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A NEW LOOK AT THE FREQUENCY OF PENSION PLAN ACTUARIAL VALUATIONS

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ABSTRACT

The frequency of pension plan actuarial valuations is an important practical question. In the absence of a generally accepted guide to actuarial principles and practices for pension plans, a new professional firm offering actuarial consulting services has both the freedom to establish and the burden of establishing the professional policies by which it will be guided. Our thinking about the practical and professional necessity of annual valuations is reflected in this paper.

Annual actuarial valuations are the well-entrenched practice in this country; the traditional British practice varies between a triennial and a quinquennial interval. Such marked variation in practice between two countries with many similarities provides another justification for carefully examining all the relevant considerations influencing the interval question. After identifying the method of analysis for our premise—that a pension plan actuarial valuation need not be performed annually as a matter of routine—and identifying the purposes for a valuation, we review in the paper some of the general considerations influencing valuation frequency.

Identifying the requirements of parties at interest, while keeping in mind the multiple purposes of an actuarial valuation, sheds light on a practical solution to the problem of picking an appropriate interval.

In the section covering the actuary's viewpoint, some of the advantages of using realistic actuarial assumptions and making a thorough analysis of actuarial experience are discussed. A portion of the reduction in administrative expenses resulting from the shift to nonannual valuations can be applied to providing plan sponsors with a more meaningful professional service.

The conditions under which pension plan actuarial valuations should be done less frequently than annually are identified. Implementation of the *plan sponsor's* policy decision to adopt the nonannual frequency—coupled with an interim annual review—is considered in detail by identifying the elements necessary for successful application of the policy. In addition, the mathematics underlying the extrapolation of valuation results as part of the annual review is presented in an appendix. Some of the practical questions associated with employee data are also discussed in an appropriate appendix.

I. INTRODUCTION

THE traditional practice of American actuaries has been to perform annual valuations of pension plans. Significant exceptions to this conventional wisdom have been pension plans established through collective bargaining under which the employer contributions are less than 5 per cent of payroll and plans established by state and local governments under enabling legislation which describes less frequent valuations, usually every five years. However, in recent years this practice has been questioned with increasing frequency, both by actuaries whose clerical staffs and computer operations are overburdened and by plan sponsors who question the economic utility and business necessity of recycling the actuarial factors against the current employee census every twelve months. Faced with the necessity of establishing professional policies for our firm and wishing to adopt a rational concept which could be interpreted consistently in a variety of circumstances, we decided to test the general policy that the optimal practice would be to perform a complete actuarial valuation on a biennial or a triennial basis, with interim annual results based upon an extrapolation of the pertinent results from the last complete valuation applied to current payroll, current benefit roll, and asset data, after a determination that conditions had not materially changed since the last complete valuation.

As we will demonstrate in this paper, the premise was, in our judgment, confirmed by our inquiry. We believe that this professional procedure will produce all necessary valuation results at lower expense to the client and with an improvement in the professional content and quality of the actuary's work. Meaningful analysis of plan events affecting pension plan costs and liabilities which can lead to the adoption of more realistic actuarial assumptions will be a particularly significant part of the increase in the value of the actuarial services. As a result, we submit that pension plan actuaries should abandon the traditional practice of annual valuations and adopt the general rule that complete pension plan valuations should be performed at two- or three-year intervals, unless circumstances justify a more frequent examination.

II. HISTORICAL BACKGROUND; BRITISH PRACTICES

The origins of the American tradition of annual pension plan valuations are unclear. Possibly the precedent stems from the fact that the majority of pension plans in operation in the late forties and early fifties were wholly or partially established under individual policy pension trusts and deferred group annuity contracts. As a matter of statutory require-

ment, the actuarial liabilities associated with those contracts must be valued annually. In recent years, however, other forms of group annuity contracts have become increasingly popular, and these vehicles in general do not require the measurement of actuarial liabilities in order to satisfy state insurance laws. Also, of course, the self-administered or self-insured plans have become increasingly popular, and these plans are exempt from any such regulatory supervision. It would therefore appear that prevailing current practice is burdened with the weight of precedents established twenty or more years ago under conditions which no longer prevail.

A review of the practices of British actuaries places our own American practices in better perspective. The traditional practice among British actuaries has been to value pension plans every five years, but there is a definite trend in Britain toward triennial valuations. For example, in the book *Pension Scheme Practice* (London: Hutchinson, 1967), by Michael Pilch, B.A., F.C.I.I., and Victor Wood, B.A., F.F.A., the authors define valuation as follows:

> At regular intervals, usually every five years, a private fund is examined by the actuary to determine whether the accumulated assets together with the estimated future contributions are sufficient to meet the accrued liability together with the estimated future liabilities. If the assets exceed the liabilities, the difference between the two is described as a surplus. If the liabilities exceed the assets, the difference is described as a deficiency. This process is an actuarial valuation. Insurance companies similarly value the whole of their life assurance and annuity funds at regular intervals [p. 183].

In *An Introduction to Pension Funds*, by E. M. Lee, M.A., F.I.A., there are also several interesting passages. In a section entitled "Frequency of the Investigation," the author has the following to say about the interval between actuarial valuations:

> The rules of a privately invested scheme must provide for actuarial investigations of the scheme to be made from time to time. The Revenue require the period between investigations to be not more than five years. As mentioned in the comment in Chapter 11 on Scheme X Rule 18, trustees are tending to favour three yearly investigations, particularly of integrated schemes [p. 179].

The above-mentioned comment on Rule 18 reads as follows:

> The period of five years between valuations was at one time common. The modern tendency is towards a period of three years, because in modern conditions of rapid change a period of five years is thought to be too long. This applies particularly in integrated schemes where the financial position may be greatly affected by changes in the State scheme.
>
> The limitation on the amount of the reserve fund is a Revenue requirement.

The Revenue are, of course, concerned to ensure that the tax privileges of approval are not extended to money not strictly required for the purposes of a scheme [pp. 161–62].

We are indebted to Mr. D. F. Gilley for his comments on the origins and trends of British actuarial practice. Mr. Gilley, a prominent British consulting actuary, was kind enough to summarize the results of his inquiries in a letter, which we have reproduced in Appendix B. His views support those of other authors and offer a thoughtful perspective on one actuary's assessment of the trend toward triennial valuations in Britain.

III. METHOD OF ANALYSIS; PURPOSES OF VALUATION

Method of Analysis

Our technique in investigating the proposition that pension plan actuarial valuation need not be performed annually as a matter of routine was as follows:

1. To identify the variety of purposes served by an actuarial valuation.
2. To examine the practical considerations affecting the interval between actuarial valuations.
3. To identify the parties at interest in the results of an actuarial valuation.
4. To investigate the outer limits on valuation frequency which were required by all parties at interest—exclusive of the plan sponsor and the responsible actuary.

If, as we suspected, no party at interest compelled an annual actuarial valuation, the question of valuation frequency could be resolved in terms of the practical business judgments of the plan sponsor and the professional interpretation of the actuary.

Purposes of Pension Plan Actuarial Valuation

The purposes served by a pension plan actuarial valuation include the following:

Measurement of accrued liabilities, accounting costs, and funding requirements in conjunction with plan establishment and benefit improvement.

Periodic determination of unfunded and/or vested benefit liabilities, as well as current accounting costs and funding requirements.

Examination of the effect of revised cost methods and asset valuation methods on unfunded liabilities and current costs.

Filing of claims under section 404 of the Internal Revenue Code for tax deduction of contributions.

Compliance with the requirements of the federal Welfare and Pension Plans Disclosure Act and comparable state disclosure legislation.

Compliance with the financial reporting and disclosure requirements of *Ac-*

counting Principles Board Opinion No. 8: Accounting for the Cost of Pension Plans.

For joint labor-management funds, filing of reports required by state banking and insurance authorities.

Determination of funding adequacy in the event of plan termination.

Analysis of unfunded plan liabilities affecting the terms of corporate mergers and acquisitions.

IV. INTERVAL BETWEEN VALUATIONS

Before examining the needs and preferences of parties having an interest in a pension plan valuation, it is helpful to identify some general considerations influencing the time interval between actuarial valuations:

Every actuarial valuation (with the sole exception of valuations which occur at the time of plan termination or the reinsurance of accrued benefit liabilities through the purchase of commercial annuities) is based upon actuarial assumptions which can only approximate the value of a plan's liabilities, the true level of accounting cost, or the appropriate contribution to the related trust fund or annuity contract. These liabilities and costs can be exactly known only at the termination of a plan. Consequently, any valuation—be it annual or decennial—must be seen as an approximation rather than an absolute and precise measurement.

For larger plans the actuarial cost accruals frequently vary only slightly between successive annual valuations.

For smaller plans the experience frequently fluctuates so much from year to year that any valuation will provide only a very rough guide for determining either accrued liabilities or the amounts required to fund benefits.

The cost of regular annual valuations may be relatively so high as to cause plan sponsors to balk at the additional cost of (or make actuaries reluctant to propose) the extensive but necessary actuarial analysis of a plan's experience.

Annual valuations without professional review of a plan's actuarial experience may provide plan sponsors with an unjustified serenity about the soundness of their funding program; on the other hand, the absence of such a review may delay recognition of an unduly conservative approach toward funding.

The cost of an actuarial valuation should be justified by the standards of value and utility applicable to any other business expense for professional services.

An annual valuation report is frequently viewed as just another routine report and given scant attention by a client. Less frequent reports, which include a more complete discussion and analysis of a plan's experience, may be read more carefully and would certainly give an interested client a broader perspective on the plan's current actuarial and financial status.

There are great differences in the ease (and cost) with which valuation data can be prepared by the plan sponsor and handled by the actuary for valuation purposes.

The frequency of special requests for costs of new benefits, either for collective bargaining purposes or for management review, is of considerable importance in picking the interval for regular valuations.

Less frequent valuations require a higher level of actuarial skill, particularly when the valuation includes a full review of actuarial experience.

V. PARTIES AT INTEREST AND THEIR REQUIREMENTS

The parties interested in pension plan actuarial valuations whose needs and preferences we have examined include the following:

1. The plan sponsor, that is, a corporation, the joint board established under the Labor Management Relations Act as a consequence of collective bargaining, or a state or local government.
2. The actuary, who may be in private practice, employed by an insurance company, or employed by the plan itself.
3. The collective bargaining agent.
4. The Internal Revenue Service.
5. The Department of Labor.
6. State agencies responsible for administering the Welfare and Pension Plans Disclosure Act.
7. The certified public accountant.
8. The attorney.
9. Other federal agencies (assuming that pension reform legislation along the lines currently under consideration is eventually passed into law).
10. Plan participants and other third-party beneficiaries of the plan.
11. Stockholders.

Other parties interested in pension plan actuarial valuations include the following:

12. State banking and insurance departments.
13. Investment managers, including banks, insurance companies, and independent investment advisers.
14. The Atomic Energy Commission and other agencies which administer cost-plus contracts that include pension plan costs.

The Actuary

An essential premise of the pension plan actuarial valuation is that the actuary can predict the composite effect of future events with sufficient accuracy to provide a meaningful guideline for accruing and funding the costs of the plan. Performing valuations at frequent intervals does not increase the likelihood that actuarial assumptions will be realized, since the actuary is always confronted with the uncertainty of future events. Periodic complete valuation, which includes gain and loss analysis, may provide guidelines which will enable us to shift our assumptions closer to the current and probable future experience.

At this point, our thesis will be supported by a blend of actuarial science and empiricism. Specifically, we have analyzed twelve actuarial valuations covering three pension plans, each of which was valued annually over a four-year period. These valuations were selected for this paper because (*a*) they fit the conditions described in Section VI; (*b*) gain and loss analysis was applied to each of these valuations, thus removing any doubt as to significant errors in the valuations; (*c*) the sample includes both groups that were stable in number of participants and groups with an increasing number of participants; (*d*) different types and sizes of groups are included; and (*e*) different types of actuarial assumptions and plan benefits are represented.

Several years ago, largely in response to client demand for an estimated pension accrual to be available for budgeting purposes, we began making forecasts of valuation results as soon as the current year's data had been reported. The estimated valuation results were based on the prior year's valuation together with the current year's data, using the actuarial formulas described in Appendix D. We found that we could easily predict the actual valuation results with an astonishing degree of accuracy. It was always gratifying to find that estimated results were so close to actual results. However, in reviewing the results of such extrapolations, the actuary must bear in mind the fact that he is dealing with a prediction about his next prediction of the plan's liabilities, as opposed to actually measuring the experience and comparing it with the actuarial basis. This is an important distinction to keep in mind in considering the relationships between the interval question, gain and loss analysis, and experience studies.

For purposes of analyzing the deviation between a prediction of valuation results and the actual valuation results, we have prepared two tables. These tables focus on (*a*) the amount to be accrued and funded by the plan sponsor and (*b*) the actuarial liabilities as measured by the present value of future benefits. Other actuarial elements and a summary of the data, including reconciliation of plan membership over the period, are given in Appendix A. In the absence of special circumstances such as plan termination, sale of the company, and the like, the plan sponsor is concerned primarily with the amount to be accrued and funded each year. By extrapolating the January 1, 1967, valuation for three years to produce estimated valuation results on January 1, 1968, 1969, and 1970, and similarly extrapolating the January 1, 1968, valuation for two years and the January 1, 1969, valuation for one year, we may then make comparisons between the accrual if there had been annual valuations and the accrual if there had been extrapolations of biennial, triennial, or quadrennial valuations. Table 1 summarizes the results of these comparisons.

TABLE 1

ANNUAL ACTUARIAL COST ACCRUAL (IN THOUSANDS OF DOLLARS)
ESTIMATED VALUATION RESULTS COMPARED WITH ACTUAL VALUATION RESULTS

	Annual	Biennial			Triennial		Quadrennial
	Actual Valuation Results	1/1/67 Valuation with 1-Year Extrapolation	1/1/68 Valuation with 1-Year Extrapolation	1/1/69 Valuation with 1-Year Extrapolation	1/1/67 Valuation with 2-Year Extrapolation	1/1/68 Valuation with 2-Year Extrapolation	1/1/67 Valuation with 3-Year Extrapolation
	Plan I						
1967	500	500	.....	.....	500	.....	500
1968	538	546	538	.....	546	538	546
1969	592	.....	590	592	599	590	599
1970	602	.....	.....	615	.....	613	622
Total deviation from annual valuation—in dollars	.....	8	−2	13	15	9	35
Total deviation from annual valuation—as per cent	.....	0.8%	−0.2%	1.1%	0.9%	0.5%	1.6%
	Plan II						
1967	547	547	.....	.....	547	.....	547
1968	628	639	628	.....	639	628	639
1969	648	.....	657	648	668	657	668
1970	741	.....	.....	753	.....	765	774
Total deviation from annual valuation—in dollars	.....	11	9	12	31	33	64
Total deviation from annual valuation—as per cent	.....	0.9%	0.7%	0.9%	1.7%	1.6%	2.5%

TABLE 1—*Continued*

	Annual	Biennial			Triennial		Quadrennial
	Actual Valuation Results	1/1/67 Valuation with 1-Year Extrapolation	1/1/68 Valuation with 1-Year Extrapolation	1/1/69 Valuation with 1-Year Extrapolation	1/1/67 Valuation with 2-Year Extrapolation	1/1/68 Valuation with 2-Year Extrapolation	1/1/67 Valuation with 3-Year Extrapolation
	Plan III						
1967	2,264	2,264	.....	.....	2,264	.....	2,264
1968	2,476	2,477	2,476	.....	2,477	2,476	2,477
1969	2,587	.....	2,547	2,587	2,549	2,547	2,549
1970	2,788	.....	.....	2,765	.....	2,723	2,724
Total deviation from annual valuation—in dollars	.....	1	−40	−23	39	−105	−103
Total deviation from annual valuation—as per cent	.....	0.0%	−0.8%	−0.4%	0.5%	−1.3%	−1.0%

Neither the scientist nor the actuary should draw sweeping conclusions by reasoning from the specific to the general, but the numbers do tell us something. They tell us that in these circumstances, involving a large number of parameters including dynamic groups of plan participants, it would have been possible to predict the annual actuarial cost accruals accurately by doing a complete valuation only every two or three years and extrapolating those valuation results as part of the interim annual review. There are many other pension plans where the conditions identified in Section VI apply, and results such as those shown could be obtained with nonannual valuations. Other actuaries may find it illuminating to apply the estimating formulas (with due regard for the adjustments that are judged to be essential, see a later portion of this section) to an appropriate group of completed valuations.

Another way of judging the deviation between estimated and actual valuation results is to examine the differences between estimated and actual present value of benefits. Table 2 shows these comparisons and adds further weight to the general conclusion. The details of data and formulas for determining the estimated present value of benefits are included in Appendixes A and D, respectively.

The point of presenting these numerical comparisons is to demonstrate that the intrinsic mathematical prediction error of an actuarial valuation in forecasting long-term rates of investment increment, withdrawal rates, future salary increase, and the like, is much greater than the deviations between an appropriate estimate of valuation results and a complete valuation. Refining an actuarial calculation based on assumptions which frequently are at best only "guesstimates" is not only wasteful of actuarial resources but can mislead the plan sponsors as to the real meaning of the actuarial cost accruals. It is important to keep in mind the distinction between predicting one's next prediction, that is, making a forecast of valuation results, and measuring the deviations between the actuarial basis and the actual plan experience. Experienced actuaries know that the latter deviations will be much greater than the former deviations.

The subject of adjustments to the basic estimating formulas deserves special mention. The actuarial algebra associated with the basic techniques is described in Appendix D. The only adjustment we made was to include the effect of the gain from investment, which is readily available without doing the complete valuation. This adjustment was made even though it had only a modest impact on the accruals, because on an a priori basis the actuarial assumptions suggested this refinement to the estimated results.

