A PRACTICAL METHOD OF FORECASTING A LIFE INSURANCE COMPANY'S GROSS OPERATING EARNINGS FOR THE CURRENT YEAR

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TO COMMENCE this paper with the unqualified and vulnerable statement that management *must* have an intelligent estimate of the operating earnings for the current year well ahead of the year-end would indeed be presumptuous. Nevertheless, it is difficult to find fault with the logic of permitting such an estimate to form an integral phase of life company management. In support of this contention, a survey of United States and Canadian companies carried out a few years ago[1] indicated that most of them did some work in one way or another connected with this subject, even though not necessarily attempting as early an estimate of earnings as is advocated herein. There are, in particular, four principal areas of management where forecasts of future earning power made early in the current year, say in February or March, are of significant value:

(1) In planning desirable changes in the dividend scale in order both to guard the company's solvency and to preserve individual equity among policyholders.
(2) In planning and budgeting for agency expansion.
(3) In determining amounts that are likely to be available for appropriation to special reserves and for reserve strengthening.
(4) In using such preliminary estimates throughout the course of the year as a yardstick against which to measure the full impact on earnings of deviations in mortality, interest and expenses from what was initially considered to be the expected. For instance, it may become apparent three-quarters of the way through the year that the percentage ratio of actual to tabular mortality is running one or two points behind the average over the past few years which was used in the first estimate of earnings; or, because of an increased interest rate in the securities market, the expected gross rate of interest earned

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[1] "Interim Financial Statements of Life Insurance Companies in the United States," by C. O. Shepherd, and "Estimating Surplus," by R. C. Barnsley, *Transactions of the Thirteenth International Congress of Actuaries (1951)*, Vol. I, Sec. I (Analysis of Financial Results)—also containing other miscellaneous notes on the analysis and estimation of surplus.

may be one or two hundredths of a percent higher than appeared likely at the beginning of the year. What effect will these fluctuations have on earnings in dollars and cents at the end of the year? To obtain a clear picture at intervals throughout the year of the results of the interplay of all of these factors combined, it is an invaluable aid to have as a base a clearly defined estimate of the year's earnings under a set of predetermined conditions.

Apart from the above uses, the very act of estimation is, in itself, a form of budgeting and can be regarded as a target or objective for the current year, especially in so far as expenses are concerned. Furthermore, if the initial estimate is adjusted periodically throughout the year to reflect the actual experience as it unfolds, the final refined estimate made later in the year serves as a useful check on the accuracy of both the accounting procedures and the reserve calculations.

In spite of the apparent importance of surplus estimation, there is very little discussion of the subject recorded in the Society of Actuaries' publications, in the last few years at least. It is therefore the purpose of this paper to describe in broad outline a practical and reasonably accurate approach to forecasting a life insurance company's "Gross Operating Earnings" that will emerge in the annual statement[2] during the current year, by making use of the trends in the major sources of profit and loss as analyzed in the gain and loss exhibit. The phrase "Gross Operating Earnings" is meant to embrace the total earnings of a company from all sources before appropriations to special reserves and reserve strengthening, before payment of policyholders' or stockholders' dividends, and after all expenses including taxes, but excluding both realized and unrealized capital gains and losses. Although a figure for "Gross Operating Earnings" does not appear as such in the annual statement, nevertheless it can be obtained directly therefrom by examination of the revenue analysis of operations on page 4.

Gain and loss theory has been thoroughly analyzed by Mr. C. O. Shepherd in *RAIA* **XXXI** and is now well known. Regardless of its many limitations and fallacies when applied to large, nonhomogeneous blocks of business, the trends displayed by the various sources of profit and loss are relatively stable and, taken over a short period of time, say four or five years, form an excellent base from which to forecast the current year's earnings provided the company is sufficiently large to give reasonably stable averages.

Looking at the problem generally, there are four major sources of earn-

[2] Using the 1953 form of Convention Blank proposed by the National Association of Insurance Commissioners.

ings, or of return to surplus, to be analyzed for the previous year and estimated for the current year—mortality, loading, interest and surrender. There will, of course, be miscellaneous profits and losses from each year's transactions that will usually be nonrecurring. These are best shown separately. Table 1 is a revenue statement of earnings by source and indicates the method used in displaying the final results of the investigation. Subsidiary exhibits can also be prepared giving a more detailed analysis of certain of the individual sources of profit which may be of special interest to a particular company. Moreover, it is feasible to divide the whole of Table 1 by line of business, currency, participating and nonparticipating, if this is considered to be of value. However, as will be more fully appreciated later, there are practical limitations placed on the value of making too fine a division, resulting from the lack of accuracy of expense splits and the lack of sufficient volume to produce smooth trends.

