Pension Terminology defines "pension cost" as the nonpreferred term for "pension plan contribution" (that is, normal cost plus amortization payment) or "current contribution," let us assume Mr. Chittenden's distinction. We are then asked to provide the best estimate of the "true long-range cost" of adopting the amendment. Is he talking about the incidence of "cost," (pension plan contributions) or ultimate cost $B + E$, benefits plus expenses to be paid? Mr. Chittenden fails to see that *these are two different "costs."*

We can make a forward projection of the ultimate cost $B + E$ for twenty or thirty years. This estimate of the benefits and expenses is the potential cost referred to by Mr. Chittenden. However, we still have to estimate the incidence of plan contributions or "true long-range cost" many years into the future. "Best estimates" are requested for contribution levels (for Schedule B). The term "best estimate" is not used in the context of projecting benefits plus expenses, $B + E$; one would use an expression

such as a "careful projection of $B + E$." I must assume that Mr. Chittenden is asking for a best estimate of future contribution levels. Actuaries select assumptions, monitor them by comparing them to actual ("real") experience, and change them if they do not mirror emerging or expected experience. Consequently, since actuaries are always only estimating "long-range costs," "true" is an inappropriate description. Whose long-range costs would be false? A best estimate of long-range cost is all that can be asked of an actuary; "best estimate" implies that it should be *as close to the truth as possible*. To estimate the incidence of plan contributions, we must first develop the actuarial (time weighted) value of $B + E$ after choosing a time period suitable to the presentation, such as twenty or thirty years (for public plans a much longer period may be appropriate), for which to estimate appropriate periodic contributions, which when added to I will finance the $B + E$ actually to be paid. Note that we have used "as close to the truth as possible," refraining from saying "as close to the 'real cost' as possible." As a matter of fact, Mr. Chittenden's "cost" or "pension cost" is contributions—the same as my "cost." Our difference is that Mr. Chittenden is willing to wait twenty or thirty years, or even until the last pensioner has died, before he will say what "cost" is. Then it is $B + E - I$, which, from the equation $C + I = B + E$, is C—the actual pension plan contributions over the life of the plan. Mr. Chittenden's undefined or poorly defined "cost" is indeed contributions. When he says "assumptions . . . are tools to determine appropriate current contributions to fund ultimate pension cost," he is merely saying that assumptions are tools to determine, or rather estimate, appropriate periodic contributions that will, over the life of the plan, add up to the actual contributions, C, which, incremented by investment income, I, will finance all the benefits plus expenses to be disbursed or paid out from the pension fund. In order to obtain an estimate of the portion of lifetime contributions appropriate for assignment to the current period, our "cost" becomes important. Since these theoretical or estimated pension plan contributions depend partly on assumptions, it is perfectly appropriate to say that "cost" is reduced (in theory) if our interest assumption is increased, just as it is correct for Mr. Chittenden to say that C is reduced if I is increased in actual fact. We did indeed ask Mr. Chittenden and all actuaries to test theory against reality and to realize that it is the actual investment yield which must increase for financing benefits due to indexing if there is to be no increase in contributions above the actual contributions in a static economy. This theoretical comparison in no way implied that pension plan contributions in a dynamic economy are the same for an indexed as for a nonindexed plan.

If $B + E$ is given as independent of experience, and I actually increases due to inflation, C is reduced. This results in a reduction in pension plan contributions. An increase in actual investment yield (mirroring the actuary's theoretical interest assumption) reduces the present value of benefits (though not the benefits themselves), and thus reduces normal cost and actuarial accrued liability. This brings about a reduction in pension plan contributions—a very real reduction and not just a shift of pension plan contributions into the future. We agree with Mr. Chittenden that an increase in the interest assumption, if not matched by an increase in the actual investment results, will reduce only the estimated current or periodic "cost" (contribution) and not his ultimate cost $B + E - I$.

Mr. Chittenden makes a number of pertinent remarks on projecting pension plan contributions, providing valuable insights about making sensible presentations of the financial implications of an amendment to plan sponsors. We also favor such full discussion, as was recommended in the paper. Mr. Chittenden's remarks indicate his genuine concern with testing theoretical assumptions against actual emerging experience over long periods of time to make as good an estimate as possible of actual costs (contributions) that will be necessary over the long run—a position we fully agree with.

This lengthy analysis of Mr. Chittenden's discussion shows how easily actuaries use *cost* in more than one way. We must define all our terms precisely, distinguish them, and use them carefully, so that our readers—especially the public—understand at all times what we are saying. The AAA Committee for Pension Terminology recommends (as we do now) using "benefits plus expenses" directly, rather than the ambiguously defined "ultimate cost," and "pension plan contributions" for "cost." We find that we are able to express all our ideas clearly by using "pension plan contributions" appropriately differentiated and described either as the actual pension plan contributions over the life of the plan or as a theoretical estimate of that portion of C, contributions needed over the life of the plan to be assigned to the current time period on the basis of the actuary's best estimate of future experience and the actuarial cost method and amortization period selected by the plan sponsor.