In all three of these plans the soundness of the actuarial basis does not

TABLE 2

PRESENT VALUE OF FUTURE BENEFITS (IN THOUSANDS OF DOLLARS)
ESTIMATED VALUATION RESULTS COMPARED WITH ACTUAL VALUATION RESULTS

VALUATION DATE	ANNUAL: ACTUAL VALUATION RESULTS	BIENNIAL				TRIENNIAL			QUADRENNIAL	
		1/1/67 Val. with 1-Year Extrapolation	1/1/68 Val. with 1-Year Extrapolation	1/1/69 Val. with 1-Year Extrapolation	(Average Extrapolated PVB*) ÷ (Actual PVB)	1/1/67 Val. with 2-Year Extrapolation	1/1/68 Val. with 2-Year Extrapolation	(Average Extrapolated PVB) ÷ (Actual PVB)	1/1/67 Val. with 3-Year Extrapolation	(Average Extrapolated PVB) ÷ (Actual PVB)
	Plan I									
January 1, 1967	8,459	8,459	.....	.....	.....	8,459	.....	.....	8,459	.....
January 1, 1968	9,403	9,545	9,403	.....	1.0151	9,545	9,403	1.0151	9,545	1.0151
January 1, 1969	10,684	.....	10,636	10,684	0.9955	10,785	10,636	1.0025	10,785	1.0095
January 1, 1970	11,365	.....	.....	11,547	1.0160	.....	11,505	1.0123	11,496	1.0115
	Plan II									
January 1, 1967	9,610	9,610	.....	.....	.....	9,610	.....	.....	9,610	.....
January 1, 1968	10,894	11,193	10,894	.....	1.0274	11,193	10,894	1.0274	11,193	1.0274
January 1, 1969	11,747	.....	11,874	11,747	1.0108	12,223	11,874	1.0257	12,223	1.0405
January 1, 1970	13,323	.....	.....	13,495	1.0129	.....	13,663	1.0255	14,107	1.0588
	Plan III									
January 1, 1967	49,698	49,698	.....	.....	.....	49,698	.....	.....	49,698	.....
January 1, 1968	55,782	56,439	55,782	.....	1.0118	56,439	55,782	1.0118	56,439	1.0118
January 1, 1969	60,324	.....	60,089	60,324	0.9961	60,787	60,089	1.0019	60,787	1.0077
January 1, 1970	64,811	.....	.....	65,116	1.0047	.....	64,810	1.0000	65,548	1.0114

* PVB = present value of future benefits.

depend upon an accumulation of gains from investment, relative to the actuary's investment return assumption, to offset losses on salary scale, or other actuarial factors. With Plan II there was no inflationary component included in the salary scales. The method of valuing the social security offset, that is, an assumption of no future change in the social security law, and the fact that assumed termination rates were very much lower than those currently being realized provided the margin in liability measurement for this plan. For Plan III the salary scale included only a 1.6 per cent inflation factor, but there were margins in relation to termination rates and social security benefits that resembled those in Plan II. The effect of these margins in liability measurement can be seen by looking at the present value of benefits table (Table 2).

In general, we believe that the actuary should be making few, if any, adjustments in the basic extrapolation technique. If the assumption base is definitely conservative, making such adjustments becomes a metaphysical exercise which wastes the actuary's time and his client's money. If the assumption base is realistic, the various assumptions can be viewed as the mean of a real universe. Trying to follow the fluctuations about this mean by a series of elaborate interim adjustments will add very little to the basic validity of the long-term actuarial forecast.

In most situations we would advocate adjusting the estimates only to reflect an appropriate adjustment for the actual actuarial gain from investment increment during the prior year, and only in those cases where the actuarial basis contains sufficient realism in liability measurement to permit this. Such limitation of the special adjustments has several advantages: (1) the calculation is simple but precise; (2) as plans become increasingly mature and increasingly well funded and use more realistic investment return assumptions and asset valuation methods, this source of gain takes on greater relative significance; (3) plan sponsors can readily understand and appreciate the significance of this adjustment; and (4) it is a useful tool in speaking to the plan sponsor about the performance of pension fund assets.

In making the judgment as to whether additional special adjustments are required, the actuary should consider all the factors identified in Section VI, as well as the number of years between complete actuarial valuations, the skill and experience of the actuarial personnel involved, the degree of conservatism desired in the accruals, the availability of special data that will be required, and the availability of historical relationships which can be used to estimate actuarial gains and losses. For the larger plans, sampling techniques can provide a basis for estimating gains and losses.

The gain and loss analysis, included in the complete valuation, will provide a useful test of the accuracy of these interim estimates of gains and losses. When the conditions suggest that very large special adjustments may be required, it is probably better to tell the client that he needs a special valuation, rather than to make a series of approximate special adjustments.

The extrapolation techniques used to develop results for the interim annual review are likely to provide more accurate results when applied to a "realistic" actuarial basis than when the same techniques are applied to a "conservative" actuarial basis. The actuarial bases used for valuing Plans I–III are realistic, which partially accounts for the precision with which results were estimated. The figures shown in the accompanying tabulation (in thousands of dollars) are indicative of the degree of realism in the actuarial bases used to value Plans I–III over the three-year observation period.

	Plan I	Plan II	Plan III
1. Actuarial gain from experience plus decrease in actuarial liability due to increase in social security benefits, over the three-year period January 1, 1967—January 1, 1970	176	253	− 1,722
2. Actuarial liability at end of period, January 1, 1970	5,127	6,917	36,245

The net effect of actuarial gains from experience and decreases in actuarial liability due to increases in social security benefits is relatively close to zero for Plans I and II over this three-year period, even though year-to-year fluctuations were substantial. The market decline of 1969 creates a somewhat distorted picture of the realism in Plan III's actuarial basis. Where the actuarial basis is very conservative or unduly optimistic, the deviations between actual and estimated results are likely to be larger than those indicated in Tables 1 and 2 of this section.

The actuary's primary concern must be the maintenance and improvement of the professional quality of his services, with due regard for the business objectives of his client. Well-informed businessmen demand the best possible return for dollars invested in professional fees. One of the professional adviser's responsibilities is to assist his client to achieve that objective. It is our view that pension actuaries need no special justification to do valuations less frequently than annually. Quite to the contrary, it is the practice of regular annual valuations that we believe requires special justification.

The Accountant

Plan sponsors whose financial affairs are subject to audit must comply with the provisions of *Accounting Principles Board Opinion No. 8* of the American Institute of Certified Public Accountants. The *Opinion* does not discuss in detail the appropriate interval between actuarial valuations but does include the following statement: "Although annual valuations are, perhaps, the rule, some employers have valuations made at less frequent intervals, in some cases as infrequently as every five years."

Our reading of *Opinion No. 8* convinced us that it would be acceptable if an actuarial certification of current pension costs and the excess, if any, of the actuarially computed value of vested benefits over the total of the pension fund and balance-sheet entries were based on an extrapolation from a complete valuation performed one or more years earlier. However, we submitted our proposed policy to Walton W. Kingsbery, a partner of Price Waterhouse & Company and a member of the Employee Benefits Committee of the American Institute of Certified Public Accountants. Our letter is contained in Appendix B. Mr. Kingsbery has since stated that he and his fellow committee members discussed our proposal and were individually in agreement that a certifying accountant could rely on an actuarial certification prepared in conformity with our proposed policy. However, his Employee Benefits Committee does not have jurisdiction over interpretations of auditing practices and could not express an official opinion. Through Mr. Kingsbery's patient co-operation, our inquiry was forwarded to Mr. J. R. Fritzemeyer, director of auditing and reporting of the AICPA. His review is not yet complete, but we anticipate a favorable interpretive comment in a forthcoming issue of the *Journal of Accountancy*.

The Internal Revenue Service

The presumption throughout this paper is that we are considering a funded, qualified plan, although our conclusions would generally apply equally to unfunded plans. The plan sponsor must comply with the Internal Revenue Code in order to qualify the plan and trust and to obtain tax deductions for contributions. The Code does not take any strong positions on the question of an appropriate interval between actuarial valuations, although the filing of Form 2950 to claim deductions does require an annual review and valuation of plan assets.

The most definite IRS viewpoint on interval arises in connection with their concern over the possibility of overfunding where the Clause A 5 per cent rule is applied to claim deductions. In this case the regulations

provide that the taxpayer must submit "an actuarial certification of the amount reasonably necessary to provide the remaining unfunded cost of past and current service credits"; after the second plan year, however, this certification (and supporting data) is required only every five years.

When it comes to deductions under Clauses B and C, the IRS viewpoint on interval is less definite. There is certainly an implication that there will be some type of actuarial calculation and report each year, but the primary (if not the only) purpose of this report is to determine whether the deduction claimed exceeds the statutory limitations.

Revenue Ruling 69-255 may result in a plan sponsor's being told by the IRS to have an additional valuation done where it is necessary to establish that a pension plan is not overfunded. But the effect of this ruling on the interval question, even in those special situations where overfunding is a possibility, is not clear. The ruling has not been in existence long enough to establish clearly either the degree or the methodology of application.

Funds established by joint boards created under the provisions of section 302 of the Labor Management Relations Act are in a somewhat different position with respect to the IRS than funds established unilaterally by a corporation. The trustees of the joint labor management fund must certify to the IRS that the conversion of defined contributions under a labor agreement into a defined schedule of benefits was developed from "reasonable actuarial assumptions." Those trustees must also assert that the employer contributions during the term of the related collective bargaining agreement are adequate to meet the terminal funding cost of benefits for persons retiring during the course of the labor agreement and, in addition, exceed the sum of the plan's normal cost and interest on its unfunded liabilities. It could be argued that this requirement imposes a higher duty on the joint board than on the corporation, since a corporation is required only to identify the actuarial basis used to justify a tax deduction, not to attest to the reasonableness of that actuarial basis. So far as we know, the IRS does not require an actuarial valuation each year if the necessary tests are satisfied in the first year of a labor agreement running for more than one year. It would therefore appear unnecessary to make further actuarial valuations during the term of the agreement unless there was a substantial change in circumstances.

The need to satisfy IRS requirements does not constitute a mandate for doing a complete actuarial valuation every year. (See the section on the attorney for further comment on IRS implications.)

Federal Welfare and Pension Plan Disclosure Requirements

The data and information necessary to satisfy these disclosure requirements are readily available from the interim annual review and do not require a complete annual actuarial valuation. The disclosure information currently required includes amount of employer and employee contributions, number of employees covered, benefits paid, statement of assets, liabilities, receipts and disbursements, detailed statement of expenses charged against the plan, date of the last actuarial valuation, a statement of actuarial assumptions and method, identification of who performed the valuation, and so on.

State Welfare and Pension Plan Disclosure Requirements

To our knowledge, none of the state welfare and pension plan disclosure laws requires information which demands a complete annual actuarial valuation.

The Attorney

To determine whether existing law, regulations, or judicial interpretation of fiduciary responsibility require annual actuarial valuations of pension funds, we submitted our proposed professional policy to the senior tax partner of a prominent New York law firm. Our inquiry and his response are presented in Appendix B. Apart from the requirement that plans claiming deductions under Clause A of section 404(a)(1) must submit to a valuation at least every five years, the Internal Revenue Code and Regulations make no specific reference to a required frequency of annual valuations. It is, of course, obvious that a valuation would be required by the IRS to determine a plan's original qualification or its continued qualification upon plan amendment. On the question of a plan sponsor's fiduciary responsibility for actuarial valuation of a pension plan, there would appear to be no laws or judicial decisions that identify a specific time interval for actuarial valuation.

The Collective Bargaining Agent

The interest of a union in pension plan actuarial valuations focuses on four considerations:

1. At the time a labor agreement is negotiated, it is necessary to measure the annual cost of pension plan benefit improvements in order to know the employer's contribution to the plan or to determine the increase in cash wages, if a total wage package has been negotiated.
2. Some labor agreements require the employer to fund a defined schedule of

benefits at a minimum level, usually including a fixed period for amortization of past service liabilities.

3. For plans which require defined contributions convertible into a fixed level of benefits, the union is interested in knowing whether improvements in the original schedule of benefits can be justified by surpluses accumulated in the trust fund or by changes in actuarial methods or assumptions that are justified by current and prospective events.
4. Upon plan termination or curtailment, the union is interested in the adequacy of the accumulated pension fund to provide the accrued benefits under the plan.

We are not aware of any labor agreements which demand an annual actuarial valuation for any of these purposes. In our judgment, substantial changes in benefit provisions should be accompanied by a complete actuarial valuation. However, we believe that the contractual requirements for minimum funding of past service liabilities can be accomplished by extrapolation from the results of the last complete actuarial valuation.

Proposed Pension Legislation

There are now before Congress many bills proposing new conditions and restrictions on pension plans. A number of these proposals would directly affect the actuary, including minimum funding standards, calculation of plan termination reinsurance premiums, periodic reporting to a central government agency, and disclosures to plan participants. These bills, in general, leave to the discretion of a government agency the control and regulation of minimum standards. However, the bills do appear to contemplate that actuarial valuations would not necessarily be made annually.

For example, Senate Bill S. 2, proposed by Senator Javits of New York, provides that the plan termination reinsurance premium, which is a function of the unfunded value of vested benefits, would be computed on a three-year basis. Also, the bill provides that a plan will be reviewed by a qualified actuary at intervals of not more than three years. Another of the widely publicized pension bills, H.R. 1269, proposed by Representative Dent of Pennsylvania, appears to contemplate that an actuarial valuation will not be performed each year. For example, section 104, dealing with annual reports to be submitted to a central government agency, provides for filing a copy of the most recent actuarial report or, if there is no such report, a statement explaining its absence. The bill further requires that all statements pursuant to that section of the bill shall be certified, by an actuary deemed qualified by the secretary of labor, as being in conformity with accepted principles of actuarial practice.

To the best of our knowledge, the provisions of the Javits and Dent bills, as they affect this question, are typical of the provisions of other proposed legislation. We interpret the intent of this proposed legislation to permit valuation with nonannual frequency, provided that the responsible actuary can demonstrate that the legislative requirements are reasonably satisfied by extrapolation from an earlier complete actuarial valuation.

Employees, Shareholders, and Other Parties

While employees and shareholders are greatly affected by the results of the actuarial valuations, it is not possible to identify any organized opinion on the part of either of these groups on the question of the frequency of pension plan actuarial valuations.

The Plan Sponsor

The plan sponsor typically has four concerns. He wishes to satisfy the requirements of all parties at interest in the pension plan. He wishes to see that current costs, both accounting and funding, are reasonable in relation to the obligations of the retirement plan and tolerable as a charge against operating income or a strain on cash flow. He is also concerned that his stewardship responsibilities have been properly discharged and that his plan is being prudently financed on a basis which, over time, will satisfy the benefit security requirements of participating employees without being an undue expense for current shareholders. Finally, he wishes to control the administrative costs associated with the plan.

As revealed by our analysis of the requirements of the various parties interested in the pension plan actuarial valuation, an annual valuation is not compulsory. Consequently, we conclude that the business interests of a plan sponsor argue for a general policy that actuarial valuations be performed at biennial or triennial intervals.

To illustrate the potential for reducing administrative costs while maintaining or improving professional quality, consider a comparison between the practice of regular annual valuations and triennial valuation coupled with interim annual review. The accompanying tabulation, show-

Year	Annual	Triennial
First	100%	20– 30%
Second	100	20– 30
Third	100	150–170
Total	300%	190–230%

ing the relative cost of annual and triennial valuation, expressed as per cent of annual valuation costs, is illustrative of the principle involved and reflects our personal experience. This table suggests a different incidence of actuarial fees, together with a 23–37 per cent lower three-year total of fees. The 20–30 per cent cost in intermediate years reflects the fact that an actuarial review using current data will be conducted in those years when a complete valuation is not performed. The table is illustrative only, since it cannot reflect all the prevailing practices and conditions with annual valuations. The total cost reduction to the plan sponsor (i.e., actuarial fees plus the sponsor's internal costs) will vary substantially, depending upon such factors as the cost associated with data preparation and handling, and the actual interval between valuations.

Cost reduction alone is an inadequate reason for changing the frequency of actuarial valuation. The plan sponsor must be convinced that he has discharged all his responsibilities at least as effectively as he did before. That may not happen until his consulting actuary has become convinced of the merits of de-emphasizing the role of routine arithmetic.

VI. CONDITIONS UNDER WHICH VALUATIONS SHOULD BE DONE LESS FREQUENTLY THAN ANNUALLY

The factors which affect the actuarial cost accruals and the associated actuarial liabilities are the following: (1) the provisions of the retirement plan; (2) the actuarial assumptions; (3) the actuarial cost method, including the past service amortization schedule; (4) the method used to adjust for actuarial gains and losses; (5) the method used to value the plan assets; (6) the financial data; and (7) the employee data. Changes in all these items, except items 6 and 7, are within the control of the plan sponsor, under the guidance of his professional advisers. The immediate cost impact of changes in item 6 is readily determined. The financial data must be reviewed annually in order to satisfy the reporting requirements of the IRS and the applicable disclosure laws. The cost impact of changes in item 7 is not easy to evaluate when the changes are large, unless the complete valuation is done. However, in the typical case of a work force which is either growing steadily or reasonably stable, the changes are gradual and do not affect the cost accrual rates very much from year to year. In practice, the justification for doing an annual valuation, in the absence of major changes in the first six items, is to evaluate the cost impact of changes in the employee data. In many cases it is both necessary and proper that this evaluation be performed annually. However, a great many pension plans, even those having as few as several hundred par-

ticipants, show a remarkable year-to-year stability in the average census characteristics of employee data which affect the cost accrual rates from year to year.

The interim annual review must include tests to indicate when major shifts in the seven cost factors suggest that a special valuation is needed. Clearly, actuarial judgment is required to determine what constitutes a major shift. In Appendix C are guidelines which will be helpful in making judgments on employee data. Small shifts in cost factors between regularly scheduled complete valuations can be either ignored or temporarily evaluated—until the next complete valuation—using suitable approximation techniques.

The annual actuarial review must be directed by a qualified actuary and must use acceptable techniques for estimating costs as well as testing the need for a special valuation. An important objective of the interim annual review is to avoid exposing the plan sponsor to widely fluctuating costs between regularly scheduled complete valuations. Spin-offs, acquisitions, mergers, and the like, may require special valuation work on subsets of employees during the interim years for the actuary to advise his client confidently about the impact on pension cost.

There will be situations in which plan sponsors are so accustomed to an annual valuation that a change to an interval of two or three years between complete valuations should be more gradual. In these instances the regular annual valuation could be preceded by an estimate of valuation results to build confidence in the new approach. Some plan sponsors may still be unwilling to accept the small risk of lengthening the interval between complete valuations. They are certainly justified in continuing with an annual valuation, if that leads to more confident management decisions.

VII. IMPLEMENTING THE POLICY DECISION

Implementation of the policy decision to lengthen the traditional one-year interval between pension plan actuarial valuations must take into account the practical circumstances of each specific application. The policy can be successfully applied if it includes the following elements:

1. A complete actuarial valuation every two or three years, except where special circumstances (identified in Sec. VI) require a special valuation.
2. The inclusion in the complete valuation of an analysis and reconciliation of actuarial gains and losses since the previous complete valuation, with revisions in assumptions and/or experience studies as appropriate.