Before embarking on a detailed description of the method used in forecasting earnings, it may be advantageous to the reader to stress the fact that throughout the paper an effort has been made to describe, simultaneously, for each source of profit, two different and yet very closely related aspects of the forecast. Firstly, the initial estimate, which is made early in the current year, is described in some detail. Secondly, the problems encountered in making an intermediate "follow-up" on such estimate later in the current year, say about the end of October, are dealt with more briefly. From some points of view, it might have been better to have left the considerations involved in following up the initial estimate entirely alone until the end of the paper, since it may result in a tendency towards confusion at times. However, it was felt that the advantages of tracing each source of profit, while all pertinent factors are under consideration, right through to the final stage, would far outweigh the disadvantages of leaving it for later consideration, especially since the possibility of confusion can be minimized by drawing this point to the reader's attention. Perhaps it should also be mentioned that the term "current year" will be used to denote the year for which the forecast is being made (1955 in the illustrations) and the term "previous year" will be applied to the final year for which an accurate analysis has been made (1954 in the illustrations).

Most of the material used in preparing the analysis of the previous year's actual experience, as shown in the first column of Table 1, is obtained with a minimum of labor either directly from Parts I and II of the gain and loss exhibit in the annual statement or from the basic statistical records used in the preparation thereof. There are, however, a few possible

TABLE 1

GROSS OPERATING EARNINGS
(Ordinary and Group combined)

	(1) 1954 Actual		(2) 1955 Estimate	
Mortality and Disability				
Tabular Cost..................	$12,239,262		$13,000,000	
Actual losses.................	6,107,354		6,700,000	
Mortality gain on assurances....	$ 6,131,908		$ 6,300,000	
Mortality gain on Double Indemnity......................	80,161		50,000	
(a) Total mortality gains.....	....	$ 6,212,069	....	$ 6,350,000
(b) Mortality profit on annuities......................	....	−69,854	....	−50,000
(c) Gain on total disability...	....	33,787	....	25,000
Expenses				
First year Gross Premiums......	$ 9,101,254		$10,105,000	
First year Net Premiums.......	8,095,765		9,088,000	
First year Premium Loading.....	$ 1,005,489		$ 1,017,000	
New Business Expenses.... ...	5,994,272		6,517,000	
(d) Investment in New Business	....	−4,988,783	....	−5,500,000
(e) New Business Expenses recovered from terminated policies.................	....	949,906	....	1,000,000
Renewal Gross Premiums.......	$37,695,402		$41,370,000	
Renewal Net Premiums........	31,188,237		34,181,000	
Renewal Premium Loading......	$ 6,507,165		$ 7,189,000	
Maintenance Expenses.........	4,531,238		4,892,000	
(f) Gain on Renewals........	....	1,975,927	....	2,297,000
Interest				
Interest Dividends and Rents...	$18,186,777		$20,107,000	
Less Investment Expenses......	1,407,122		1,695,000	
Net Investment Earnings.......	$16,779,655		$18,412,000	
Interest Required..............	11,777,590		12,300,000	
(g) Gain from Interest.......	....	5,002,065	....	6,112,000
Other Sources				
(h) Unallocated and Miscellaneous.................	....	22,437	....	50,000
Gross Operating Earnings.	....	$ 9,137,554	....	$10,284,000
(i) Net Profit and Loss Account	....	281,367		
		$ 9,418,921		

exceptions, some of which will arise as a result of individual company methods of preparing the annual statement:

(1) A complete division of net premiums by new annual, single, and renewal may not always be readily available.

(2) Investment expenses given in the gain and loss exhibit may not be considered sufficiently realistic to give consistent results from year to year.

(3) Division of expenses between acquisition and renewal is not necessary for the gain and loss exhibit. This will be dealt with more fully when describing the method of forecasting earnings.

Investment transactions which are of such a nature that they would disturb the uniform progression of interest profits if included therein, are segregated and shown separately in the "Net Profit and Loss Account." In the writer's company this account includes both realized and unrealized net capital gains as well as currency profits and other miscellaneous items. Although such items are removed from the analysis, they must nevertheless be recognized if a balance with statement earnings is to be achieved. Since management policy towards investment reserve appropriations is closely geared to the actual size of the net profit and loss account at the year-end, it has not been considered necessary up to the present time to attempt to estimate it during the early part of the year. However, a continuous record is available showing the net position of its major components, for use near the year-end as an indication of its final magnitude. Nonrecurring profits and losses in connection with the analysis of increase in reserves, accounting procedures and expenses, are also shown in a separate account, "Unallocated and Miscellaneous Gains." Some of the latter that will affect the earnings will be known even in the early part of the current year and are therefore included in the preliminary forecast as well (Col. (2) of Table 1).