We thank Messrs. Hirst and Brown for doing the research and taking the time to prepare a discussion of the excess interest approach. It is a valuable addition to our paper.

The failure to point out strongly enough the very serious erosion of deferred vested benefits by inflation stemmed from the great reluctance of United States corporations even to consider this problem. Don Grubbs, Jr., has been a very effective voice in the United States for portability of

vested deferred pensions and for a central clearinghouse; we should have added our voices as did our Canadian discussants, Messrs. Hirst and Brown. During an open forum discussion at the Houston meeting (1982), Richmond was questioned about this matter and responded that he favored paying a lump sum calculated at a true rate of interest, such as 3 or 4 percent. The lump-sum value of the deferred pension then could be rolled over into another pension plan, to an IRA, or to a central clearinghouse established or sponsored by the federal government.

As to the most desirable approach to indexing, we fully agree that automatic indexing can very well perpetuate inflation. As Richmond pointed out during the Houston meeting, investment yields of common stocks (and to a lesser extent other investments, such as commercial paper and real estate) have kept pace with inflation except for periods of hyperinflation. We suggested limiting indexing to 5 percent per annum to provide an incentive to all concerned to avoid hyperinflation. We now find the excess interest approach even more attractive. If pensioners know that their postretirement increases will depend upon actual realized investment returns, they will have a stake in bringing inflation under control. We note that pensioners will bear the risk of adverse investment performance, but we find this desirable in the context of increasing the pensioners' responsibility for bringing inflation under control. The plan sponsor can guarantee a minimum increase (as in the Rockefeller Plan). If the plan sponsor will accept the same investment risk that he has always borne, he can tie the excess interest approach to T bills, mortgages, or long-term bonds, as Messrs. Hirst and Brown suggest. We encourage plan sponsors to use the excess interest approach and we believe that they will be most likely to adopt this approach if they tie pension increases to actual (dollar weighted) realized investment results. Insurance companies now offer long-term investment contracts guaranteeing 15–16 percent interest (as of the summer of 1982), making the excess interest approach currently quite attractive to both pensioners and plan sponsors.

Since New England Life, our employer, adopted performance indexing using a 4 percent true rate of interest effective July 1, 1982, we can answer some of the questions raised about measuring actual returns. First, our plan is very well funded so the question of unfunded liabilities was not of as much concern to us as it might be to other plans. We absorb any additional contributions resulting from a less than fully funded condition. For plans where this is a problem, the plan sponsor could initially adopt a true rate of 6 or 7 percent and amortize resulting unfunded actuarial accrued liabilities over ten years, then lower the true rate to 5 or 4 percent and repeat the process. As to negative returns or returns less than the

true rate (4 percent), the plan sponsor absorbs the full additional contributions needed. Pension increases once granted are never rescinded. Presently we have chosen to keep assets invested in an unallocated fund contract and to use contractual (book value) dollar weighted investment returns to measure actual investment yields. We realize that if bond coupon rates rise, contractual interest increases but market value yield may be lower or negative. We expect that in the long run there will be compensating periods when bond yields (coupons) fall and contractual investment yields fall but market values increase. We expect that results for pensioners will average out over very long-term bond cycles. We do contemplate segregating retired life assets in a cash management trust and using market value returns for indexing if we ever believe that its yield over the long run will exceed that of long-term bonds and mortgages. At present, we do not.

Finally, we wholeheartedly agree with Messrs. Hirst and Brown that our societies no longer have the option of not providing indexed pensions. Considering the current social security difficulties, there is little doubt that greater reliance on the private pension system in the future will be necessary. Only the private pension system can provide private investment capital which our economy needs. The choice is now between providing indexed pensions "within the private free-enterprise system or through an increased government-designed system." We agree with Messrs. Hirst and Brown. "Given these limited options, the choice surely is clear."

Ms. Rappaport correctly points out that benefit design considerations apply in the postretirement period as well as at the point of retirement. We emphasized providing adequate, but not overly generous, pensions so as to leave financial resources for indexing. Ms. Rappaport points out that the needed amount of indexing of the private pension will depend upon how much the tax-free social security benefits are increased. Forthcoming corrections in the construction and measurement of the CPI may reduce the overindexing problem for social security benefits. For many pensioners who pay little or no taxes, the tax-free aspect is not material. There will remain tax considerations primarily for median-paid and, to a lesser extent, highly paid workers, but taxes vary so much from person to person depending upon a number of factors (such as bracket creep, the amount of unearned income, and tax shelters) that it may prove difficult to reflect them in the amount of indexing granted.