3. An interim annual actuarial review, to include
   a) Sufficient work on plan assets to satisfy all the usual reporting requirements.
   b) Computation of the actuarial gain from investment increment during the year, with adjustment in costs when appropriate.
   c) A review of current employee data sufficient to
      i) Determine whether changes have occurred which require doing a complete valuation in the off-cycle year, which then re-establishes the starting point of the cycle.
      ii) Make other adjustments to the interim estimates, on the basis of judgmental forecasts of actuarial gains currently occurring.
   d) Use of accepted actuarial formulas to estimate the cost accruals and the by-products of actuarial valuation required by the plan sponsor.

The theory and practice of gain and loss analysis for pension plans are adequately described in the actuarial literature;[1] hence they should require no further elaboration in this paper. Appendix D of this paper contains the actuarial formulas which are to be used to estimate cost accruals. The actuary's report to the plan sponsor should include an appropriate description of the methodology used to estimate cost accruals.

The need to collect employee census data both for the periodic complete valuation and for the interim annual review raises many practical questions, some old and some new. Appendix C addresses some of the practical questions associated with review, reconciliation, and collection of employee data.

VIII. SUMMARY AND CONCLUSION

While some actuaries and professional firms have debated the pros and cons of shifting away from the traditional practice of annual valuations, the question has not yet been given the thorough airing it deserves. Some progressive plan sponsors have already adopted biennial or triennial valuations. Just as plan sponsors, in connection with their professional advisers, are demanding that pension fund assets be more productive, those same voices can and will be heard making similar demands on the subject of administrative expenses. The weight of traditional practices is not to be taken lightly; neither should such practices go unexamined. From our examination we conclude that traditional practices are ripe for change.

[1] William A. Dreher, "Gain and Loss Analysis for Pension Fund Valuations," *TSA*, XI (1959), 588–648; Arthur W. Anderson, "A New Look at Gain and Loss Analysis," *TSA*, XXIII (1971), 7–47; and Ronald E. Downing and William P. Roberts, Jr., "Analysis of the Change in Normal Cost under the Frozen Initial Liability Valuation Method," *Proceedings of the Conference of Actuaries in Public Practice*, XX, 420–44.

APPENDIX A

PENSION PLAN DETAILS

PLAN I

Summary of Actuarial Method and Assumptions

ACTUARIAL COST METHOD

The initial past service liability was determined by the entry age normal cost method. Actuarial gains and losses are used to adjust future normal costs under the frozen initial liability method.

Pension cost is being accrued and funded at a rate equal to normal cost plus interest only on the unfunded frozen initial liability.

ACTUARIAL ASSUMPTIONS

1. Investment return: 4 per cent per year.
2. Mortality:
   a) 1951 Group Annuity Table prior to retirement; 1965 Group Annuity Table after retirement, for normal, early, and vested retirement.
   b) 1944 Disabled Railway Employees Select Mortality Table after disability retirement.
3. Retirement age: 60.
4. Separation: aggregate rates. (See accompanying tabulation for sample values.)
5. Disability: aggregate rates. (See accompanying tabulation for sample values.)

Age	Sample Annual Rates per 1,000 Employees		Age	Sample Annual Rates per 1,000 Employees	
	Separation	Disability		Separation	Disability
25	66.8	0.75	45	3.4	1.62
30	52.5	0.84	50	.....	2.40
35	28.5	0.96	55	.....	4.00
40	10.0	1.15	60	.....	.....

6. Asset valuation: at cost value.

Key Points of Benefit Structure

1. Normal retirement benefits:
   a) The normal retirement date is the first day of the month coinciding with or next following the sixtieth birthday.
   b) Commencing on the normal retirement date, a monthly pension of $200 for five years certain, and, beginning the sixth year, a monthly pension of $100 for life.
2. Early retirement benefits:
   a) A participant who has attained age 55 and completed at least ten years of continuous service is entitled to a monthly pension commencing on the

first day of the month coinciding with or next following his actual retirement.

b) Early retirement benefits are payable according to the following schedule:

Number of Months Early Retirement Precedes Normal Retirement Date	Monthly Pension for 5 Years Certain	Monthly Pension Beginning the Sixth Year
0	$200	$100
12	180	92
24	160	84
36	140	76
48	120	68
60	100	60

3. Plan I also includes disability retirement benefits, vested retirement benefits, and preretirement death benefits.

TABLE A1

RECONCILIATION OF PLAN MEMBERSHIP YEAR BY YEAR: PLAN I

	1967	1968	1969
Flow of active lives:			
1. Number at beginning of year	979	1,069	1,178
2. New entrants	209	197	201
3. Transferred in from other plans	1	14	45
4. Retired during year	6	8	14
5. Terminated with a vested benefit during year	18	11	22
6. Terminated without a vested benefit during year	88	72	100
7. Previously reported to the actuary in error	0	0	2
8. Died during year	3	0	3
9. Transferred out to other plans	5	11	72
10. Number at end of year [(1)+(2)+(3)−(4)−(5)−(6)−(7)−(8)−(9)]	1,069	1,178	1,211
Flow of retired lives:			
1. Number at beginning of year	6	12	23
2. Retired during current year from prior actives	6	8	14
3. Retirees not previously reported to the actuary	0	3	2
4. Benefits terminated by end of certain period	0	0	1
5. Number at end of year [(1)+(2)+(3)−(4)]	12	23	38
Flow of vested terminations:			
1. Number at beginning of year	34	45	57
2. Vested in current year	18	11	22
3. Vesteds not previously reported to the actuary	2	4	3
4. Vesteds previously reported in error to the actuary	6	1	2
5. Benefits terminated by end of certain period	3	2	8
6. Number at end of year [(1)+(2)+(3)−(4)−(5)]	45	57	72

TABLE A2

KEY FIGURES FROM ACTUAL AND EXTRAPOLATED VALUATION RESULTS (IN THOUSANDS OF DOLLARS): PLAN I

	1/1/67 Valuation with 3-Year Extrapolation	1/1/68 Valuation with 2-Year Extrapolation	1/1/69 Valuation with 1-Year Extrapolation	1/1/70 Valuation
1. Covered compensation at 1/1/67	N.A.*			
2. Benefit roll at 1/1/67	8			
3. FIL normal cost for 1967	482			
4. Entry age normal cost for 1967	464			
5. Present value of future lives	11			
6. Accrued liability—entry age normal basis at 1/1/67	3,081			
7. Assets at 1/1/67	2,412			
8. Interest on unfunded FIL for 1967	19			
9. Actuarial investment gain				
10. Cost accrual for 1967:				
a) No adjustment	500			
b) Adjusted for actuarial investment gain				
1. Covered compensation at 1/1/68		N.A.		
2. Benefit roll at 1/1/68		21		
3. FIL normal cost for 1968	526	519		
4. Entry age normal cost for 1968	507	504		
5. Present value of future lives		12		
6. Accrued liability—entry age normal basis at 1/1/68	3,672	3,558		
7. Assets at 1/1/68		2,908		
8. Interest on unfunded FIL for 1968	19	19		
9. Actuarial investment gain for year ending 12/31/67		−10		
10. Cost accrual for 1968:				
a) No adjustment	545	538		
b) Adjusted for actuarial investment gain	546			

* N.A.=not applicable.

TABLE A2—*Continued*

	1/1/67 Valuation with 3-Year Extrapolation	1/1/68 Valuation with 2-Year Extrapolation	1/1/69 Valuation with 1-Year Extrapolation	1/1/70 Valuation
1. Covered compensation at 1/1/69			N.A.	
2. Benefit roll at 1/1/69			43	
3. FIL normal cost for 1969	580	571	573	
4. Entry age normal cost for 1969	559	556	548	
5. Present value of future lives			14	
6. Accrued liability—entry age normal basis at 1/1/69	4,314	4,193	4,370	
7. Assets at 1/1/69			3,596	
8. Interest on unfunded FIL for 1969	19	19	19	
9. Actuarial investment gain for year ending 12/31/68			14	
10. Cost accrual for 1969:				
a) No adjustment	599	591	592	
b) Adjusted for actuarial investment gain	599	590		
1. Covered compensation at 1/1/70				N.A.
2. Benefit roll at 1/1/70				70
3. FIL normal cost for 1970	596	587	589	583
4. Entry age normal cost for 1970	560	571	563	545
5. Present value of future lives				14
6. Accrued liability—entry age normal basis at 1/1/70	5,010	4,881	5,057	5,127
7. Assets at 1/1/70				4,209
8. Interest on unfunded FIL for 1970	19	19	19	19
9. Actuarial investment gain for year ending 12/31/69				−80
10. Cost accrual for 1970:				
a) No adjustment	615	607	608	602
b) Adjusted for actuarial investment gain	622	613	615	

PLAN II

Summary of Actuarial Method and Assumptions

ACTUARIAL COST METHOD

The initial past service liability was determined by the entry age normal cost method. Actuarial gains and losses are used to adjust future normal costs under the frozen initial liability method.

Pension cost is being accrued and funded at a rate equal to normal cost plus interest only on the unfunded frozen initial liability.

ACTUARIAL ASSUMPTIONS

1. Investment return: 4 per cent per year.
2. Mortality:
   a) 1951 Group Annuity Table prior to retirement; 1965 Group Annuity Table after retirement, for normal, early, and vested retirement.
   b) 1944 Disabled Railway Employees Select Mortality Table after disability retirement.
3. Retirement age: 65.
4. Separation: aggregate rates. (See accompanying tabulation for sample values.)
5. Disability: aggregate rates. (See accompanying tabulation for sample values.)

Age	Sample Annual Rates per 1,000 Employees		
	Separation		Disability, Males and Females
	Males	Females	
25	138.4	189.9	0.75
30	115.8	160.9	0.84
35	73.1	79.4	0.96
40	35.0	35.0	1.15
45	16.8	16.8	1.62
50	7.1	7.4	2.40
55	1.5	1.5	4.00
60	.....	.....	8.43
65	.....	.....	.....

6. Salary increases: the factors shown in the tabulation below multiplied by salary at the indicated age determine the estimated highest five-year average salary.

Age	Males	Females	Age	Males	Females
25	1.670	1.511	45	1.150	1.115
30	1.475	1.360	50	1.090	1.070
35	1.336	1.252	55	1.047	1.035
40	1.229	1.174	60	1.015	1.011

7. Asset valuation: at cost value.

Key Points of Benefit Structure

1. Normal retirement benefits:
   a) The normal retirement date is the first day of the month coinciding with or next following the sixty-fifth birthday (with ten years of service).
   b) Commencing on the normal retirement date, a monthly pension for life equal to 50 per cent of compensation averaged over the period of five consecutive years which yield the highest average, less 50 per cent of the primary monthly social security benefit.
2. Early retirement benefits:
   a) A participant is eligible for early retirement benefits on the first day of the month coinciding with or next following retirement, provided that he has attained age 55 and has completed at least ten years of service.
   b) At early retirement a monthly pension for life, based on his normal retirement benefit earned to the date he terminates employment, is payable. An actuarial equivalent reduction is made to reflect any early commencement of payment.
3. Plan II also includes vested retirement benefits after ten years of service.

TABLE A3—RECONCILIATION OF PLAN MEMBERSHIP YEAR BY YEAR: PLAN II

	1967	1968	1969
Flow of active employees:			
1. Number at beginning of year	1,605	1,799	1,776
2. New entrants and pickups	347	290	370
3. Transferred in from other plans	3	0	35
4. Previously reported in error to the actuary	0	1	3
5. Retired during year	25	21	24
6. Died during year	3	1	3
7. Terminated with a vested benefit during year	41	33	18
8. Terminated without a vested benefit during year	82	236	163
9. Transferred out to other plans	5	21	47
10. Number at end of year [(1)+(2)+(3)−(4)−(5)−(6)−(7)−(8)−(9)]	1,799	1,776	1,923
Flow of retired lives:			
1. Number at beginning of year	98	118	148
2. Retired during current year	25	21	24
3. Retirees not previously reported to the actuary	0	13	6
4. Benefits terminated by death or end of certain period	5	4	5
5. Number at end of year [(1)+(2)+(3)−(4)]	118	148	173
Flow of vested terminations:			
1. Number at beginning of year	0	41	55
2. Vested during current year	41	33	18
3. Vesteds not previously reported to the actuary	0	14	5
4. Benefits terminated by lump-sum payments	0	31	0
5. Vesteds previously reported in error to the actuary	0	2	0
6. Number at end of year [(1)+(2)+(3)−(4)−(5)]	41	55	78

TABLE A4

KEY FIGURES FROM ACTUAL AND EXTRAPOLATED VALUATION RESULTS (IN THOUSANDS OF DOLLARS): PLAN II

	1/1/67 Valuation with 3-Year Extrapolation	1/1/68 Valuation with 2-Year Extrapolation	1/1/69 Valuation with 1-Year Extrapolation	1/1/70 Valuation
1. Covered compensation at 1/1/67	6,746			
2. Benefit roll at 1/1/67	43			
3. FIL normal cost for 1967	477			
4. Entry age normal cost for 1967	470			
5. 1 per cent of future payrolls	736			
6. Accrued liability—entry age normal basis at 1/1/67	4,475			
7. Assets at 1/1/67	2,643			
8. Interest on unfunded FIL for 1967	70			
9. Actuarial investment gain				
10. Cost accrual for 1967:				
a) No adjustment	547			
b) Adjusted for actuarial investment gain				
1. Covered compensation at 1/1/68		8,024		
2. Benefit roll at 1/1/68		63		
3. FIL normal cost for 1968	568	571		
4. Entry age normal cost for 1968	559	529		
5. 1 per cent of future payrolls		876		
6. Accrued liability—entry age normal basis at 1/1/68	5,089	5,114		
7. Assets at 1/1/68		3,222		
8. Interest on unfunded FIL for 1968	70	58		
9. Actuarial investment gain for year ending 12/31/67		−11		
10. Cost accrual for 1968:				
a) No adjustment	638	628		
b) Adjusted for actuarial investment gain	639			

TABLE A4—*Continued*

	1/1/67 Valuation with 3-Year Extrapolation	1/1/68 Valuation with 2-Year Extrapolation	1/1/69 Valuation with 1-Year Extrapolation	1/1/70 Valuation
1. Covered compensation at 1/1/69			8,447	
2. Benefit roll at 1/1/69			88	
3. FIL normal cost for 1969	597	601	590	
4. Entry age normal cost for 1969	589	557	544	
5. 1 per cent of future payrolls			917	
6. Accrued liability—entry age normal basis at 1/1/69	5,797	5,792	5,836	
7. Assets at 1/1/69			3,906	
8. Interest on unfunded FIL for 1969	70	58	57	
9. Actuarial investment gain for year ending 12/31/68			14	
10. Cost accrual for 1969:				
a) No adjustment	668	659	648	
b) Adjusted for actuarial investment gain	668	657		
1. Covered compensation at 1/1/70				9,948
2. Benefit roll at 1/1/70				112
3. FIL normal cost for 1970	704	708	695	702
4. Entry age normal cost for 1970	693	656	641	587
5. 1 per cent of future payrolls				1,086
6. Accrued liability—entry age normal basis at 1/1/70	6,540	6,501	6,534	6,917*
7. Assets at 1/1/70				4,696
8. Interest on unfunded FIL for 1970	70	58	57	39
9. Actuarial investment gain for year ending 12/31/69				−8
10. Cost accrual for 1970:				
a) No adjustment	774	765	752	741
b) Adjusted for actuarial investment gain	774	765	753	

* Includes an actuarial loss of 450 for new lives reported into plan with full past service credit; due to errors in reporting of employee data.

PLAN III

Summary of Actuarial Method and Assumptions

ACTUARIAL COST METHOD

The initial past service liability was determined by the entry age normal cost method. Actuarial gains and losses are used to adjust future normal costs under the frozen initial liability method.

Pension cost is being accrued and funded at a rate equal to normal cost plus interest only on the unfunded frozen initial liability.

ACTUARIAL ASSUMPTIONS

1. Investment return: 6¼ per cent per year.
2. Mortality:
   a) 1951 Group Annuity Table prior to retirement; 1965 Group Annuity Table after retirement, for normal, early, and vested retirement and for widow's benefit.
   b) 1944 Disabled Railway Employees Select Mortality Table after disability retirement.
3. Retirement age: 65.
4. Separation: aggregate rates. (See accompanying tabulation for sample values.)
5. Disability: aggregate rates. (See accompanying tabulation for sample values.)

Age	Sample Annual Rates per 1,000 Employees		
	Separation		Disability, Males and Females
	Males	Females	
25	88.8	163.8	0.75
30	68.9	137.3	0.84
35	40.0	72.8	0.96
40	16.5	21.4	1.15
45	7.3	7.3	1.62
50	2.9	2.9	2.40
55	.....	.....	4.00
60	.....	.....	8.43
65	.....	.....	.....

6. Salary increases: the factors shown in the following tabulation multiplied by salary at the indicated age determine the estimated highest five-year average salary.

Age	Males	Females	Age	Males	Females
25	4.708	2.703	45	1.790	1.454
30	3.376	2.247	50	1.502	1.289
35	2.653	1.913	55	1.257	1.153
40	2.162	1.657	60	1.061	1.040

7. Asset valuation: cost value, except for common stock. Common stock valued at cost value plus 70 per cent of the excess of market value (on the valuation date) over cost value. An aggregate basis is used to adjust common stock values.

Key Points of Benefit Structure

1. Normal retirement:
   a) Eligibility—age 65 with ten years of continuous service.
   b) Benefit—life annuity based on the larger of (i) or (ii):
      i) 1½ per cent of highest five-year average earnings per year of credited service, less one-half of estimated primary social security amount.
      ii) 3 per cent of highest five-year average earnings per year of credited service (maximum credited service of fifteen years), less one-half of estimated primary social security amount.
2. Early retirement:
   a) Eligibility:
      i) Age 55 and ten years of continuous service.
      ii) Age 60 with ten years of continuous service and unable to perform job due to infirmity which is not totally disabling.
   b) Benefit—in case (i), benefit as determined in section 1(*b*) reduced for early commencement at 5 per cent per year; in case (ii), benefit as determined in section 1(*b*) unreduced for early commencement.
3. Disability benefit:
   a) Eligibility—ten or more years of continuous service.
   b) Benefit—benefit as determined in section 1(*b*) payable at age 65.
4. Deferred vested benefit:
   a) Eligibility—under age 55 with ten or more years of continuous service.
   b) Benefit—benefit as determined in section 1(*b*)(i) payable at age 65.
5. Widow's benefit:
   a) Eligibility—age 45 with ten or more years of continuous service.
   b) Benefit—25 per cent of benefit as determined in section 1(*b*) payable upon employee's death to surviving spouse for life.