The above description is perhaps an unduly brief indication of the actual labor involved in producing the analysis of previous year's earnings, if for no other reason than the difficulty of allocating expenses in a reasonable and consistent manner. By omitting further details it is not intended to give the impression that no effort is required to rearrange the statistics as in the first column of Table 1, but rather it is assumed that anyone seriously interested in arriving at such a result can devise a method of doing so from basic government statement records kept by his company. The total earnings must be balanced with the statement earnings to ensure that the work is accurate and that all items have been accounted for.

As regards forecasting the current year's profit, it is the intention to deal with this aspect of the problem in sufficient detail to suggest at least one method of estimating each of the major sources of profit as given in Table 1. The merit in estimating such profits directly, rather than attempting to forecast the assets and liabilities independently and subsequently determining surplus as the difference, lies in the fact that, by so doing, the larger sources of error are substantially reduced. This point will be more evident as each phase of the estimate is dealt with.

Perhaps the most important requirement in making such an estimate with reasonable accuracy is to use an integrated approach to the problem—that is, an approach closely correlating estimates of new business with acquisition costs and new premium income, and likewise correlating estimates of earned interest with estimates of required interest, not to mention that new business must also be used in forecasting mortality profit and that the available renewal loading must be related to estimated renewal expenses. Indeed, this is the pivotal point of the whole procedure, for, as long as all of these factors are closely tied together, modest variations in forecasts of the individual factors, such as volume of new business, premium income or expenses, will not have an undue effect on the final result.

Assuming that a realistic new business target by lines of business has been set up by the agency department after a careful appraisal of the business outlook for the current year, considering the company's expansion program, if any, general economic conditions, and the company's competitive position, it is then possible to proceed with the particular phases of the forecast arising from it. The results of these are later combined with the very much larger portion of the forecast which is derived from business already on the books. The precise method used in a particular case would, of course, depend on the actual data that might happen to be available in the company or that could be obtained by a reorientation of basic statistics.

MORTALITY GAIN ON ASSURANCES

Estimate of Tabular Cost[3]

The stability of the pattern formed by the average tabular cost per $1,000 of business in force, when analyzed in suitable subdivisions, may be somewhat surprising to anyone who has not actually observed it over a period of years. Although there are several forces attracting it in opposite directions, the outcome is usually a smooth curve which can be projected

[3] Tabular Cost is used throughout the paper with reference to reserve basis and is assumed to be "ultimate."

with considerable accuracy. There are, of course, years in which a new major force is introduced, such as occurred in 1948 when most companies started using the CSO tables for valuation of new business. In years such as these or shortly thereafter, trends may be altered, but by anticipating the effect of such changes, either by judgment or by statistical tests, projections can be kept from getting too far out of line.

The illustrations in Tables 2 to 7 inclusive are given in order to demonstrate four points:

(1) The degree of accuracy that may be expected in projections of tabular cost.
(2) The subdivisions of business that are necessary to give a sufficient degree of consistency in trends to make them suitable for projection.
(3) The types of summaries that are kept from year to year to facilitate projection.
(4) The method of projecting tabular cost per $1,000 within each subdivision of business in force.

Not all companies calculate tabular costs directly from reserves and sums assured in the various divisions in which they are quoted herein (business in force January 1st, cancellations, new business, paid-up additions, etc.). However, most of them could obtain such divisions without a great deal of additional labor either from reserve checking procedures or from calculations of dividends or dividend liability items. Failing this, they can be derived by use of the appropriate reserves, net premiums and interest rates in the gain and loss equation. (See Section B in Mr. C. O. Shepherd's paper, *RAIA* XXXI, 431, for the gain and loss equation broken down into its component parts of persisting, new and canceled business.)

The interesting feature of the illustration in Table 2 is the regularity in the change between columns (3) and (4) in moving from the tabular cost for the year ending December 31st to that of the year commencing December 31st on the same business in force. Similar regularity is not apparent in column (3) for successive calendar years for the obvious reason that the averages do not apply to the same block of business. It is possible in most years to project the tabular cost per $1,000 on the business in force as of January 1st to within a cent using this method. Since the tabular cost on such business forms the bulk of the total estimate for ordinary assurances, this is one place where accuracy is essential.