We do indeed favor indexing but not mandated indexing. We prefer a voluntary approach flowing from extensive dialogue between plan sponsors, their employees, and the plan actuaries. Mandated indexing would not help if there is no pension plan in place, and, indeed, it might dis-

courage the future growth of defined benefit pension plans. Mandated indexing would also further disadvantage employers with defined benefit pension plans as compared to employers with no pension plan at all. The private sector can adopt indexing from among a wide range of alternatives that are within the financial capabilities of plan sponsors of differing financial resources. One approach, performance indexing, will limit additional benefits to what actually can be financed out of increased investment earnings. The plan sponsor does accept the additional contributions incident to using a postretirement interest assumption wholly or partly excluding the rate of inflation. One of the approaches that we suggested for firms with currently limited financial resources was ad hoc indexing. We favored this as a temporary expedient for plan sponsors who are in current economic difficulties with the expectation that they might begin advance funding in the future. Ms. Rappaport suggests that in our current economic climate many plan sponsors can not now commit to automatic indexing but prefer ad hoc increases. We are glad that some of these plan sponsors will have as capable an actuary as Ms. Rappaport to guide them. We do hope that she will review their economic successes in future years of prosperity and discuss with them the advantages of prefunding especially since it will generate the savings needed for investments and increased productive capacity from which all pensions must ultimately be paid.

Mr. Walls, like Mr. Chittenden, misconstrued our theoretical demonstration concerning "reduction in cost" or "pension plan contributions" as our manner of selecting actuarial assumptions and making best estimates. We have already pointed out in our response to Mr. Chittenden that this is not so. Mr. Walls also refers to Mr. Richmond's statement, at the Ottawa meeting of 1981, of not using an explicit interest rate ("incorporating more than a 2 or 3 percent rate of inflation" which was omitted from the quote!) unless postretirement indexing was being adopted. At the time that statement was made, our explicit "best estimate" interest assumption did not incorporate more than 2 percent inflation. It was then our best estimate. As more plan sponsors began to inquire about indexation, we began to review carefully what should be a best estimate assumption as to long-run inflation. We concluded that it should be higher than 2 percent. We also realized that this could have a dramatic impact on estimated pension plan contributions for nonindexed plans. We believed that we should explore all the ramifications of the impact of inflation on pension plan benefits and contribution levels with plan sponsors. This, in turn, led us to write our paper to share our thoughts with other pension actuaries. We will continue to share our thoughts with the plan sponsors that we service.

Because we failed to differentiate clearly enough for Mr. Walls the theoretical interest assumption from the actual investment yield against which it must be tested, he misinterpreted our source of the reduction in "cost." Consequently, he suggested as an examination question: "Discuss what is wrong with the following statement: An actuary can provide for the cost of increased benefits in a pension plan by changing assumptions." First he criticizes Mr. Richmond for using "cost" in the sense of "pension plan contribution," then uses it himself this way in the suggested question. Although in *TSA* XXIX, page 309, he defines cost as $B + E - I$, he refers the authors for a definition of cost to Mr. Furnish's "ultimate cost" which is $B + E$. He then concludes that "the authors have an idea that reality has something to do with the costs of a pension plan." We wonder which or whose costs he means. At any rate we suggest that the answer to the question might be a definition of "cost."

We have a better question. "Discuss the statement: The costs of indexing may be financed without any increase in the costs." Here the first "costs" refer to ultimate costs or benefits plus expenses and the second to incidence of costs or pension plan contributions as discussed in Jeff Furnish's paper. The source of financing would be increased investment earnings. This semantic confusion can be avoided simply by not using the undefined word "cost" at all but rather "pension plan contributions" or "benefits plus expenses" as appropriate. This is the recommendation of the Joint Committee on Pension Terminology in its Final Report of 1981. We do wish to thank Mr. Walls sincerely for referring us to the ultimate cost in Jeff Furnish's paper. This helped clear up the semantic confusion in the use of "cost" by the authors and the discussants. Mr. Walls wished "cost" to refer to the *actual* contributions over the entire life of the plan or C in the equation $C + I = B + E$. Paradoxically, he referred me to Mr. Furnish's paper, which further compounds the semantic confusion by saying that benefits plus expenses, $B + E$ (identically equal to $C + I$), represents the ultimate "cost" to be financed.

Mr. Walls thought that we were saying that an increase in the interest *assumption* could reduce the *actual* contributions over the *life of the plan*. After reading Jeff Furnish's paper, we concluded that Mr. Walls assumed that we were saying that a change in assumptions would reduce the benefits (ultimate "cost") to be paid. No actuary would be that negligent. Of course, we defined "cost" as pension plan contribution assigned to the *current* year as the result of a particular cost method, amortization period, and a best estimate set of actuarial assumptions. It is a theoretical estimate of the appropriate portion of lifetime plan contributions to be assigned to the current period—the definition in the Study Note for Part 10, of which

he is chairman. If an actuary increased his interest assumption, then the theoretical pension plan contribution for the current period would be reduced. The actual contributions required will be reduced if actual experience matches assumed experience. Of course, an actuary tests his estimates against reality and revises his assumptions as appropriate so that theoretical contributions over the years converge to the actual contributions needed over the life of the plan. Only an increase in the actual investment yield will reduce the contributions actually needed over the life of the plan. This matter is treated more fully in the response to Mr. Chittenden.