TABLE A5

RECONCILIATION OF PLAN MEMBERSHIP YEAR BY YEAR: PLAN III

	1967	1968	1969
Flow of active lives:			
1. Number at beginning of year	2,914	3,080	2,835
2. New participants during year	443	173	165
3. Transferred in from other plans	25	49	128
4. Covered employees not previously reported to the actuary	13	0	0
5. Retired during year	24	26	30
6. Died during year:			
a) With widow's annuity	8	4	3
b) Without widow's annuity	7	8	7
c) Total	15	12	10
7. Terminated with a vested benefit during year	43	39	63
8. Terminated without a vested benefit during year	222	373	228
9. Transferred out to other plans	11	17	76
10. Reported to the actuary in error in the previous year	0	0	0
11. Number at end of year [(1)+(2)+(3)+(4)−(5)−(6)−(7)−(8)−(9)−(10)]	3,080	2,835	2,721
Flow of retired lives:			
1. Number at beginning of year	264	299	322
2. Retired during current year:			
a) From prior actives	24	26	30
b) From prior vesteds	24	5	10
c) Widows' annuities	8	4	3
d) Total	56	35	43
3. Retirees not previously reported to the actuary	1	3	12
4. Benefits terminated by death	22	14	16
5. Retirees previously reported in error	0	1	0
6. Number at end of year [(1)+(2)+(3)−(4)−(5)]	299	322	361
Flow of vested terminations:			
1. Number at beginning of year	1,021	1,011	1,044
2. Vested in current year	43	39	63
3. Vesteds not previously reported to the actuary	7	11	8
4. Died in current year	8	2	1
5. Retired in current year	24	5	9
6. Vesteds reported in error, transferred, or re-employed	28	1	5
7. Benefits terminated by lump-sum payments	0	9	0
8. Number at end of year [(1)+(2)+(3)−(4)−(5)−(6)−(7)]	1,011	1,044	1,100

TABLE A6

KEY FIGURES FROM ACTUAL AND EXTRAPOLATED VALUATION RESULTS (IN THOUSANDS OF DOLLARS): PLAN III

	1/1/67 Valuation with 3-Year Extrapolation	1/1/68 Valuation with 2-Year Extrapolation	1/1/69 Valuation with 1-Year Extrapolation	1/1/70 Valuation
1. Covered compensation at 1/1/67	28,537			
2. Benefit roll at 1/1/67	241			
3. FIL normal cost for 1967	1,902			
4. Entry age normal cost for 1967	1,964			
5. 1 per cent of future payrolls	3,691			
6. Accrued liability—entry age normal basis at 1/1/67	24,650			
7. Assets at 1/1/67	18,845			
8. Interest on unfunded FIL for 1967	362			
9. Actuarial investment gain				
10. Cost accrual for 1967:				
a) No adjustment	2,264			
b) Adjusted for actuarial investment gain				
1. Covered compensation at 1/1/68		31,961		
2. Benefit roll at 1/1/68		328		
3. FIL normal cost for 1968	2,131	2,142		
4. Entry age normal cost for 1968	2,200	2,199		
5. 1 per cent of future payrolls		4,110		
6. Accrued liability—entry age normal basis at 1/1/68	27,984	27,496		
7. Assets at 1/1/68		22,607		
8. Interest on unfunded FIL for 1968	362	337		
9. Actuarial investment gain for year ending 12/31/67		200		
10. Cost accrual for 1968:				
a) No adjustment	2,493	2,476		
b) Adjusted for actuarial investment gain	2,477			

TABLE A6—*Continued*

	1/1/67 Valuation with 3-Year Extrapolation	1/1/68 Valuation with 2-Year Extrapolation	1/1/69 Valuation with 1-Year Extrapolation	1/1/70 Valuation
1. Covered compensation at 1/1/69			32,701	
2. Benefit roll at 1/1/69			443	
3. FIL normal cost for 1969	2,180	2,192	2,255	
4. Entry age normal cost for 1969	2,251	2,250	2,254	
5. 1 per cent of future payrolls			4,179	
6. Accrued liability—entry age normal basis at 1/1/69	31,673	31,154	31,559	
7. Assets at 1/1/69			25,965	
8. Interest on unfunded FIL for 1969	362	334	332	
9. Actuarial investment gain for year ending 12/31/68			−283	
10. Cost accrual for 1969:				
a) No adjustment	2,542	2,525	2,587	
b) Adjusted for actuarial investment gain	2,549	2,547		
1. Covered compensation at 1/1/70				33,733
2. Benefit roll at 1/1/70				584
3. FIL normal cost for 1970	2,249	2,261	2,326	2,487
4. Entry age normal cost for 1970	2,322	2,321	2,325	2,259
5. 1 per cent of future payrolls				4,276
6. Accrued liability—entry age normal basis at 1/1/70	35,514	34,962	35,397	36,245
7. Assets at 1/1/70				28,335
8. Interest on unfunded FIL for 1970	362	334	332	301
9. Actuarial investment gain for year ending 12/31/69				−1,375
10. Cost accrual for 1970:				
a) No adjustment	2,611	2,594	2,658	2,788
b) Adjusted for actuarial investment gain	2,724	2,723	2,765	

APPENDIX B

EXTRACTS FROM LETTERS

In response to an inquiry received by him whether British actuarial literature might explain the practice and professional reasons for the intervals between valuations in the United Kingdom, D. F. Gilley, F.I.A., A.S.A., replied by two letters, of which the relevant passages are as follows:

The practice of quinquennial valuations really goes back, I suspect, to the beginning of recorded actuarial time. Certainly it was enshrined in the Insurance Companies Act of 1909 and the Friendly Societies Act of 1896 and I believe, but am not sure, that there was an earlier Act in 1870 which may have mentioned it. Anyhow, I am having some more enquiries made and hope to be able to write to you shortly. . . . Certainly, my own clients have either quinquennial or triennial valuations, and triennial valuations have been a comparatively recent development during the last 10 years or so. There are, of course, some clients who like to know what the effect of a special wage award is going to be on their pension liabilities but it is hardly necessary to make a full-blooded valuation in order to achieve this.

You might like to refer to the book "Surplus in British Life Assurance" by P. R. Cox and R. H. Storr-Best. On page 15 it is recorded that in 1800 the Equitable passed a bye-law ordering that a valuation be made every ten years. On the following page there is an interesting reference to frequency of surplus distribution. William Morgan, the Actuary of the Equitable, adhered to the ten-year interval on the grounds that

(*a*) only over a period of this length could fluctuations in the amounts of claims be smoothed out satisfactorily,

(*b*) since the bonus was based on the number of premiums paid from the outset, any increase in the frequency of payment would increase the drain on surplus, and

(*c*) the process of making a valuation was very laborious.

It would appear from a reading of the early chapters of the book that the making of valuations was very closely linked with the idea of distributing surplus.

As a result of the troubles which beset the insurance industry in the 1860's, which are mentioned in a book entitled "The Royal Exchange Assurance" by Barry Supple, published by Cambridge University Press, the Life Assurance Companies Act of 1870 was passed. Section 7 reads as follows:

> "Every company shall, once in every five years if established after the passing of this Act, and once every ten years if established before the passing of this Act, or at such shorter intervals as may be prescribed by the instrument constituting the company or by its regulations or bye-laws, cause an investigation to be made into its financial condition by an actuary, and shall cause an abstract of the report of such actuary to be made in the form prescribed in the fifth schedule to this Act."

At that time it appears that the Gresham were having triennial valuations and I think the Scottish Widows were having seven-yearly valuations. The Equitable were still making decennial valuations and continued to do so up to the end of the century.

The Friendly Societies Act of 1896 prescribed quinquennial valuations for friendly societies.

I can only conjecture that the practice of valuing pension funds quinquennially derived from the background of life assurance and friendly societies. It seems reasonable that if the requirement was for valuations at only five-yearly intervals in the case of life assurance companies and friendly societies, it is unlikely that it would occur to any actuary to make valuations of pension funds more frequently. It is only in recent years that we have had the requirement for triennial valuations of life assurance companies. There is no statutory requirement for triennial valuations for pension funds but many of our substantial employers like to know the condition of their funds more frequently. It appears therefore that triennial valuation of at least the larger pension funds will become more common. One of the pressures has been the desire for the release of surplus in order to finance post-retirement cost of living increases. I think however that as a result of the forthcoming legislation on National Insurance we shall see funds with built-in post-retirement escalation provisions. Once formal funding of such provisions is under way it may be that there will be less pressure for frequent valuations and, who knows, the trend towards triennial valuations may be arrested.

December 20, 1971

Mr. William A. Dreher
William A. Dreher & Associates, Inc.
444 Madison Avenue
New York, New York 10022

DEAR MR. DREHER:

You have asked us to render our opinion on the matter of whether an annual actuarial valuation of a pension plan (and its associated trust, if any) qualifying for preferential federal tax benefits under Sections 401, et seq. and 501, et seq. of the Internal Revenue Code of 1954, is required as a condition for such qualification. For the purposes of this letter, we do not consider any particular pension plan but, rather, speak of the term "pension plan" as a generic concept subject only to its qualification for preferential federal tax benefits. We also assume familiarity with the relevant provisions of the Code governing the qualification of pension plans for preferential federal tax treatment.

It is a general practice to cause annual actuarial valuations of qualified pension plans. However, our research indicates that this is a custom, the origins of which we cannot trace, and it is our opinion that except in the case of an employer seeking to deduct contributions to a pension trust under the provisions of Section 404(a)(1)(A) of the Code, there is no requirement that there be such

annual actuarial valuations. Section 404(a)(1)(A) of the Code establishes a "5% rule" in that it limits the amount of annual deductible contributions by an employer to a pension trust to an amount "not in excess of 5% of the compensation otherwise paid or accrued during the taxable year to all the employees under the trust." Reg. §§ 1.404(a)-4(a) and (b) jointly provide that in the case of an employer seeking to deduct its contributions to a pension trust under the "5% rule" that "the taxpayer need not submit actuarial data . . . in the first taxable year" in which it seeks to deduct its contribution under that rule but "[f] or the first taxable year following the first year to which the initial 5 percent limitation applies and for every fifth year thereafter or more frequently when preferable to the taxpayer, the taxpayer shall submit with his return an actuarial certification of the amount reasonably necessary to provide the remaining unfunded cost of past service credits of all employees under the plan with a statement explaining all the methods, factors and assumptions used in determining such amount."

There is no such regulatory requirement applicable to employers claiming a deduction to pension trusts under the provisions of Sections 404(a)(1)(B), (C) or (D)* of the Code. Indeed, if an employer claims deductions for its contributions under Section 404(a)(1)(B) which provides for the funding of pension plans as "a level amount, or a level percentage of compensation, over the remaining future service of each such employee," the only regulatory requirement is that such level amount or level percentage be determined "in accordance with . . . generally accepted actuarial methods which are reasonable and appropriate in view of the provisions of the plan, the funding medium and other applicable considerations." A similar regulatory provision requires employers claiming deductions of their contributions under Section 404(a)(1)(C) relating to contributions on the basis of normal cost plus 10% of past service cost, to determine the normal cost component (and by implication, the past service component) "by any generally accepted actuarial method." Reg. § 1.404(a)-6(a)(3).

Research has disclosed no other authority nor any commentary requiring an annual or even periodic actuarial valuation of a pension plan, the contributions of which are claimed as a deduction under a provision of the Internal Revenue Code other than Section 404(a)(1)(A) of the Code. In our opinion, the absence of any such authority or commentary clearly implies that there is no requirement of annual or even periodic actuarial valuation. Nor is there any such requirement in either of the two other principal federal statutes regulating such plans: section 302 of the Labor Management Relations Act (29 U.S.C. § 186) requires only that contributions to a jointly administered union-employer plan be made pursuant to a written agreement containing a "detailed basis on which contributions are made," and the annual information return (Labor Department Form D-2) required by the Welfare and Pension Plans Disclosure Act re-

* Section 404(a)(1)(D) provides for the carryover of excess contributions and their deduction in subsequent years subject to the limitations of Sections 404(a)(1)(A), (B), or (C). [Footnote in original letter.]

quires only a description of the actuarial cost methods and assumptions currently used. While an annual actuarial report may be submitted with that form, such a submission is clearly optional.

The fiduciary responsibility of the trustees of a particular pension plan impels them to cause actuarial valuations to be made at certain times. However, there is no general fiduciary duty to have an annual actuarial valuation. In our opinion an actuarial valuation need be no more frequent than as may be required under section 404(a)(1)(A) of the Code, for employers claiming deductions under that section or as may be consistent with the general fiduciary duties of the trustees to keep and render clear and accurate accounts, furnish information to the beneficiaries at reasonable times as to the nature and amount of trust property and exercise such care and skill as an ordinary prudent man would exercise in dealing with his own property. 1 Restatement (Second), Trusts §§ 172–74 (1959). Because each pension trust must be considered in terms of the provisions of its governing plan and trust instrument, its funding medium, the actuarial assumptions upon which contributions have been determined and other factors, it is impossible to state any general rule or even rule of thumb as to whether any particular trust should undergo an actuarial valuation.

The distinction between an actuarial valuation of a pension trust and an appraisal of the fair market value of its assets must be emphasized. In Revenue Ruling 69-421, Part 2(s), 1969-2 C.B. 59 at 68, the Internal Revenue Service has prescribed that "[a]ny type of qualified plan that provides for distributions in accordance with amounts stated or ascertainable and credited to participants, as in . . . trusteed pension plans of the money-purchase type, must provide for a valuation of securities held by the trust, at least once a year, on a specified inventory date, in accordance with a method constantly followed and uniformly applied, and requires the fair market value of the securities on that inventory date to be used for that purpose." This requirement, however, relates only to an appraisal of the fair market value of those assets; it does not concern an actuarial valuation of the pension plan.

Very truly yours,
ROYALL, KOEGEL & WELLS

August 24, 1971

Mr. Walton W. Kingsbery
Price Waterhouse & Company
60 Broad Street
New York, New York 10004

DEAR WALT:

During a conversation in June, I told you that our firm had concluded that an annual actuarial valuation of a pension plan was, in many cases, a waste of money and did not accomplish any practical or professional objective for clients, assuming the plan design, covered employee population and other key variables

to be relatively constant from period to period. Since this conclusion is at variance with prevailing practice among American actuaries—although quite consistent with the historic practices of British actuaries—we expect that our views may raise a few eyebrows among our professional colleagues.

Our basic premise is that it is often sufficient to make a formal and complete actuarial valuation only every two or three years. Subject to a review of the plan, the current trust fund assets and current employee census information to determine that there had not been material changes of circumstances, a reliable estimate of actuarial liabilities and costs, for both accrual and funding purposes, could be made during interim years by extrapolating from the last formal actuarial valuation.

To illustrate simply, for a plan with no retired employees the current actuarial liability could be estimated by adding the normal cost to the actuarial liability from the last valuation and increasing the total by a percentage equal to the actuarial investment return assumption. This result would be compared with the currently appraised value of the pension fund to arrive at a current estimate of the unfunded liability. Similarly the normal cost, expressed as a percentage of covered payroll, could be applied to the current covered payroll to produce a current year normal cost.

The technique best suited to a particular plan would vary, depending on the actuarial cost method, the type of benefit structure and other elements. Also, adjustments for significant variations from individual assumptions could be incorporated in the result. In any event the theoretical basis of the projected results would be derived from mathematical techniques described in the actuarial literature.

The resulting actuarial certification of these estimates would be presented over the professional signature of the actuarial firm, with a proper description of the basis upon which the estimates were prepared.

We are now preparing a paper for presentation to the Society of Actuaries which will identify the circumstances in which a less frequent actuarial valuation is proper and marshall the evidence in support of our views. Because the actuary's valuation is subject to review by other authorities, including the accounting profession and the Internal Revenue Service, it will be necessary that our paper be responsive to the standards and requirements of those other groups.

When we talked before, you indicated your willingness to submit this matter to the AICPA Employee Benefits Committee and to determine if, in their opinion, this procedure would comply with the requirements of APB Opinion No. 8 and would permit the certifying accountant to rely upon the actuary's opinion in giving his comprehensive opinion on the propriety of the client's financial statements.

If you would like any further information about our policies or views before submitting the matter to your committee, please let me know.

Cordially,

WILLIAM A. DREHER

APPENDIX C

EMPLOYEE DATA CONSIDERATIONS

1. GUIDELINES TO TEST FOR SPECIAL VALUATIONS

In Sections VI and VII we have indicated the need for including a test of current employee data as part of the interim annual review between complete valuations. These tests should be appropriate to the particular situation as judged by the actuary responsible for the plan. The ultimate in complexity of data tests is to do the complete actuarial valuation, which is what we are seeking to avoid. We prefer to keep these interim data tests as simple as possible.

It is useful to consider the minimum employee data required to make the interim forecasts. There are three necessary data items (only in total for each valuation class; individual employee data is not necessary): (1) the total number of covered employees; (2) the total covered compensation (essential only where the costs are a function of compensation); and (3) the total current rate of benefit payment, including lump sums where applicable. The actuary's need for additional data is a function of the tests that he wishes to make.

The question to be answered by making the data tests is whether the average cost characteristics of the covered group have changed. The basic estimating formulas take account of a normal uniform expansion and contraction in the size of the group. In designing these tests, the actuary should consider such factors as the scheduled interval between complete valuations (the greater the interval, the greater the need for more comprehensive testing of changes in the average cost characteristics), the availability of data, and the cost fluctuation which the plan sponsor is willing to accept. Deferring a complete valuation simply defers recognition of possible changes in cost; it does not ignore those changes indefinitely.

Each valuation group with a different set of assumptions—for example, male versus female—should be tested separately. Data testing should also be done separately for each operating division, subsidiary, or the like which requires a separate valuation, as contrasted to an allocation of costs.

The results of the tests of employee data are not the sole criterion for deciding when a special valuation is required, but these results must be evaluated along with the other considerations identified in Section VI. It has been our practice to avoid a "cookbook" approach to these tests but rather to emphasize the need for a responsible judgment after the actuary has completed his review of all related circumstances.