In addition to the major sections of business illustrated in Tables 2 to 7, estimates of tabular cost are required for miscellaneous items such as substandard business and group conversions. Summarizing the individual

TABLE 2

ESTIMATE OF TABULAR COST ON ORDINARY ASSURANCES IN FORCE JANUARY 1ST OF THE CURRENT YEAR

Year	One Year's Tabular Cost on Business in Force Dec. 31 for Year Ending Dec. 31	Sum Assured in Force Dec. 31	Tabular Cost per M on Business in Force Dec. 31 for Year *Ending* Dec. 31 (1)÷(2)	Tabular Cost per M on Business in Col. (2) for One Year *Commencing* Dec. 31
	(1)	(2)	(3)	(4)
1951.......	$7,025,000	$ 958,355,000	$7.33	$7.45
1952.......	7,375,000	1,026,488,000	7.18	7.31
1953.......	7,823,210	1,103,438,000	7.09	7.24
1954.......	8,257,450	1,195,000,000	6.91	7.07*

* Estimated. On business in force 1/1/55 estimated tabular cost for current year is $7.07×1,195,000 = $8,448,650.

TABLE 3

ESTIMATE OF TABULAR COST ON NEW BUSINESS (ORDINARY ASSURANCES) FOR CURRENT YEAR

Year	Ordinary New Sum Assured in Force Dec. 31	Tabular Cost Calculated for (1) for Year Ending Dec. 31	Tabular Cost per M per Half-Year for Year Ending Dec. 31 (2)÷(1)
	(1)	(2)	(3)
1952...........	$ 91,865,000	$258,000	$2.81
1953...........	105,153,000	297,000	2.82
1954...........	123,864,000	373,000	3.01
1955...........	145,000,000	435,000	3.00*

* Estimated.

TABLE 4

ESTIMATE OF TABULAR COST ON CANCELLATIONS (ORDINARY ASSURANCES) FOR CURRENT YEAR

Year	Sum Assured Canceled in Year Ending Dec. 31	Endowments Matured in Year Ending Dec. 31	Sum Assured Canceled less Endowments Matured (1)−(2)	Tabular Cost Calculated for (3) for Year Ending Dec. 31	Tabular Cost per M for Year Ending Dec. 31 (4)÷(3)
	(1)	(2)	(3)	(4)	(5)
1952....	$44,897,000	$3,005,000	$41,892,000	$185,339	$4.42
1953....	46,564,000	2,928,000	43,636,000	194,180	4.45
1954....	48,614,000	2,641,000	45,973,000	209,637	4.56
1955....	51,000,000	2,800,000	48,200,000	224,130	4.65*

* Estimated.

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TABLE 5

ESTIMATE OF TABULAR COST ON PAID-UP ADDITIONS FOR CURRENT YEAR

Year	Amount of Paid-up Additions in Force Dec. 31	Tabular Cost Calculated for Year Ending Dec. 31	Tabular Cost per M for Year Ending Dec. 31 (2)÷(1)
	(1)	(2)	(3)
1952.......	$21,779,000	$155,460	$7.14
1953.......	22,428,000	156,296	6.97
1954.......	23,389,000	162,554	6.95
1955.......	24,600,000	170,232	6.92*

* Estimated.

TABLE 6

ESTIMATE OF TABULAR COST ON DOUBLE INDEMNITY FOR CURRENT YEAR

Year	D.I. Sum Assured in Force Jan. 1	Tabular Cost Calculated for Year Commencing Jan. 1	Tabular Cost per M for Year Commencing Jan. 1 (2)÷(1)
	(1)	(2)	(3)
1952.......	$111,206,000	$114,445	$1.029
1953.......	117,300,000	121,246	1.033
1954.......	125,000,000	129,545	1.036
1955.......	134,000,000	139,360	1.040*

* Estimated.

TABLE 7

ESTIMATE OF TABULAR COST ON GROUP INSURANCE FOR CURRENT YEAR

Sum assured in force Jan. 1..................	$372,000,000
Increase prior year.........................	70,000,000
Estimated increase current year.............	90,000,000
Estimated sum assured in force next Jan. 1...	462,000,000
Average sum assured in force 1955..........	417,000,000
Average tabular cost per M in force Dec. 31, 1954..................................	9.93
Estimated average tabular cost for 1955......	10.00*
Estimated tabular cost ($10.00 × 417,000) ...	4,170,000

* Obtained by projection of the average tabular costs per M over the past four or five years.