The basic employee data variables affecting costs are (*a*) attained age, (*b*) employment age, (*c*) covered compensation, and (*d*) employee status—active, retired, terminated with vesting. Large shifts in the average characteristics of employee data can create both an actuarial gain or loss and a change in the normal cost rate.

In testing ages for signifiacnt shifts in the averages, it is the cost age, that is, the age corresponding to the average benefit-weighted deferred single premium,

that is significant for cost purposes. However, the cost age is correlated with the (unweighted) average attained or employment age, and it is generally sufficient to test only the changes in those unweighted ages in order to determine whether the cost ages have shifted significantly. The number of plan participants and the historical pattern of changes in average attained or employment age are the relevant parameters in judging whether or not age shifts identified in the current interim annual review are significant. For the very largest plans, average age shifts as small as 0.25 years—and less—could be very significant; for the very smallest plans, shifts as large as two years could be normal. However, a change of one year or more in the average attained or employment age is a significant shift in average cost characteristics for most plans. In the absence of any offsetting factors or conditions, such a change might well be sufficient justification for performing a complete valuation in lieu of the interim annual review. For employee groups not previously covered by a pension plan, it may be desirable to have annual actuarial valuations for a few years in order to develop some historical patterns and to build confidence in the base to be used for future extrapolations.

One viable procedure for testing age changes as part of the interim annual review is (1) to develop, as part of the periodic complete valuation, the aggregates—and the averages—of attained age and employment age for each group to be separately tested in a subsequent interim annual review and (2) to adjust the aggregates—and the averages—by the net of ins and outs since the last complete valuation. The procedure is easy and economical to apply, since it requires collecting a minimal amount of data—only for new entrants and terminations—for the interim annual review.

Another procedure that works well, particularly where the plan sponsor has an annual employee statement prepared, is to compute the sum of year of birth and year of employment for all covered participants. Those aggregates, in combination with number of participants, can then be used as part of the interim annual review to test changes in average attained age and employment age.

Changes in covered compensation are important only where the cost is a function of compensation. This will be particularly important where an integrated final average pay benefit plan is involved. In most cases the plan sponsor's personnel or financial department can provide adequate information about the level and incidence of pay increases, which can eliminate the need to collect man-by-man data. A review of current salary changes is part of the continuing examination of the appropriateness of the long-term forecast of salary, including increases for merit, inflation, productivity, and the like. The average annual pay increase, based on available aggregate data, can be compared with the assumed average annual pay increase, to develop a simple but effective test. Even with large integrated final pay plans using a realistic salary forecast, we have accepted deviations between actual and expected of 50–75 per cent as reasonable fluctuations about the mean—that is, the assumed salary increase. Even larger fluctuations can be tolerated, without calling for a special valuation, when testing salary changes for plans based on career average pay, nonintegrated plans, or

very small plans. Again, there is no "cookbook" approach that will be satisfactory over the broad range of potential circumstances; judgment must always be applied.

Changes in the mix of covered employees by sex, or other separate valuation groups, are generally less significant in their contribution to fluctuations in cost than other employee data characteristics. The initial mix and changes in that mix can be identified using procedures analogous to those for testing changes in ages. Significant shifts in the mix by sex, as well as an unusually large number of early retirements or terminations, are also likely to be revealed by the tests associated with average attained or employment age.

There are many stable situations which will require little or no interim testing of employee data when the complete valuation is biennial or triennial. The actuary can confidently make such a judgment only where there is an established pattern of stability and there have been no large events to disturb that stability.

2. GENERAL OBSERVATIONS ON EMPLOYEE DATA

a) For the gain and loss analysis which is part of a periodic complete valuation, it is essential that changes in the census of covered participants (since the last complete valuation) be adequately reconciled.

b) It is neither necessary nor desirable (primarily for expense reasons) to reconcile changes in the census as part of an interim annual review.

c) Actuaries can take advantage of the increasing use of employee benefit statements as a good source of "clean" data for interim annual review purposes.

APPENDIX D

DEFINITIONS, FORMULAS, AND SPECIAL METHODS

The definitions and formulas set out below identify the actuarial algebra associated with the extrapolations made for Plans I–III. With some obvious adjustments to fit special circumstances, for example, where administrative expenses are paid out of the trust, the formulas apply generally to the entry age normal cost method with frozen initial liability. While the entry age normal cost method—with or without the frozen initial liability method to adjust for gains and losses—is probably the most commonly used actuarial cost method, the principles here can be readily extended for application where other actuarial cost methods are used.

DEFINITIONS

t = Valuation year of the last complete actuarial valuation;

$(AL)_t^A$ = Actual accrued liability determined from the complete valuation as of beginning of valuation year t;

$(AL)_{t+r}^E$ = Estimated accrued liability as extrapolated from the last complete valuation at time t to the beginning of an interim review year $t + r$, where $r > 0$;

$(NC)_t^A$ = Normal cost for valuation year t as determined from the last complete valuation, calculated on the assumption that it is due at the beginning of year t;

$(NC)_t^{A'}$ = $(NC)_t^A$, with adjustment for gains and losses under the frozen initial liability method;

i = Investment return assumption;

B_{t+r}^A = Actual rate of benefit payments as of beginning of year $t + r$, where $r \geq 0$;

$(LS)_{t+r}^A$ = Reserve released for actual lump-sum payments made during year $t + r$, where $r \geq 0$;

B_{t+r}^E = Estimated benefit payments made during year $t + r$, where $r \geq 0$;

$(NC)_{t+r}^E$ = Estimated normal cost for interim review year $t + r$, calculated on the assumption that it is due at the beginning of year $t + r$;

$(NC)_{t+r}^{E'}$ = $(NC)_{t+r}^E$, with adjustment for gains and losses under the frozen initial liability method;

$(AS)_{t+r}$ = Total covered compensation of those active plan participants not beyond the period to accrue and fund costs at the beginning of year $t + r$;

$(AN)_{t+r}$ = Total number of those active plan participants not beyond the period to accrue and fund costs at the beginning of year $t + r$;

${}^SP_t$ = The average entry age normal cost rate, when costs are a function of $(AS)_t$, for valuation year t as determined from the last complete valuation;

${}^SP'_t$ = ${}^SP_t$, with adjustment for gains and losses under the frozen initial liability method;

${}^NP_t$ = Average entry age normal cost per participant, when costs are not a function of $(AS)_t$, for valuation year t as determined from the last complete valuation;

${}^NP'_t$ = ${}^NP_t$, with adjustment for gains and losses under the frozen initial liability method;

${}^S(TA)_t$ = Average (weighted by salary) of the present values of an annual annuity of 1, increasing according to the salary progression assumed in the actuarial basis, for each participant from the valuation date until the end of the period to accrue and fund costs or prior termination of employment;

${}^N(TA)_t$ = Average (weighted by lives) of the present values of an annual annuity of 1 for each participant from the valuation

date until the end of the period to accrue and fund costs or prior termination of employment;

G^I_{t+r} = Actuarial gain from investment for the year $t + r$;

K = Fraction of the year between any date of payment and the valuation year end or the interim annual review year end;

$(PVB)^E_{t+r}$ = Estimated present value of all future benefits as extrapolated from the last complete valuation at time t to the beginning of an interim review year $t + r$.

FORMULAS

$B^E_{t+r} = \frac{1}{2}(B^A_{t+r} + B^A_{t+r+1}) + (LS)^A_{t+r}$;

$(NC)^E_{t+r} = {}^S P_t(AS)_{t+r}$, where normal cost is a function of compensation;

$(NC)^E_{t+r} = {}^N P_t(AN)_{t+r}$, where normal cost is not a function of compensation;

$(NC)^{E'}_{t+r} = {}^S P'_t(AS)_{t+r}$ + (special adjustments), where normal cost is a function of compensation;

$(NC)^{E'}_{t+r} = {}^N P'_t(AN)_{t+r}$ + (special adjustments), where normal cost is not a function of compensation;

$(AL)^E_{t+r} = [(AL)^A_t + (NC)^A_t](1 + i) - B^E_t(1 + i)^K$, when $r = 1$;

$(AL)^E_{t+r} = [(AL)^E_{t+r-1} + (NC)^E_{t+r-1}](1 + i) - B^E_{t+r-1}(1 + i)^K$, when $r > 1$;

$(PVB)^E_{t+r} = (AL)^E_{t+r} + (NC)^E_{t+r}\,{}^S(TA)_t$, or

$(PVB)^E_{t+r} = (AL)^E_{t+r} + (NC)^E_{t+r}\,{}^N(TA)_t$, for plans where normal cost is not a function of compensation;

$(ACA)^E_{t+r}$ = Total estimated actuarial cost accrual for year $t + r$;

= $(NC)^{E'}_{t+r}$ + (scheduled contribution for past service amortization).

SPECIAL ADJUSTMENTS

The only special adjustment made for the twelve valuations presented here was to include the estimated effect of the actual actuarial gain from investment which occurred *after* the last complete valuation:

$$\text{(Special adjustment)} = \frac{1}{{}^S(TA)_t}\,(\text{unamortized portion of all } G^I_{t+r}, \quad \text{where } r \geq 0),$$

where ${}^N(TA)_t$ is used in place of ${}^S(TA)_t$ when normal cost is not a function of compensation. In other circumstances it would be both practical and theoretically defensible to use other approaches in handling both the accumulation of unamortized investment gain and the accumulation of the total unamortized gain. Similarly, special adjustments to ${}^S P_t$ and ${}^N P_t$ would be an appropriate part of an interim annual review in certain circumstances—for example, minor changes in

the level of plan benefits. All special adjustments would be subject to a complete review and revision at the time of the next complete actuarial valuation.

ACTUARIALLY COMPUTED VALUE OF VESTED BENEFITS

Accounting Principles Board Opinion No. 8 requires most plan sponsors to disclose the excess, if any, of the actuarially computed value of vested benefits over the total of the pension fund and any balance-sheet pension accruals less any pension prepayments or deferred charges. In many situations, such as the four valuations on each of Plans I–III in this paper, there is no excess of liability over assets and therefore no need to calculate the value of vested benefits in order to satisfy the requirements of *Opinion No. 8*.

For those plans where there is—or may be—an excess, it is necessary to pick an appropriate method for computing the vested benefit liability. There are essentially two approaches to this calculation; one is the termination of plan assumption, and the other is the continuation of plan assumption. The interim annual review procedure we recommend includes an estimate of the excess of vested benefit liability over assets, without doing a complete valuation. In both cases the actual value of assets (based upon the selected procedure for determining their value) will be routinely available as part of the interim annual review, so our task—for *Opinion No. 8* purposes—is essentially one of estimating the vested benefit liability.

Under either the termination liability concept or the going-concern concept, the current liability for the closed group of participants who were either retired or terminated with vested benefits at the time of the last complete valuation can be estimated by using formulas already identified in this Appendix, as follows:

$$(AL)^{E}_{t+r} = (AL)^{A}_{t}(1 + i) - B^{A}_{t}(1 + i)^{K}, \qquad \text{when } r = 1;$$

$$(AL)^{E}_{t+r} = (AL)^{E}_{t+r-1}(1 + i) - B^{A}_{t+r-1}(1 + i)^{K}, \qquad \text{when } r > 1.$$

This approach, which does not use current data for either retired or terminated vested participants, generally contains a small probability of either a material understatement or a material overstatement of liability. However, in the latter case the amount by which the liability might be overstated could be large. Where the plan sponsor does not wish to accept the risk—which will be greater for smaller plans than for larger plans—of a large overstatement in liability, another method should be considered.

Another approach, which could produce more accurate results in situations where the population is more mature, would be to develop an experience reserve factor, which is then multiplied by the actual rate of benefit payment at the time of the interim annual review to determine the estimated liability. A single experience factor—but separate by immediate and deferred benefits—or multiple factors reflecting such variables as type of retirement, sex, and the like, could be used. This approach does, of course, include the use of current data for retired and terminated vested participants.

TERMINATION LIABILITY CONCEPT

We favor the termination liability approach to the determination of the vested liability for active employees. The reasons for this preference are that (1) the calculations are relatively simple; (2) a minimum number of actuarial assumptions is required; (3) the concept is more consistent with the fund's liabilities upon plan termination; and (4) comparison between plans will be facilitated.

As part of the periodic complete valuation, the active life vested liability can be calculated for the current year and each of the interim annual reviews scheduled between complete valuations. For most plans, the current census contains all the employees who can qualify for a vested benefit in the next several years. The vested liability for the interim years can be calculated by recognizing the potential increase in accrued benefit due to the increase in years of service and by assuming that the actuarial experience follows the assumptions. Where new employees can vest almost immediately, a slight modification to the above approach may be required to adjust for the fact that the closed group will not generally include all those eligible for vesting in the next several years.

THE GOING-CONCERN CONCEPT

The same general procedure applied under the termination liability concept (i.e., estimating the vested liability for several years in advance when doing the complete valuation) can be applied under the going-concern concept. Under the going-concern concept, the actuarial assumptions for the reserve factors to determine the value of vested benefits should be the same as those used to determine the annual actuarial cost accruals.

In certain very stable situations, a ratio technique could be used to estimate the vested liability for the interim annual review. The ratio (separate for each valuation class or group with a different set of assumptions) of vested liability to either the accrued actuarial liability or the present value of future benefits could be determined as part of the complete actuarial valuation. This ratio, with appropriate adjustment for trend, could then be multiplied by the estimated accrued liability or estimated present value of benefits determined as part of the interim annual review. Although this approach could be used under both the termination liability and going-concern concepts, it will probably produce more accurate results under the latter concept.

DISCUSSION OF PRECEDING PAPER

BARNET N. BERIN:

This paper puzzles me, for the following reasons:

At a pleasant luncheon at Lloyd's of London, in July of 1971, a prominent British pension consultant and a Scottish pension actuary told me that they envied our ability to do annual valuations and that they felt that this was simply a further indication of how far ahead we were in the pension field.

At a workshop on the presentation of valuation results at the Society meeting in New Orleans in March, 1972, the British actuary referred to in the paper—in response to a question from the audience—mentioned that he preferred to show as little technical detail as possible in his reports, since such detail could be misinterpreted and misunderstood. He may be right; but we could not operate this way here, where some corporate firms have actuaries on their staffs, where some unions have actuaries full time or employ them freely, and where more and more employers have former pension consultants on their staffs.

The concept of using "realistic actuarial assumptions" appears in various places throughout the paper. But what is realism? For example, consider interest rates. Realism is a seasonal concept, changing all the time. If you need to be convinced after 1969–70, please ponder Henry Moir's discussion, in *TASA* in 1929 (XXX, 613), immediately on the eve of the Great Depression. Read how convinced this deservedly famous actuary was of his ability to forecast interest rates. Unfortunately, he stated his rates explicitly, and he was very wrong. Again, what about the level of salary increases? These can change with governmental decisions (the Pay Board, etc.) as well as with economic turndowns. In one industry, defense, this is now a period with little or no salary increases.

A careful actuarial gain and loss analysis, prepared on an annual basis, enables the actuary to evaluate the appropriateness of the assumptions. The first year's gain and loss are helpful; two years' gain and loss begin to indicate the developing experience; and so on, until changes can be made on a reasonable basis. In other words, the initial actuarial assumptions need not be worried over, provided that regular actuarial gain and loss analyses are developed. Skipping a year, or more, makes these studies difficult because of data problems on the "ins and outs" between valuation dates.

Can "the aggregates—and the averages" be helpful in forecasting valu-

ation results? "Assuming the plan design, covered employee population, and other key variables to be relatively constant from period to period," it may be possible. (The quotations are from the paper.) Unfortunately, these conditions are not frequently encountered and are not likely, particularly under immediate gain funding methods. The spread gain funding methods have implicitly, in this approach, a powerful smoothing device which permits the development of a one-year cost as a percentage of covered payroll which might not change markedly from year to year, provided that the actuarial experience is reasonably close to assumptions. I think that most pension actuaries feel that this closeness is difficult to achieve in practice, where the rule seems to be that the unexpected does occur fairly frequently.

Referring to annual valuations, the paper states that "in recent years, this practice has been questioned with increasing frequency." We have not felt this to be the case among our 350 or so pension plan clients. I have spoken to other actuaries, and they have reacted similarly.

The annual valuation enables the actuary to test his assumptions. Periodic adjustments can then be made on a reasonable basis. This is the only distinguishing element between pension actuaries and nonactuarial forecasters and is part of what a professional approach demands. As the valuation period is varied from one year to three years to five years, the actuarial gain and loss analysis becomes not less difficult but more difficult and more time-consuming: tying things together becomes exceedingly difficult; some control is lost. Clearly, a meaningful test of actuarial assumptions becomes a problem.

We have been operating on the basis of time charges for many years: each employee has a stated rate per hour and records his time, and quarterly computer runs give us the breakdown of charges for each client. Computer work is added at cost. The client is billed exactly on this basis. There are no deviations. If there is no work on a particular case at the end of the quarter, there is, of course, no charge. From actual experience on other than annual valuations, we have found that the annual cost of a two-year valuation is more than 50 per cent of the cost of an annual valuation, that the annual cost of a three-year valuation is more than 33 per cent of the cost of an annual valuation, and that the annual cost of a five-year valuation is more than 20 per cent of the cost of an annual valuation. The reason is simply that the data problems in developing a careful actuarial gain and loss analysis become difficult because of the problems in keeping track of participants in an ever changing environment, over a period longer than one year.

Cost estimates become less meaningful if valuation data are out of

date. Even if new data are requested, the last valuation report represents a useful bench mark.

Any of our clients who wants to move from a one-year valuation to a less frequent valuation can do so without resistance. When they weigh the advantages against the disadvantages, most clients choose the annual valuation. This paper has reinforced my feeling that annual valuations are desirable.

G. ASHLEY COOPER:

I would like to begin by commenting on the title of the paper, which starts with the words "A New Look." This is somewhat surprising, since the concept of valuations less frequent than annual has been discussed with employers for many years and is far from new. Indeed, in discussion with other actuaries, I have discovered that a substantial percentage of plans are already valued on a biennial or a triennial basis. Thus there is actual experience as to how periodic, rather than annual, valuations operate in practice.

Let us look at what the paper sets out to demonstrate. It appears that there are three points. The first is that annual valuations are not legally required. Second, the objective seems to be to show that annual valuations are unnecessary from the technical, actuarial point of view. Third, the paper states or implies that less frequent valuations would save employers (or others) substantial sums of money.

On the first point, I believe there can be no disagreement. In present circumstances there is no legal necessity for a valuation each year. Let us then move on to the second, or actuarial, item. It seems to me that the tables and figures in the paper serve only to show in practice the self-evident actuarial fact that costs will follow the assumptions if there are no actuarial gains and losses. I agree.

The problem is that, in today's conditions, fewer and fewer plans are throwing up insignificant actuarial gains or losses. Events are just taking place too rapidly, and here I have in mind mergers and acquisitions; plan changes; union negotiations, past or upcoming; plant openings or closings; the wage price freeze; and regulatory and legislative changes, some of which are still prospective.

A complete list would, of course, be much longer. The point is that cost calculations are required for so many more purposes than just a "normal" check on cost progression. This leads to another subject, which I will discuss again later, which refers to the more sophisticated financial planning that so many corporations are performing today. In sum, a valuation is no longer "just a routine valuation." Moreover, most employers want these results now, not two or three years from now.

The analysis of gain and loss is another technical feature that bears examination. I agree with the authors that under many plans this type of analysis is extremely valuable. However, there are problems if the analysis is not made annually but is, say, triennial. Not only is the valuation procedure much more complex, but the results emerge in a strange fashion. The first two years will show no gain or loss except from investments if the authors' proposals are followed, while all gains and losses for the triennial period will turn up in the third year. This is unrealistic and affords difficulties in interpretation, since it is only too easy to forget what happened two years ago.

Now let us look at the third aim of the paper, which implies significant cost savings if valuations are less frequent than annual. In my opinion, this is the area least adequately explored by the authors of this paper.

From what we have seen, the cost savings implied in the paper are likely to be largely illusory for one or more of the following reasons:

1. The consulting actuary and his firm provide much broader services than a "regular valuation." Thus potential cost savings can relate only to a percentage of a portion of the total annual bill.
2. The tremendous progress in the application of electronic data processing procedures to actuarial work has potentially decreased the relative cost of processing a valuation.
3. As indicated above, clients are now very frequently requesting special cost calculations, many of which can be processed along with a regular valuation. Thus, eliminating the valuation hardly affects the cost of computational work in total.
4. The vexed question of data collection and preparation has to be considered. We find more and more that the major cost of valuation work relates to employee data. Our experience shows that for many, but not all, clients the data-related costs (allowing for the employer's own costs) are often just as high, on an annual basis, for a biennial valuation as for an annual one.
5. Substantial additional costs are likely if the actuary follows the suggested procedure for an interim review and then finds that, after all, a full valuation is required. Moreover, under current conditions, with events moving more rapidly than in the past, this might occur quite frequently.
6. What costs the client real money is skilled professional time, not routine clerical or computer time. A regular valuation for an unchanged plan uses very little skilled time, while the interim review usually will require a professional decision, since it will seldom be a routine process.

In summary, I believe that the potential savings on valuations will quickly disappear on critical analysis. Actual, practical experience on plans that are valued biennially or triennially confirms this conclusion.

Finally, let me refer to British practice, as the authors have done. The

advent of the computer has allowed British actuaries to value more frequently than in the past. It seems strange to hear a plea that United States actuaries should value less frequently.

JAMES J. CRYAN:

I believe that the authors may have practical suggestions of some merit for some actuarial firms, but I question the applicability of the premises to firms such as our own, which start from a vastly different position. For example, I question seriously the prominence given to the implication that biennial or triennial valuations are necessary to be able to afford to develop meaningful experience analysis which can lead to use of more realistic assumptions. Our firm has been doing this routinely for years on a large percentage of the annual valuations which we perform.

Some background information is necessary to properly understand my quite different view of the question at issue. A few years ago our office installed modern projection-type valuation systems on our computers. Conversion to these new systems is now just about complete. The systems include what we consider to be extremely efficient and powerful data management, editing, and correction facilities which give every evidence of having a favorable impact on valuation costs.

The valuation programs incorporate a very complete and accurate gain analysis and the ability to change assumptions much more easily and economically than ever before. We also have the ability now to introduce separate decrements—for example, for withdrawal without vesting, termination with vested rights, and early retirement (all on a select and ultimate basis)—and to properly combine them into an active service table on a man-by-man basis. All this should add up to considerably better valuation results. These advantages are in addition to the inherent accuracy of valuing ancillary benefits in an age-at-event projection system.

The essence of such an approach when operated on a large scale is a high degree of flexibility coupled with meaningful standardization where appropriate and a high degree of continuity from year to year. At the very moment when we begin to see a combination of significant improvements in results coupled with potential savings in costs, it strikes me as a hard request to be asked to seriously consider skipping annual valuations. My first reaction is that the excellent case the authors have made comes a number of years too late.

My second reaction, based on our experience, is that the case for other than annual valuations based on cost savings reads better in theory than it works in practice. We have had in our office for a number of years a

small percentage (but a quite respectable number) of valuations performed less frequently than annually. We find that both our own over-all costs and the client costs are not significantly lower than for annual valuations. This seems to stem from the following considerations. From the client's point of view, the gathering and processing of census data are often considered to be necessary evils done on a relatively infrequent basis, and thus it is no wonder that many of them have trouble with what is really a relatively simple task. We conclude that lack of practice compounded by turnover in the clients' offices tends to make a bad problem worse when the interval between censuses is lengthened. It is a truism in data processing that the small percentage of records which contain errors, or do not match, costs more to process than the high percentage of good records. On the other hand, many clients seem to be approaching or reaching the time when they can produce accurate annual census data at low cost as a by-product of a computerized payroll or employee data base system. In this connection the authors indicate that data used for annual statements are an excellent source of totals for interim valuations. Since they are generally at least as accurate as data required for valuation purposes, they are also appropriate input to a valuation system.

In the actuarial office similar problems arise when valuations are skipped. Actuarial personnel have to master a larger number of techniques (e.g., interim as well as formal valuation methods) and numerous variations of these techniques. Refamiliarization every two or three years is time-consuming and costly. The practical problems of gain analysis (to which both we and the authors attribute considerable importance) are considerably magnified. The fact that basic actuarial rates and probabilities are expressed on an annual basis makes the situation much simpler when experience is measured over one-year intervals. Calculations of expected release and incurral elements are considerably complicated when the interval is lengthened, and the assumption of central occurrence becomes more tenuous. Programs become more complicated, actuarial personnel have many more variations with which to contend, and the possibility of error increases.

The possibility that the adoption of less frequent valuations may lead to errors or loss of confidence in actuaries due to large later corrections in results based on interim valuations is a matter for serious concern. It would appear that some recent developments, such as the introduction of unreduced early retirement benefits, substantial social security increases, plant closings, and personnel cutbacks, may very well lead to significant deviations from the results of interim valuations. To para-

phrase John Donne, "any pension actuary's misstep diminishes me, because I am involved in pensions; and therefore never send to know for whom the bell tolls. It tolls for thee." In a period when actuaries are under attack from certain quarters and when we still have formidable problems to solve in the area of assumptions, this problem is of special concern.

As we all know, pension plan costs are a significant element of a corporation's financial picture. Annual contributions often exceed net profits, and it is not unheard of for the accrued liability to exceed the net worth of the corporation. Stinting on relatively modest actuarial fees when such important considerations are involved does not seem to be an answer.

Murphy's law states that if anything can go wrong it will. Purchases and sales of corporate entities will invariably occur between formal valuations. Time is usually of the essence, hard dollars are involved, and more money could be lost to the client in one such instance than could be saved over the lifetime of the plan. We are also concerned over the situation where the interim valuation indicates that large shifts are probable and a formal valuation is necessary. The inevitable delays could leave the client with large contribution increases communicated too late in the year for proper budgeting.

The thrust of recent developments in our office is to provide our personnel with powerful and efficient tools to perform calculations and thus free actuaries for more important consulting. We already have considerable evidence that in many cases we can get more accurate answers on the effects of changing plans and assumptions faster, as economically, and with less involvement of the actuary than rough estimates formerly entailed. This process relies heavily on standardization, availability of current valuation data and results, and continuity from year to year. The proposal to perform valuations less frequently would require actuaries to become heavily involved in unnecessary judgment decisions arising from interim valuations and thus seems to be a step in the wrong direction.

To sum up, I agree completely with the authors that we should all be striving to produce ever better service at lower cost. However, I believe that in these early years of the computer age, our approach represents a better long-range answer.

DONALD S. GRUBBS, JR.:

Neil Cronquist and Bill Dreher have raised a question which ought to be raised, because little attention has been given to it previously. The paper mentions the possibilities of biennial and triennial valuations and

also an English practice of quinquennial valuations, but it gives no indication of how one should decide which of these practices is better or how one should choose between them. Why were quinquennial valuations rejected?

Actuarial valuations serve as a guide to steer one's course toward the objective of meeting eventual benefit payments. Like a spaceship for the moon, at certain periods we take a new reading on our position and adjust our course as necessary. The more frequently readings are taken, the less violent the changes in course that will be required. One objective of employers is usually to have pension costs which will remain relatively stable as a percentage of compensation if the plan is related to pay, or as a cost per employee if the plan is not related to pay. More frequent valuations serve this end a little better. More frequent valuations also have additional cost. At some point the additional cost of more frequent valuations is not worth the additional value to be obtained from the new reading on our position. At some other point, the additional value to be gained is worth more than the additional cost. All actuaries would agree that daily valuations are unnecessarily costly and that valuations every twenty years would not allow us to adjust our funding frequently enough. The question, then, is a relative one. At what point of frequency does the additional cost exceed the value of the additional information? There is no absolute answer to that question, but an aerospace manufacturer with great fluctuations in employment needs more frequent valuations than a railroad. But what is right for either one?

All the illustrations are based upon the frozen initial liability (FIL) method, which spreads gains and losses over future years and produces much more stable deductible contributions than a method in which actuarial gains are currently recognized to reduce the current year's maximum deductible contribution, which for many companies is the actual contribution. This is not to criticize the FIL method but only to indicate that numerical results might not be appropriate if some other valuation method were used.

The reference to "deductible contributions" does not contain any reference to gains. If an FIL or aggregate cost method is used, there are no gains, but if some other method is used, the deductible contribution must be reduced by the amount of gains. Under an entry age normal cost method or a unit credit cost method, how are gains to be determined without an annual valuation? If the IRS does not require an annual valuation to determine gains, some employers may do one anyway and determine as their deductible contribution the larger of the amounts they get with and without an actuarial valuation.

The examples are all for plans with 1,000 or more employees, and the

paper is generally written with reference to larger employers. It refers to "even plans with as few as several hundred participants." The majority of all pension plans have less than 100 employees. It might be interesting to see an illustration on a 25-member pension plan or even a 10-member pension plan.

The cost of valuations is basic to the considerations involved, but there is no information on the actual amount of fees. No one ever discusses actuarial fees publicly, but we need factual information about what fees are and specifically how much saving might be available. Actuarial fees need not be so high as to make anyone balk at valuations. There is tremendous variation in actuarial fees for valuations. Some actuarial firms charge fees several times those of other firms. A question closely related to this paper is, "What does an annual valuation need to be, and what does it need to cost?"

It might be helpful to translate the relative fees into a cost which is a percentage of employer contributions for various sizes of plan. For example, fees for annual valuations might average 1 per cent of employer contributions, and triennial valuations might reduce them to 0.7 per cent of employer contributions, a saving of 0.3 per cent of the plan's cost. This would put the whole discussion into context a little better. One very practical consideration not discussed in the paper is that the proposal would have a serious adverse financial effect upon some consulting actuaries. Much of the income of some actuaries comes from annual actuarial valuations, and this proposal might decrease those fees by one-third. This proposal might create a very serious financial problem for a number of consulting firms, but it should not be rejected for that reason. Actuaries must look at the client's problems objectively from the client's viewpoint, even when their own compensation is affected. Some actuaries have felt that they could avoid conflicts of interest by not taking commissions, but there are many other situations like this one and like the question whether to recommend a pension plan or a profit-sharing plan, where the actuary's compensation is directly affected by his recommendation to the client. Thus the actuary's integrity is put to the test.

PAUL H. JACKSON:

The authors first present the suggestion that complete actuarial valuations should be performed on a biennial or triennial basis; they proceed to discuss some of the uses of pension valuations and analyze certain estimates made on three pension plans, each over a four-year period; and, on the basis of the demonstrations in the paper, they would hope to persuade actuaries to abandon the traditional practice of annual valuations. The paper is written with persuasive sophistry. This is a "new

look" at the "traditional" practice; "conventional" wisdom must be re-examined; annual valuation without gain and loss analysis "may provide plan sponsors with an unjustified serenity"; "traditional practices are ripe for change"; and "progressive plan sponsors have already adopted biennial or triennial valuation."

While the paper is generous in its length and is appropriately supplemented by extensive appendixes that appear to add technical and professional weight, unfortunately it does not address itself to the technical aspects of the particular problem of the appropriate frequency for actuarial valuation.

It is not difficult to assess the importance of the table contained in the section headed "The Plan Sponsor." In this section the authors conclude that professional quality can be maintained or improved by their new approach, which at the same time offers a 23–37 per cent discount on professional fees. The message comes through loud and clear. Over a three-year period, where "traditional" actuaries would be charging three years' fees, the authors' firm, thanks to its forward-looking approach, will charge between 1.9 and 2.3 years' fees. Such an offering to undercut actuarial fees should never be permitted to appear in a professional journal. And the thinly veiled implication that actuaries who do not agree with the authors' proposals are hidebound traditionalists who are overcharging their clients is most ungracious.

First of all, the reader must assume that in the term "regular actuarial valuation" the authors mean to include three items of work: (*a*) a complete item-by-item check of the employee data with the data from the previous valuation; (*b*) an official actuarial valuation of the program, developing liabilities and contribution requirements; and (*c*) a complete analysis of actuarial gains and losses by source. That this indeed is the authors' approach is suggested by the appendix tables showing a reconciliation of plan membership year by year for each of the three plans studied; by the fact that Mr. Dreher has authored a paper on gain and loss analysis; and by statements sprinkled throughout the paper and appendixes to the effect that gain and loss analysis is a vital part of the complete valuation. This is the classic procedure developed by the early pioneers in the actuarial field in both England and the United States. Many practicing pension actuaries have long been aware of the fact that a complete gain and loss analysis conducted annually for a plan covering only a small number of employees is likely to develop results having little or no statistical significance, while incurring a level of expense that can be of considerable significance to the client. Under the circumstances it is surprising that the authors made minimal reference to the relationship between frequency of valuation, size of plan, and statistical significance.

It is likely, for example, with the particular plans selected by the authors to illustrate their proposal, that gain and loss analysis conducted at five- or even ten-year intervals would prove statistically inconclusive.

Several purposes served by the actuarial valuation of a pension plan are not included in the authors' list. First, an official actuarial valuation based on actual current employee data and conducted annually serves as a convenient basis from which to price potential plan changes, and such changes have a habit of cropping up at frequent and unscheduled times. Second, an annual valuation which includes a depth of funding analysis will provide a useful picture of funding progress and the extent to which it is set back by plan amendments. The value of this latter analysis is enhanced by the availability of an annual series of such figures. The authors' list of parties at interest is not all-inclusive, either. For example, Senate and House committees request information from particular pension plans from time to time; the SEC or the Defense Contract Audit Agency or a federal court may require information; the Pay Board may require pension costs before approving wage or benefit increases; and the sale, purchase, or merger of companies or divisions brings in various other parties as well.

The authors point to the fluctuations that can occur from year to year in the actuarial valuation results for smaller plans. Such fluctuations can be disturbing to plan sponsors and do require explanation, but, even so, I cannot believe that the authors are serious in their suggestion that the existence of these wide variations is, in and of itself, a valid reason for taking the valuation results for one particular year and extrapolating from them over the subsequent three-year period. What if the year selected develops unusually low costs or high ones? Is it really better to use the same cost level for the next two years rather than suffer the embarrassment of presenting the plan sponsor with a fluctuation in cost? In my judgment the annual figures, with all their variation, present a valuable statistical time series for the actuary's professional review. The actuary who adopts procedures that eliminate these year-to-year fluctuations will, to that extent, have divorced himself from reality. If an actuary is prepared to ignore the actual employee data in order to develop smoother results, he may as well ignore the actual assets and the plan of benefits as well.

On the matter of collective bargaining, the authors "are not aware of any labor agreements which demand an annual actuarial valuation." The standard labor agreement in the auto industry requires "a report prepared by the actuary in respect of each year's actuarial valuation of the plan setting out . . . the normal cost; payment toward amortization; method and assumptions; gross actuarial deficiency; and amount of

assets used in the actuarial valuation." No doubt there are many other such agreements in existence.

In the heart of the "professional" analysis, Section VI of the paper, the authors list seven factors which affect the actuarial cost accruals. Item 1 is the plan of benefits, item 2 the actuarial assumptions, items 3–5 the methods, and items 6 and 7 the employee and financial data. Stating the factors in this way, the authors conclude that annual valuations are conducted merely "to evaluate the cost impact of changes in the employee data." Note, however, that the actual experience under the plan, such as the actual rates of early retirement, of withdrawal, or of salary increase, is not explicitly listed as a factor, so that "changes in the employee data" by indirection include all of the actual experience that is developing under the plan.

The authors do admit that the method of triennial valuation with interim estimates should be considered appropriate only in the case of a work force which is growing steadily or is reasonably stable, and in the absence of major changes in plan benefits, actuarial assumptions, and methods. In two of the three plans included in their analysis, however, pension benefits are offset by 50 per cent of social security, so that the net pension benefits valued for active employees have been changing regularly at two-year intervals.

On the basis of my own experience, I have found that an official actuarial valuation of a pension plan, developing liabilities and contribution requirements on an annual basis, is both necessary and desirable. To begin with, our socioeconomic climate is characterized by change, and the rate of change is rapidly increasing. A brief review of the last half-dozen years might illustrate this point: there have been three separate changes in social security, aggregating 43 per cent, with a fourth change pending; three sets of completely new integration rules have been announced, two of which have become effective; an accounting research study on pension costs has been published, and *Accounting Principles Board Opinion No. 8* has been promulgated (along with *Nos. 12*, *16*, and *20*, which also have a tangential bearing on pensions); there have been several changes in our tax laws, including a new tax reform act having a considerable impact on pension disbursements; two pension studies (McClung and Dent) have been published by the House of Representatives; the Senate has conducted a survey of 1,500 pension plans and has published preliminary results; we have had a three-month wage-price freeze followed by Phase 2; there have been two major EEOC rulings affecting benefit plans; and the DCAA has issued pension cost standards. The list seems endless indeed.