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estimates shown here gives a total estimated tabular cost of $13,000,000 for the current year, apart from double indemnity which is a further $139,000 (figures taken to nearest thousand).

Estimate of Actual Losses (death benefits less reserves) on Ordinary Assurances

In choosing the estimated ratio of actual to tabular cost for the preliminary forecast of the current year, it is useful to examine two factors: (1) the trend over past years, (2) the average experience over a period of years. In many instances, trends are obscured by chance fluctuations, and it is necessary to rely on a simple average. Any such average should not, of course, be taken over too long a period of time, as it is affected by changes in distribution of business by plan, age at issue, duration and reserve basis. Probably the last four or five years is a reasonable period with which to work.

Having the estimated ratio of actual to tabular cost, it is a simple matter to apply it to the estimated tabular cost itself, giving the estimated actual losses. Ratios for group insurance, ordinary insurance, and double indemnity are projected separately. The combined weighted ratio used in the illustration is 51.5 percent.

A record is kept of the experienced mortality losses throughout the course of the year. By comparing such experienced losses with the prorated estimate of actual losses used in the preliminary forecast, a continuous summary is made available for demonstrating the financial effect of abnormal fluctuations up to any given time. Furthermore, in making the intermediate estimate of mortality gains from assurances for the full year, the above experienced losses for the fractional year are substituted for the prorated estimate of actual losses and an attempt is made to estimate the actual losses for the balance of the year, noting that mortality is normally somewhat heavier in the closing months. Still further improvement is made over the initial estimate by substituting the calculated tabular cost on the business in force on January 1st for the preliminary estimate of such cost, and by adjusting the estimated tabular cost on new and canceled business to allow for indicated variations therein.

MORTALITY PROFIT ON ANNUITIES AND GAIN ON TOTAL DISABILITY

In many companies the amount of annuity and disability business is quite small and would have only a minor effect on total profits. If this is the case, it is sufficiently accurate to estimate the profit from these sources in bulk, relying on trends over a period of a few years. A further subdivision can be made by "Ordinary" and "Group" if warranted by reason of volume. On the other hand, if the profits and losses from annuitant

mortality and disability claims are relatively large, more elaborate methods similar to those employed in the insurance mortality estimates would have to be used in order to preserve reasonable accuracy in the final result.

Mortality profit from annuities is, like that from assurances, subject to a more accurate reassessment later in the current year by comparing tabular reserves released with the actual reserves released up to that time. The profit or loss for the remainder of the year is obtained by projecting the experience to date on a pro-rata basis, with due allowance for the normally heavier mortality in the closing months of the calendar year as was mentioned under the section dealing with assurances.

Disability profit is also reassessed later in the year by considering each term separately in the gain and loss formula with the in-force, new, and canceled reserves listed separately. By the time the intermediate estimate is made, the reserves on the business in force on January 1st are known, and the full year's net premiums and interest are filled in by merely following trends as indicated by the corresponding items of prior years, thus leaving the full year's new and canceled to be estimated from the experienced new and canceled of the first part of the year.

Although a follow-up on annuitant mortality profit and disability claim profit during the year is, like mortality profit, subject to the objection of chance fluctuation for the remainder of the year, nevertheless it has the merit of recognizing the facts as they actually exist up to that time.

<div align="center">ESTIMATES OF PREMIUM INCOME AND LOADINGS</div>

In making estimates of premium income, the method outlined below uses cash premiums, even though the final statement is on a revenue basis. This necessitates a separate estimate of outstanding and deferred premiums, as will be seen later.

New Business

It was mentioned earlier that the agency department, in setting the new business objective, subdivides its estimate by line of business (*i.e.*, by Ordinary and Group, Assurances and Annuities). Using the previous year's ratios, a further subdivision is made into single and annual premium business, and participating and nonparticipating. By keeping running summaries of previous years' cash premium incomes within each of these divisions and corresponding ratios of average premium per $1,000, projected ratios are calculated and applied to the amount of new business to give estimated new cash premium income for the current year.

Projections of new business ratios of premium income per $1,000 of assurance cannot be made from statistical trends alone. There are a num-

ber of factors which may accelerate or perhaps even reverse the trends displayed in previous years and which can only be based on judgment. For instance, some account has to be taken of recent changes or anticipated changes in the level of premium rates, not to mention that such changes may herald a shift in the proportion of business by line. Then again, with rapidly increasing new business, allowance has to be made for the effect of lag in the prior year's fractional premium on the averages produced from it. Remembering that *cash* premiums are used, the averages will tend to be lower on this account. To mention just one other point, it may not be convenient to exclude family income riders from the sums assured and premiums. The resulting lack of homogeneity, combined with fluctuations in the volume of family income business, may very well produce spurious results which will require correction.

Renewal Premiums

In estimating the renewal premiums, it is possible once again to lean more heavily on statistics, since they depend on more or less known factors and hence can be projected with a greater degree of accuracy. The projection formula used below, in which R^{1954} denotes cash renewal premiums received in the calendar year 1954 and N^{1954} denotes new cash premiums received in the calendar year 1954, makes the arbitrary assumption that ninety percent of new cash premiums received in the year will be received as renewal premiums in the following year:

$$K^{1954}R^{1954} + .9N^{1954} = R^{1955} .$$

On solving this equation for K for a few successive years, it will be found that the results follow a fairly uniform pattern for ordinary assurances. The degree of consistency displayed by the following series of K's is typical:

$$K^{1951} = .9415$$
$$K^{1952} = .9430 \qquad K^{1954} \text{ (projected)} = .9493$$
$$K^{1953} = .9470$$

It is more difficult to apply a formula of this nature to group renewal premiums because of fluctuations in the increases and decreases of coverage in existing groups. However, the effect on loading surplus of an error in group insurance premium estimates arising from a given fluctuation in volume is not as great as the effect of an error of similar magnitude in the ordinary department, since the margins in group premiums are proportionately smaller. It should not be inferred from this that the accuracy of the estimate of total surplus attributable to group insurance is necessarily greater than the accuracy of the estimate of total surplus arising

from ordinary insurances, as a substantial part of the effect of fluctuations in volume is reflected in the estimate of group tabular cost.

Table 8 illustrates the form of cash premium record that is kept from year to year.

TABLE 8

ESTIMATE OF CASH PREMIUM INCOME FOR THE CURRENT YEAR

YEAR	ORDINARY ASSURANCE			ORDINARY ANNUITY			
	New Single	New Annual	Renewal	Participating Single	Nonparticipating Single	New Annual	Renewal
1953...	$101,000	$3,222,654	$25,799,801	$424,264	$ 932,106	$552,354	$3,175,977
1954...	106,033	3,595,017	27,502,333	402,998	2,010,204	462,766	3,339,450
1955*..	110,000	3,900,000	29,400,000	500,000	2,290,000	560,000	3,600,000

* Estimated.

TABLE 8—*Continued*

YEAR	GROUP INSURANCE		GROUP ANNUITY		DISABILITY AND D.I.	
	New	Renewal	New	Renewal	New	Renewal
1953.....	$402,205	$2,106,109	$395,910	$2,715,028	$29,901	$248,357
1954.....	424,474	2,651,702	477,896	3,428,765	32,407	281,844
1955*....	500,000	3,100,000	550,000	4,200,000	35,000	310,000

*Estimated.

Loadings on New and Renewal Premiums

Corresponding to the summaries for previous years' cash premiums, similar accounts are kept of loadings on cash premiums derived from basic gain and loss calculations. By projecting the loading ratios and applying them to estimated premium income, an estimate of the loadings available on the current year's premium income is obtained. Just as in making projections of average premiums per $1,000, judgment must also be used in making projections of loading ratios to allow for known changes in rates and reserves. The final summary of premiums and loadings is conveniently displayed as in Table 9. It should be noted that it is not necessary to make an estimate of the loading available from the outstanding and deferred premiums, since cost of collection is not included in expenses. These two items are therefore considered to be offsetting, and hence the accuracy of the estimate of outstanding and deferred premiums has negligible effect on the accuracy of the forecast of surplus. It would be

equally possible to work throughout with revenue premiums, provided internal records are available in a convenient form for doing so. Trends could then be followed with greater precision, but final accuracy would not be improved, as it would be necessary to estimate the outstanding and deferred loadings and make a deduction therefor.

In making the intermediate estimate later in the current year, premium income is first adjusted to allow both for actual renewal receipts up to that time and for deviations in new business from the amount anticipated

TABLE 9

TOTAL PREMIUM AND LOADING ESTIMATES FOR CURRENT YEAR

	PREMIUMS		LOADINGS	
	New	Renewal	New	Renewal
Single: Cash..................	$ 2,900,000	....	$ 165,000	....
Dividend paid-up additions................	1,600,000	....	....	....
Annual: Ord. Assurance.......	3,900,000	$29,400,000	640,000	$5,600,000
Ord. Annuity.........	560,000	3,600,000	70,000	400,000
Group Assurances.....	500,000	3,100,000	89,000	900,000
Group Annuity.......	550,000	4,200,000	45,000	220,000
Disability and D.I.....	35,000	310,000	7,900	69,000
	$10,045,000	$40,610,000		
Outstanding and deferred 1954..	940,000	8,640,000	....	....
	$ 9,105,000	$31,970,000		
Outstanding and deferred 1955*.	1,000,000	9,400,000	....	....
Totals..................	$10,105,000	$41,370,000	$1,016,900	$7,189,000