Rapid change has been the rule in other aspects of pension plans. More and more plans are incorporating generous early retirement benefits, and

the rate of early retirement has been found to vary by level of benefit, by economic conditions, and by employee attitudes. There have been cyclical changes in unemployment, with some industries (notably defense) seriously affected, and wholesale shifts in the types and characteristics of many employee groups. There has been a flood of new IRS regulations affecting pension plans, new tax forms such as the new Form 4848 and its attachments, imposing ever greater reporting requirements, and sporadic demands for extensive information on pension costs raised by accountants. There has been a trend toward the development of computerized benefit statements giving each individual employee a record as to where he stands under the employer's various programs, and frequently the employee data used for actuarial valuation can serve this purpose as well. And within the last month or so, we learn that an employer may be required to compute "roll-on" pension cost resulting from pay increases (exclusive of the roll-on due to promotion, longevity, and automatic in-grade progression) in order to justify wage or benefit increases under current Pay Board rules. In short, in almost every area one can see a proliferation of requirements and an increasing rate of change. In a way it is quite remarkable that anyone, at this precise moment of history, should suggest that less frequent factual information might be appropriate.

Many years ago, the compilation of reasonably accurate data was a major part of actuarial valuation, and great emphasis was laid on the importance of obtaining information about the covered employee group that was exact to the last man and that could be reconciled from one year to the next without discrepancy. There has been a trend in recent years toward the placing of employer payroll information and other relevant personnel statistics on electronic data processing systems, with regular data checks and with immediate adjustment when data discrepancies appear. The collection of data for an annual actuarial valuation can frequently be made a routine part of an employer's data processing program, and, where payroll data serve as the base, the need to reconcile the data is minimized. It becomes a fairly routine matter for the employer to develop pension data annually, and the development of actuarial valuation results on the basis of these raw data (reviewed only for reasonableness and consistency and not for perfect balance) is fairly inexpensive. While a full-scale actuarial gain and loss analysis can result in considerable expense, the annual processing of these employment data against actuarial valuation factors develops an annual statistical time series which is most helpful in detecting trends and cyclical patterns. The gain or loss from investments can be readily broken out, and the remaining gain or loss from all the other actuarial assumptions combined does have some value in assessing how appropriate they are. For many plans,

running such data through the computer is a less expensive way of developing reasonable results than having an actuary make estimates. Although the authors appear to criticize this approach as unprofessional, it is difficult to see how they can object to a minor variation in data, even one of the order of 0.5 per cent, while at the same time maintaining that interim estimates of valuation results that vary by as much as 1 or 2 per cent from accurate figures are acceptable. The question may be whether one prefers to get an expensive but infrequent "perfect" actuarial valuation or an annual actuarial valuation that is only reasonably accurate but far less time-consuming.

Many knowledgeable computer people will have serious misgivings about merely testing the annual data for reasonableness. To those who would cite the adage "garbage in, garbage out," I can only observe that it is possible to consider the actuarial rates used in the valuation of a pension plan to be somewhat less than eternal truth. When a roundhouse swing is taken at early retirement costs by using age 63 rather than 65, when either 2 per cent or 5 per cent compound salary increase factors may be used along with 4 per cent or 7 per cent interest, perhaps some of the "garbage in" is actuarial in origin, at least in the sense that computed results may fall short of a perfect prediction of future developments.

As an actuary, I cannot close my discussion of this paper without comment on the evidence which the authors present to support their argument. In supporting their thesis by a "blend of actuarial science and empiricism," the authors have presented results for three pension plans over a four-year period. That they should expect professional readers on the basis of this evidence to leap to a general conclusion that actuaries should abandon annual valuation is indeed asking a lot. The particular groups are very small and extremely stable, and the benefit structure involves no troublesome early retirement supplements, no subsidized options, no remarriage or work test forfeitures, no exotic quirks. All are valued on the aggregate cost, frozen initial liability method; two have assets valued at book value; and the reconciliation of plan membership tables over the three calendar years of transactions indicates a total of six active lives reported to the actuary in error at some point out of a total of some 17,000 reportings (an error ratio of 0.04 per cent!). With plans so straightforward in benefit structure and so stable in size, it is surprising that the estimates for the second and third plan year valuations were not closer than 1 per cent and 2 per cent, respectively.

In the second and third plans, in line with conventional and traditional actuarial thought, males and females are assumed to have different separation rates and different salary increase factors. Since these cases consist of roughly 1,800 and 3,000 active lives, one must wonder as to the

extent to which such separate rates have been based on pure judgment and the extent to which they trace back to the data and the actual experience. In fact, in case 3, the variation in salary increase factors by sex is so great as to seem to provide prima facie evidence of past discriminatory pay practices, and the continued use of such factors for the valuation of pension benefits presumably implies that much the same practices are expected to extend for decades into the future. It has been my experience on the very largest plans I serve that the data available have not been sufficiently extensive to develop realistic withdrawal, early retirement, or salary increase factors by sex. If current equal employment opportunity rulings have any impact on the future, then it is likely that observed differences by sex in salary increase factors and separation rates should be changing in a very fundamental way. As a side issue, one might wonder whether the best interests of the actuarial profession will be served by the continual and extensive publication of tables showing separate withdrawal rates, salary increase factors, or even cost factors broken down by sex or by race.

In fairness to the authors, they have probably taken a particular set of circumstances, including their own internal needs and facilities, and have honestly concluded that their purposes are best served by following a certain course. A thorough reading of their paper has not convinced me that their proposed course is a desirable one. While they describe their proposal as being on the side of progress, in my judgment they are proposing a backward step that is inappropriate for the current socioeconomic setting for private pension plans and even runs counter to the recent trend in Britain, where the shift has been from five years to three years, that is, to more frequent valuation than had been the custom since the early years of this century. I would have no quarrel with the authors' paper if it had remained an internal document within their firm aimed at the establishment of their own professional policy. When the paper is to be published in the *Transactions*, with the implication that it presents reasonable grounds for others in the profession to change their basic approach to the actuarial valuation of pension plans, then it must stand on its technical and professional merits. On these terms I judge it to add very little to professional knowledge.

STEPHEN G. KELLISON:

The authors are to be congratulated for this excellent addition to the literature. They make a convincing case for the redundancy of annual actuarial valuations in most situations. The purpose of this brief discussion is to note that in certain instances the trend may be in the opposite direction.

Until 1970 the legislature of the state of Nebraska held biennial sessions. Actuarial valuations on several of the major retirement systems covering public employees were also performed biennially. In the 1970 general election the electorate enacted a constitutional amendment requiring annual sessions of the legislature. In 1971 the legislature commenced a policy of annual budgeting instead of biennial. In the process of requiring all agencies to submit annual budgets, the requirement of annual actuarial valuations instead of biennial was enacted into law. Apparently the feeling was that conditions change rapidly enough that a revised cost estimate should be made available during each budgeting period.

DOUGLAS H. MILES:

My excuse for adding to what the authors have quoted in their paper from my partners Gilley and Lee is that, having worked in consulting practice on both sides of the Atlantic, I may be slightly more conscious of the differences in the actuarial approach to pension funding in the two countries.

To a great extent, of course, the different approaches reflect different sociological patterns, tax practice, and legislative requirements, but the difference between annual valuations and those made less frequently has considerable effect.

As I recall American practice (and I have been back in England now for nearly fifteen years), contributions are generally adjusted each year to allow for experience gains and losses in the preceding year. I gather from the paper that the authors would still aim to do this without making a full valuation. What we usually do is slightly different: a contribution rate is prescribed which one hopes to be able to maintain, and in fact funds run for surprisingly long periods without varying it. Even with quinquennial valuations, it is probably still true that in more cases than not the recommendation at the valuation will be to continue the present rate of contribution. Frequently, these days, this may be coupled with the use of surplus for increasing pensions after retirement. It can be argued that this is a negative form of adjustment of contributions; technically, of course, this is the case, but I mention it as a difference in approach as to the function of the contribution rate.

In fixing contribution rates in Britain, one inclines to use methods in which the contribution rate will tend to fall—attained age normal cost rather than entry age normal cost, for example—but in these days of considerable fluctuations in rates of salary increase (and I think that final salary schemes are commoner than on the American side of the Atlantic), some built-in margins have helped to hold contribution rates in difficult

times. Exact contribution rates fluctuating year by year give an appearance of accuracy of costing, but, unless the actuarial assumptions correspond with experience, this accuracy in the contribution rate is spurious. Once this is accepted, the most that can be hoped for is a balance of errors, and then variations in the contribution rate of less than 0.5 per cent cannot be regarded as significant. On the other hand, to allow automatically for experience losses is a valuable corrective for an inadequate initial contribution rate.

The British practice, then, of valuations less frequent than yearly has given rise to a somewhat different actuarial approach from that applying in the United States. To go into details would require more time than I have available. Whether the adoption of less frequent valuations in the United States would similarly result in an altered approach is another matter—it may be more difficult in view of the different tax and legislative requirements in the United States.

PAULETTE TINO:

How often should actuarial valuations be performed? In some cases a valuation obviously should be done every year. Let me give three examples: (1) The actuary shares in the responsibility of maintaining the records for a plan in which benefits are incremented each year on the basis of the applicable salary for the year or in a plan calling for a minimum benefit of the same nature. (2) The benefits are credited in units, the value of which is dependent upon the performance of the fund and, for good measure, dependent also upon the mortality experience. (3) The plan is funded on the unit credit cost method, and the contribution for a given year is offset by the gains of the preceding year.

Let me focus the discussion on plans in which benefits are based on final average pay and are funded on methods of the frozen initial liability type, and look at the data problems.

1. *Need to Clean Up the Data*

The essential difficulty in producing a valuation resides in the data. It is incumbent on the actuary to check the information given by the company. In an age when vested benefits are becoming extremely popular, to mention only one point, there will always be the necessity to call the company on some employees reported as terminated without benefits, for which age and service indicate that a deferred pension should have been shown. It is difficult enough to get the information straightened out if it is a question of looking some months back in the records, without having to wait for two or three years or more when changes of personnel or other circumstances make it difficult to obtain an answer.

It has become very common for a company to engage a firm to produce computerized employee benefit statements. This can often be done as a by-product of annual valuations. In any event, the statements cannot be produced on raw data without multiplying the chances of mistakes that are embarrassing both for the actuary and the company.

2. *Relative Ease of Preparing Annual Valuations or Complexity of Preparing Them Less Frequently If an Analysis of the Experience Is Made*

In the age of computers, when the data are ready, the valuation proper has become a relatively easy matter whatever the complexity of the benefits. Liabilities approximated in the past can be exactly computed on the basis of the assumptions being used. The items required for the reconciliation of the results from one year to the next can be routinely obtained. This, incidentally, can reveal more inconsistencies passed over in the screening of data.

Now let us examine the burden added to the reconciliation phase of the operation if the valuation is performed at intervals of more than one year. Proper decrements must be produced from the available q_x, w_x, and so on, in order to link factors like $N_{65}^{(12)}/D_x$ from the beginning to end of the interval and obtain the proper expected releases for mortality, turnover, and so forth.

This may be easy enough, but difficulties promptly arise for liabilities emerging from benefits incremented each year, like vesting benefits. The reconciliation formula for a noncontributory case will run as follows for a three-year period:

$$\left(\frac{1}{D_x^t}\sum_{t=0}^{64-x} B_{x+t}w_{x+t}D_{x+t}^t\frac{N_{65}^{(12)}}{D_{x+t}}\right)(1+i)^3$$

$$-(q_x^{(3)}+w_x^{(3)})\left(\frac{1}{D_{x+3+t}^t}\sum_{t=0}^{64-(x+3)} B_{x+3+t}w_{x+3+t}D_{x+3+t}^t\frac{N_{65}^{(12)}}{D_{x+3+t}}\right)$$

$$-w_xB_x\frac{N_{65}^{(12)}}{D_x}(1+i)^3-w_{x+1}B_{x+1}\frac{N_{65}^{(12)}}{D_{x+1}}(1-q_x-w_x)(1+i)^2$$

$$-w_{x+2}B_{x+2}\frac{N_{65}^{(12)}}{D_{x+2}}(1-q_x^{(2)}-w_x^{(2)})(1+i)$$

$$=\frac{1}{D_{x+3}^t}\sum_{t=0}^{64-x} B_{x+3+t}w_{x+3+t}D_{x+3+t}^t\frac{N_{65}^{(12)}}{D_{x+3+t}},$$

where B_{x+t} is the vested benefit (which can be zero) for year t and $q_x^{(n)}$ is the n-year mortality decrement. Who can do the proper job and charge,

with data problems added, not more than 70 per cent over the fee for annual valuations?

Let me just mention two other areas of difficulty. First, there is the question of the various statuses under which a single employee can be classified in the interval between two valuations; for example, an employee active at the beginning of the period will terminate with vested rights thereafter, then retire and die before the end of the interval. Will you allocate the various pieces of experience to the proper decrements? Second, the postponed retirement gains calculation will require yearly examinations to tie in the yearly disbursements shown in the trustee statements with the expected payments.

3. *Final Observations*

The plans illustrating the argument of the author are relatively stable in membership. In Plan III, substantial benefits are linked to the decrements, increasing the likelihood of stability. What about a plan not so well balanced where sharp curtailment of membership has caused a sharp decrease in normal cost rate? Extrapolations become difficult, especially if more significant turnover takes place thereafter—situations very often encountered in past years.

Computers have eased our burdens, thus permitting more precise analyses each year. Annual gain and loss determinations can be used to build a base for confirming or adjusting future valuation assumptions.

Does it make sense to loosen our standards now, especially, when managements, accountants, stockholders, and governments all seem to favor adequate and timely disclosure? Or could it be that the only compelling reason for performing less frequent valuations is that our colleagues from England are moving in the other direction?

FREDERICK P. SLOAT:

Mr. Dreher gives four reasons for favoring the termination liability approach to the determination of the vested liability called for by *APB Opinion No. 8*. These reasons are as follows:

1. The calculations are relatively simple.
2. A minimum number of actuarial assumptions is required.
3. The concept is more consistent with the funds' liabilities upon plan termination.
4. Comparison between plans will be facilitated.

The purpose for the vested benefits test used by the Accounting Principles Board in drawing up *APB Opinion No. 8* was to apply a minimum test to an employer's provision for pensions, namely, whether the employer has provided to date for an amount of cost sufficient to

cover the liability for all vested benefits under the operation of the plan. There was no thought of this as a test of what would happen upon termination of the plan. It was not its purpose to see that the employer met sufficient cost to cover all vested benefits that might arise because the plan was to terminate.

Accordingly, reason 3 has no application to the intent of *APB Opinion No. 8*. Reasons 1 and 2 are desirable but are inappropriate as basic criteria in a professional approach for ascertaining what concept should be used for a given purpose. With respect to reason 4, the usual provisions upon termination of a plan result in the vesting of all benefits for service up to that time, and, therefore, there would be fewer differences among plans on a termination of plan comparison. However, this comparison is not called for by the purpose for which the vested benefits test was incorporated in *APB Opinion No. 8*. Further, a more informative comparison among plans is one based on their active operations.

(AUTHORS' REVIEW OF DISCUSSION)

NEIL R. CRONQUIST AND WILLIAM A. DREHER:

We are grateful for the thoughtful discussions, both written and oral, of our paper. These discussions will supply a most helpful dimension for the practicing actuaries who examine our proposition and evaluate its merits in the light of their own desire to improve the efficiency and professional content of their services to clients.

Our primary goal in writing this paper was to encourage acceptance of an alternative to the well-entrenched American practice of annual actuarial valuations of pension plans. About five years ago we began experimenting with biennial and triennial valuations, largely in response to prodding from clients. The results were generally satisfactory. There were no large surprises in the end-of-period valuation results, and the clients were content. Our experiences with nonannual valuations had persuaded us that they were fully satisfactory in a wide variety of circumstances, if combined with co-operation from the client and a careful interim annual actuarial review. The discipline of preparing this paper strengthened our convictions. The many excellent discussions have underlined some important principles and sounded valuable cautionary notes on the practical application of our proposals. We thank their authors and will benefit from their suggestions.

Our endorsement of nonannual valuations has obviously alarmed some American colleagues. On the other hand, the Canadian and British actuaries who rose to express their views are apparently quite comfortable with the ideas. This, no doubt, reflects the influence of traditional

British practice; but we are confident that there is one other and more important reason for their concurrence in our proposal: biennial or triennial valuations have proved economically and professionally satisfactory.

With regard to Mr. Berin's discussion, our responses are given in the same order as his comments.

Mr. Berin does not fully explain why the Scottish pension actuary "envied our ability to do annual valuations." Is the Scotsman's envy entirely a function of our seemingly higher professional standards, or does he relish the economic benefits of annual valuations?

The content and quality of actuarial valuation reports is a professional question of great importance and an area in which we all must work to achieve a higher standard of communications with clients. However, we fail to see the connection between one's attitude toward the structure of an actuarial report and the relative merits of annual or nonannual valuations.

We agree with Mr. Berin that regular actuarial gain and loss analysis can be a useful tool in developing a set of realistic actuarial assumptions. For reasons of economy—and significance of results—we prefer to have such analyses developed on a biennial or triennial basis. We do not agree with Mr. Berin when he says that the initial actuarial assumptions "need not be worried over" if he means to imply that they should be picked with any less care than one might devote to revising assumptions after accumulating several years of experience data.

In our experience, these conditions of stability of plan design and covered employee population are so frequently found in practice that we can say that a stable work force is the rule—not the exception—for the typical large employer. Use of immediate gain costing methods can create a spurious fluctuation in costs, to such an extent that the accounting profession discourages the use of immediate gain costing methods for determining accounting cost accruals.

We can only speak for ourselves. The question of valuation frequency has been initiated by a substantial fraction of our clients. Perhaps the likelihood of this question's being raised is related to one's style of educating clients about the relative significance of various actuarial matters.

With most plans we feel that at least three years of actuarial experience, and preferably five years of experience, are necessary to make sound judgments about the relationship between assumptions and experience. On the basis of Mr. Berin's comment in item 3, we believe that he would feel the same way. On the basis of our experience, doing one gain and

loss study covering a three-year period costs the plan sponsor considerably less than doing three annual gain and loss analyses covering the same period of time—and the amount of useful information is essentially the same in both cases.

Mr. Berin cites some rather unusual "actual experience on other than annual valuations." However, upon reflection it is not too surprising that an actuarial staff geared to doing annual valuations would be inefficient in producing an occasional biennial or triennial valuation.

When are the employee data out of date? When they are six months old, one year old, or five years old. It seems unnecessarily arbitrary to suggest that employee data which are one year old are significantly more meaningful than two- or three-year-old employee data—augmented by the aggregates of the data and tested for shifts—for the purpose of estimating costs many decades into the future.

We agree with Mr. Cooper when he suggests that a valuation should not be a routine procedure. We seek to avoid the routine annual valuation and at the same time to see that the periodic actuarial valuation is a meaningful tool in the management planning and decision-making process. Under our policy there is no reluctance to perform special valuations whenever changed circumstances make it necessary.

Considering the longer interval over which the gain is computed, nonannual valuation will provide a smoother adjustment for gains and losses than annual valuation—provided that the assumptions are realistic. Where the spread method of adjustment is used, actuarial gains and losses emerge in much the same manner with nonannual valuations as with annual valuations. With immediate recognition of gains, a two- or three-year spread method can be used.

Electronic data processing procedures have helped a great deal to improve quality and to lower costs. These cost reductions can be carried still further by eliminating unnecessary data processing wherever possible.

An interim annual review which turns into a complete actuarial valuation as a result of changed circumstances could generate additional costs. Mr. Cooper is correct in saying that "the interim review usually will require a professional decision, since it will seldom be a routine process." However, such a review requires considerably less professional time than is typically devoted to supervising the annual valuation.

The British practice of using nonannual valuation, whether in the form of quinquennial or triennial valuation, differs from that which we have proposed, inasmuch as they do not—to the best of our knowledge—provide for an interim annual review. It is that review which provides

the continuity of professional attention to the actuarial aspects of the pension plan between complete valuations.

Mr. Cryan correctly identifies the critical importance of collecting complete and accurate valuation data. We can only stress the desirability of having co-operation from clients in providing this information. Even though the data are relatively simple and would seem easily obtainable, it is surprising how often the data are in error or inconsistent, particularly if the personnel function is decentralized and records are coming from many sources and in many forms. We believe that good-quality census data are essential to the success of our proposal for nonannual actuarial valuations, and we underline this requirement when discussing valuation frequency with our clients.

The technical problems associated with actuarial formulas for nonannual valuations are not particularly awesome, especially when the staff is geared to the nonannual cycle. The interim annual review—properly applied—can adequately identify changes in circumstances that affect pension costs. The laymen who criticize our profession are more likely to comment upon the typical actuary's devotion to the quintessence of actuarial accuracy than to suggest that we are not valuing pension plans frequently enough.

Corporations should, of course, not be "stinting on relatively modest actuarial fees," but, to the extent that we can assist plan sponsors to make more effective use of those fees, we have performed a valuable service to plan sponsors—and to the actuarial profession.

If Murphy's law applies to the purchase and sale of corporate entities, such events will invariably occur between formal valuations—be they annual, biennial, triennial, or quinquennial. Not only is the timing difficult to predict, but frequently the assumptions used to value liabilities may be different from those routinely used to determine the actuarial cost accrual, and a special valuation may still be required.

Mr. Cryan's description of his firm's computer-based valuation is most impressive. His firm may be in a unique position within the actuarial profession, not for having a computer-based pension valuation system but for having one that combines technical sophistication with flexibility and operating efficiency. Such systems are clearly a tribute to the skill of the professionals who devise them. Our observation of similar efforts made by several firms suggests that the end result is often less successful: either the complexity of the programs leads to inefficient operation, or professional refinements are sacrificed to the requirements for trouble-free processing.

Applying the power of large-scale data-processing equipment to actuarial and employee benefit problems has been a great help to actuaries, but computers cannot supply all the answers. Computer systems are expensive to develop to the stage where they provide a high degree of reliability. Once developed, such systems require a high level of competence to maintain and/or modify them to keep pace with changing requirements. The more generality that is built into such systems, the more expensive they become. When the system is not completely general—a condition which is virtually impossible to achieve—it is necessary to have the actuary's skill and judgment applied to the problem. In our view, there is no substitute for developing and continually applying actuarial judgment, as well as finding better and more meaningful ways to apply the power of computers.

Even the smaller firms, like ours, have virtually unlimited access to computer technology through time-sharing terminals and actuarially oriented service bureaus and software houses, without being forced to carry the overheads associated with building and maintaining generalized in-house systems. Placing such great reliance on standardization and continuity in an age of rapid change does not strike us as being the right answer.

We agree with Mr. Grubbs when he says that there is no absolute answer to the question of an appropriate frequency for pension plan actuarial valuations. The frequency should vary by the circumstances of the plan sponsor. It should be noted that one purpose of the interim annual review is to enable both plan sponsor and actuary to decide whether or not a special valuation would be appropriate because of changed circumstances. Picking the biennial or triennial approach does not mean that one is always required to maintain that interval. Quinquennial valuations might be appropriate in certain circumstances, but we would always recommend that such valuations be coupled with an interim annual review.

We have some difficulty with Mr. Grubbs's analogy between actuarial valuations and the course-setting adjustments for guiding a spaceship to the moon. The astronomer can precisely predict the location of the moon and knows that the law of gravity cannot be repealed; the actuary can only approximate the ultimate characteristics of a pension plan's assets and liabilities and must recognize that many forces outside his knowledge and control will influence the plan's destiny. A lunar flight trajectory can be adjusted minutely, but, in relative terms, it strikes us that three or four course changes in a three-day journey covering a half-million miles are less frequent than an annual actuarial valuation of a pension

plan with a future life of seventy-five or a hundred years. With pension plans, a thoughtfully chosen set of assumptions modified at suitable intervals to reflect emerging experience is the best course-correcting technique we have available, and biennial or triennial valuation is not incompatible with that objective.

Actuarial gains and losses will occur with any valuation method, and these can be readily determined whether we are using annual or nonannual valuation. The gain would, of course, be computed over the entire interval since the last complete valuation. In adjusting contribution levels, it is possible to use a two- or three-year-spread method to provide a more immediate recognition of gains than is generated by the frozen initial liability or aggregate cost methods.

A valid comparison of actuarial fees must take into account differences in services, which are affected by such factors as differences among clients, varying client needs for actuarial advice, the philosophy of the actuarial firm, ease (or difficulty) of data collection, ancillary services from the valuation, and so on. Even if cost information on actuarial fees were available, it would probably be of little value in comparing one actuarial firm with another. However, the savings resulting from the shift to nonannual valuations are significant and can be meaningfully measured within the framework of a single firm's services.

To shift from annual to nonannual valuations merely to lower costs is an inadequate professional response. One of the major advantages of doing less frequent actuarial valuations is that the dollars saved by not generating the annual numbers can be applied to a meaningful analysis of the plan's experience and to supplementing the conventional valuation with special analyses of cash flow, fund growth, the cost of proposed pension legislations or plan liberalizations, the effect of alternative actuarial assumptions, and the like. We believe that our proposals not only provide the actuary with an opportunity to render better service to plan sponsors but are a means of preventing any loss of revenues to his firm.

To place Mr. Jackson's discussion in perspective, the reader should review his final paragraph and then return to the beginning. In particular, we would draw attention to his statement that "I would have no quarrel with the authors' paper if it had remained an internal document within their firm, aimed at the establishment of their own professional policy." This seems to indicate that Mr. Jackson is not unhappy with the thought that we might apply the concept of nonannual actuarial valuation within our own professional practice, but has been outraged because we put our position in writing, invite criticism, and encourage its acceptance by

other members of the Society of Actuaries. Is not debate of controversial ideas a legitimate and important function of professional associations?

Our paper is not a proposal to discount professional actuarial fees but rather the presentation of a viable alternative to the American tradition of an annual actuarial valuation. This alternative—where applied in the appropriate circumstances—has important benefits for both the plan sponsor and the actuary: costs might be reduced or the range of services expanded within the same budget; the actuary's role may shift its emphasis away from that of the narrow technician and more toward the financial management consultant.

Considering the sophistication of our audience, the term "complete actuarial valuation" as used in the body of the paper and illustrated in the appendixes seems to be an adequate description of work that would typically be included in the periodic valuation. It should be noted that "a complete item-by-item check of the employee data" is not one of the items which would normally be included in the complete actuarial valuation. Ordinarily, where the data base is well controlled, the cost effect of changes in employee data for employees included in the previous and in the current valuation can be treated as a miscellaneous source of gain or loss. A reconciliation of the flow of lives between complete actuarial valuations is an essential feature of doing the gain and loss analysis, and with appropriate planning and procedures this can become a comparatively routine and efficient exercise. Mr. Jackson appears to be supporting our fundamental premise here by suggesting (1) that annual complete gain and loss analysis is expensive and (2) that actuarial results over relatively short periods of time may be statistically inconclusive. It is exactly for reason 1 that we suggest either a biennial or a triennial complete gain and loss analysis and for reason 2 that we advocate making fewer such inconclusive actuarial calculations, as currently represented by the traditional annual valuation. Doing the gain and loss analysis every two or three years—and covering the entire interval since the last complete valuation—is just as useful as doing the analysis annually.

Mr. Jackson has made a meaningful contribution to our list of parties at interest. He has also effectively elaborated upon two important purposes of an actuarial valuation, both of which are included in our list.

The "reality" of a statistical distribution includes not only its mean but also its standard deviation. Cost results which fluctuate about the mean may provide the statistician with a vivid demonstration of random-

ness, but most plan sponsors seem to prefer stability of cost rates, with changes applied only when they are truly significant and not merely random fluctuations. The question is not whether the actuary suffers embarrassment by presenting fluctuations in cost but whether the needs of the plan sponsor are being appropriately served by a randomly fluctuating series of costs. There is no point in the paper at which we have suggested that the actuary ignore the employee data, nor do we advocate switching to nonannual valuations unless there is evidence of stability in results—even with the smaller plans.

The gain and loss analysis, which is an essential part of the complete actuarial valuation, provides the means for accumulating the actual experience developing under the plan. Item 4, in the list referred to by Mr. Jackson, explicitly includes the technique for adjusting for the effect of emerging experience under the plan.

For most plans, including those presented in the appendixes, changes in the social security law, such as those which occurred during the 1967–70 period, do not constitute major changes in plan benefits, and their effect can be rather accurately approximated as part of an interim annual review.

We do indeed live in a climate of great socioeconomic change, but in our experience it has not been necessary to perform an actuarial valuation to evaluate the effects of each and every new event. If Mr. Jackson, and his clients, find it "both necessary and desirable" to have an annual actuarial valuation, they should continue to do so.

The increasing burden of administrative expense on private pension plans makes it incumbent upon concerned professionals to eliminate inefficiencies in the use of the plan sponsor's money. Under our proposal, the plan and all surrounding conditions are professionally reviewed annually, providing an economical basis for keeping up with change.

Gain and loss analysis, which we prefer as the means for measuring the effects of plan experience, requires considerable control over the employee data from one complete valuation to the next. Changes in employee data for continuing plan participants are much less likely to be a source of analytical headaches in most situations than the identification of ins and outs to the population between complete actuarial valuations. Well-informed, co-operative clients and sensible use of computers can go a long way toward solving this reconciliation problem. We have no objection whatever to minor variations in employee data, as can be seen by examining the flow of lives and the unreconciled gains associated with some of the illustrative valuations.

We certainly agree with Mr. Jackson's assessment of the relatively imprecise nature of an actuarial prediction—and note that he again lends support to our viewpoint.

The numerical results presented in support of our argument were followed by the statement that "neither the scientist nor the actuary should draw sweeping conclusions by reasoning from the specific to the general, but the numbers do tell us something." This is hardly a request for professional readers to "leap to a general conclusion," as Mr. Jackson has suggested. But the results do rather strongly demonstrate that with straightforward, stable plans of this character the technique works and works very well. And there are a great many pension plans which fall into this general category.

We certainly advocate the continued use of separate assumptions by such factors as sex, union status, pay grade, duration since employment, race, or any other demographic variable for which the current and probable future experience indicates that significant differences can be expected.

Once there has been a clear demonstration of the need for an actuarial experience study, we have generally encountered no serious obstacles to obtaining the necessary past data.

Mr. Kellison notes that the state of Nebraska has shifted from a policy of biennial valuations to annual valuation. If this change reflects an unhappy experience with the trend of pension costs, we would suspect that the culprit is not the biennial valuation policy but inadequate actuarial methods and assumptions. Furthermore, if a biennial valuation is not accompanied by an interim annual review—as we propose—the opportunity for an earlier detection of major changes in the normal cost and other valuation results will be lost.

Mr. Miles has correctly surmised that our approach to the valuation problem would continue the traditional American practice of adjusting costs for the evolving actuarial experience gains and losses. Actuarial gains and losses are computed as part of the complete actuarial valuation. The gain from investment increment—and in some circumstances estimates of other gains and losses—is computed as part of the interim annual review. Gains and losses determined from the complete actuarial valuation are applied in the usual manner when a spread method of gains has been adopted. With immediate recognition of gains, a two- or three-year spread, depending on whether the valuation interval is biennial or triennial, can be used. Naturally, the extent to which gains have been estimated and applied as part of the interim review must be taken into account in applying gains at the next complete actuarial valuation.

We fully agree with Mr. Miles when he says, "Exact contribution rates fluctuating year by year give an appearance of accuracy of costing, but, unless the actuarial assumptions correspond with experience, this accuracy in the contribution rate is spurious." It should also be noted that, even if the actuarial assumptions correspond with the experience, year-by-year costs which fluctuate about the true mean add little significance to the validity of the long-term forecast.

Mrs. Tino identifies several situations which demand, in her judgment, that a valuation should be done every year. With respect to Mrs. Tino's example 1, we find it difficult to see why the actuary should find it necessary to do a complete valuation merely to carry out this record-keeping function. With example 2, where the value of a unit is dependent on performance of the assets only, there is generally no reason to value the liabilities, unless this is made a specific requirement of a particular plan. Where the value of a unit varies with the postretirement mortality experience, there is no reason to perform the complete actuarial valuation merely to measure this element of the experience—again, unless it is made a specific requirement of a particular plan. With example 3 it is necessary to perform the valuation each year if gains of the preceding year are to be offset immediately. However, it is also permissible under IRS regulations to use a spread method of recognizing gains when the accrued benefit method is applied.

We have found that data problems are inversely proportional to the amount of help that we are able to give our clients in structuring the data base. The data collection problem is really a very simple one, once the plan sponsor has been properly instructed as to what is expected of him. In some situations we have found it useful to identify separately the cost of collecting and reconciling employee data and the cost of performing the valuation, given the proper data. Used appropriately, this practice can identify a clerical malfunctioning in the plan sponsor's organization which is creating an excessive actuarial valuation cost. It should be also noted that lengthening the interval between valuations eliminates for many plans the data problems caused by many of the short-term employees.

The actuarial valuation is more likely to be a by-product of generating employee statements than vice versa. This is particularly true when one considers the vital necessity of having precisely accurate employee data for a personalized employee benefit statement.

The computations cited by Mrs. Tino are not essentially more difficult than those involved in annual valuations. They may seem intimidating when first encountered but can be dealt with effectively if you are regular-

ly using the biennial or triennial approach. Gain and loss analysis need not be carried to the point where the unreconciled gain has been reduced to zero. On the contrary, this analysis can be very useful even when there is an unreconciled gain or loss of as much as 1 per cent of reserves for small plans. With this tolerance level, minor elements of the actuarial experience can be readily ignored without jeopardizing the usefulness of the information.

Large changes in the census characteristics of the population are readily determined by the interim annual review, which is used to determine when a special valuation is necessary.

We agree with Mrs. Tino on the usefulness of gain and loss analysis for confirming and adjusting valuation assumptions. However, the analysis need not be performed on an annual basis as long as each analysis covers the full period since the last complete valuation.

Making the actuary's work more useful to the plan sponsor—and to the actuary—hardly means that we are about to "loosen our standards." Use of the nonannual valuation has not caused us any difficulty in making both adequate and timely disclosure to the parties at interest in the actuarial valuation.

Mr. Sloat has correctly identified some careless writing in Appendix D of the paper. We initially labeled the two approaches to calculation of the actuarially computed value of vested benefits as "termination of plan assumption" and "continuation of plan assumption," thus creating the impression—contrary to our intent—that the method would be based upon the plan's existence rather than upon the employee's election.

To define the terminology subsequently used in Appendix D and to clear up the confusion, we quote Mr. Dreher's article in the September, 1967, issue of the *Journal of Accountancy:*

> For benefits of employees still in active service, however, results can differ significantly because either of two approaches might apply:
>
> 1. THE TERMINATION LIABILITY CONCEPT. What would the pension fund's liability be if all employees were to terminate employment voluntarily on the valuation date, ignoring the effect of plan provisions that limit the liability to amounts actually in the pension fund?
> 2. THE GOING CONCERN CONCEPT. Assuming the pension plan continues indefinitely and the actuarial assumptions used to determine the pension cost accrual prove accurate, what proportion of the total value of benefits currently vested is ratably assignable to the period of service prior to the date of this actuarial determination?

Under the "termination liability" concept, the plan would be obligated to provide a deferred annuity commencing at the normal retirement age to all

employees who have, as of the current valuation date, satisfied the age and service requirements for vested retirement benefits in an amount based upon the employee's service and earnings to date. It might be noted that this concept is somewhat at variance with the commonly assumed purpose of financial statements; i.e., to reflect the events occurring in a part of the lifetime of a continuing enterprise.

We apologize for misleading the reader, and we appreciate Mr. Sloat's correction.

In summary, we have questioned the virtue and necessity of annual actuarial valuations of pension plans. Our ultimate objective is not to reduce actuarial fees but to enlarge the consulting actuary's importance to his client. Pursuit of this goal will lead to greater prosperity, both commercial and professional.

We have submitted this paper for review and criticism by our professional peers for two reasons: First, we want to apply its principles to specific situations with the assurance that business judgment is not offending sound professional standards. Second, we hope other actuaries will re-examine their past practice and adopt our proposals, when circumstances are appropriate.

We see this paper as being illustrative of a much broader need. If we are to grow—as individuals and as a profession—we must continually broaden our scope. The image of the actuary must become more that of a management consultant with specialized financial and mathematical skills and less that of a technician immersed in complex algebra and complicated terminology. We hope that our paper has served this goal.