* Estimated.

in the preliminary estimate. Both group insurance and group annuities are particularly fertile sources of improvement, since changes in coverage under existing groups will either be completed or under consideration, as will new group coverages. Loading ratios used in the preliminary estimates are then applied to the adjusted estimates of premium income.

EXPENSES

There are two separate and quite distinct steps required in order to arrive at the expense figures which appear in column (2) of Table 1. Firstly, there is the problem of preparing a forecast of the current year's expenditures; secondly, such forecast of total expenses for the current year must be divided by new, renewal and investment, together with a

further division by line, if it is desired to present the forecast in this way. The division of the previous year's actual expenses shown in column (1) is, of course, required as well. Expense analysis and budgeting are complete subjects in themselves and have already been thoroughly discussed in a number of works. It is not, therefore, the intention to do more than introduce the major phases of these subjects in so far as they are related to surplus estimates, and to the extent it is considered an aid to the reader as a basis for visualizing the framework of the over-all problem. For reference purposes, a very complete analysis of budgeting is presented by Mr. E. C. Wightman in his book "Budgetary Control in Life Insurance Management."

The method which is used by the writer's company in preparing estimates of future expenses and which has given good results is to send out to each officer in charge of a division of the company a request for estimates of the expenses which fall under his control. The request takes the form of an interdepartmental memorandum on which is indicated the information required. As a guide, the amounts of the expenses for the previous two years are quoted.

Since salaries normally constitute more than half of the total office and overhead expenses, special consideration is given to this account. A list is provided for each section manager within each department, giving individual employee salaries. By estimating the anniversary increase in salary for each clerk, the section manager makes a projection to reflect its effect on the current calendar year's salary payments. Adjustments are necessary to allow for anticipated turnover and increase in staff. In this way, the current year's salary costs are calculated fairly accurately.

Estimates of inspection and medical fees are prepared directly from the estimates of new business made by the agency department, taking into consideration the probable rates for the current year.

Rents are estimated by a method somewhat analogous to that used for salaries. The branch administration officer reviews the leases of each branch with special attention to termination clauses requiring relocation, and to new branches likely to be opened during the current year. Home office rent charges are also carefully reviewed, with special consideration being given to any plans that may exist for expansion.

Advertising costs are more or less a matter of policy and are therefore estimated readily once the policy for the immediate future has been determined.

Many of the miscellaneous expense items, such as postage, telegrams and exchange, are very satisfactorily projected by simply following

trends of previous years with allowance for any available information concerning changes in practice. To keep the estimates on a revenue basis, it is also necessary to forecast the increase in outstanding expenses (with the exception of the cost of collection, for the reason previously mentioned).

Agents' commissions are a major item, and are estimated by keeping records of the ratios of cash commissions to cash premiums for prior years and projecting the ratios for application to estimated cash premium income in Table 8, thus producing an automatic division by new and renewal. Premium taxes are similarily projected for new and renewal life insurance premiums. Advances to agents are estimated by the agency department with allowance for any contemplated changes in practice or in the method of new agent financing.

Apart from their usage in an estimate of operating earnings, the value in having such a forecast of expenses is obvious, since it permits periodic comparisons during the year between the actual expenses and the pro-rated budget. These comparisons are used to trace the reasons for certain accounts getting out of line, and corrective action is taken wherever indicated.

The second step concerns the division of expenses estimated above (except commissions, advances, and premium taxes which are already divided) by new, renewal, and investment as required for the presentation suggested by Table 1. A functional cost analysis is an aid to greater consistency, but is not essential in dividing expenses for use in forecasting earnings. The actual accuracy of the expense splits is of no concern in this regard, since the absolute division of earnings by source is itself largely meaningless, for reasons already well appreciated. The method used should, however, give consistent results, at least over short periods of time, so that trends will not be obscured in the three categories by which we require them to be divided.

As a matter of interest to companies using detailed cost accounting methods, the various expense accounts estimated as above are, for the writer's company, divided by using its functional costs along the following lines:

The actual expenses used in the latest functional analysis are set out by ledger account (salaries, rents, etc.), and these are further divided by cost centers (departments, units and individuals). The differences between the budget (or forecast), which is also divided by cost centers at the time of its preparation, and the recently analyzed expenses, are next assigned to functional categories (acquisition, selection, premium collection, etc.) using the latest available distribution ratios for the various cost centers involved. The resulting

functional categories for the *differences* are then grouped and combined into proper divisions for the earnings statement for final addition directly to the corresponding divisions (new, renewal, investment) for the former period (*i.e.*, for the most recent period for which a functional analysis is available) to produce the proper arrangement of the budget for the current year. Finally, estimated commissions, advances, and premium taxes are added to the divisions so obtained.

The intermediate follow-up on expenses consists of a comparison of actual expenses to date with the prorated budget, combined with a new forecast for the balance of the current year, with the proviso that all expenses related to premium income, such as commissions, premium taxes and advances, be recalculated directly from the revised estimates of premium income.

NEW BUSINESS EXPENSES RECOVERED ON TERMINATIONS (RETURN TO SURPLUS FROM SURRENDERS AND LAPSES)

Over the last decade, the trend of the differences between terminal reserves released on terminations other than deaths and cash values paid has undoubtedly followed a very stable pattern for most companies of at least moderate size. Under economic conditions such as we have just experienced, it is therefore sufficiently accurate to project the total of these differences for all lines of business combined. A somewhat more accurate method is to deal with each line of business separately. Ordinary insurances normally form the larger part of earnings from terminations and can be handled by projecting the ratio of earnings per $1,000 of canceled business excluding endowments matured, and applying such ratio to the estimated volume of cancellations. Proper weight is then given to any changes in each line resulting from current economic trends. Judgment must again be exercised in projecting trends, since changes in the relative levels of cash values and reserves will alter the expected profits apart from considerations of volume.

Later in the year, corrections are made to the preliminary estimates by considering the experienced volume of insurance and annuity cancellations to date.

GAIN FROM INTEREST

The importance of tying together all phases of the estimate has already been stressed. The calculation of interest surplus for the current year is an excellent example of the necessity of following this principle. It is carried out in two steps: firstly, by estimating the increase in ledger assets along with a full year's gross interest earnings, and secondly, by estimating a related increase in interest-bearing liabilities (based on the

increase in ledger assets), together with the required interest on the resultant average interest-bearing liabilities.

Estimation of the increase in ledger assets and gross interest earnings is a complex problem, and the details of the method best suited to any particular company's needs would vary with the circumstances. In principle, the approach used herein takes the following form:

(1) By analyzing each category of investment (securities, policy loans, real estate, etc.) according to the effective rate of return on individual accounts, the actual annual earning power for the current year is accurately determined for the ledger assets as at December 31st of the previous year.

(2) Quite apart from (1), by following the pattern of the increase in total assets over a period of years with proper allowance for the effect of a general increase in the level of new business in the *previous* year (noting that current year's new business contributes little to assets), a projection is made to show the expected increase in total assets for the current year. The total increase in ledger assets is then allocated among the various categories of assets, for each of which a monthly pattern of increase is developed from the experience over the past ten years or so, for use in determining the mean ledger assets.

(3) Basic assumptions are made as to probable rates of interest earned on new investments in each category of the portfolio and the contribution to interest earnings by (2) is calculated therefrom.

(4) Corrections and adjustments are required for such items as
   a) effect on interest income of the current year's trading program (under very broad assumptions),
   b) effect of immediate investment of cash in hand at the previous year-end,
   c) general shifts expected in the portfolio of investments.

(5) The sum of (1) and (3) with miscellaneous adjustments as in (4) constitutes the estimate of gross interest earned for the current year.

There is, of course, an element of successive approximation in carrying out the above procedures, since the increase in ledger assets depends on the interest earned and vice versa.

Calculations are made throughout the current year to compare the estimated interest income to date with the actual, so that management can immediately appreciate the financial effect of deviations from the original assumptions. After about six months, the year's pattern is fairly well established as regards both shifts in assets and interest income, and the corrections applied to the latter half of the year's estimate greatly improve the accuracy of forecast.

With a forecast of assets available, the estimate of required interest follows quite naturally. After projecting surplus and special reserves, as shown in Table 11, the interest-bearing liabilities are obtained as the difference between these and assets (Table 10). It will be noted that non-ledger assets form a deduction from Table 11, since ledger assets are used as the starting point rather than total assets. Furthermore, non-interest-bearing liabilities, such as the reserve for unreported claims, are treated in a manner similar to unassigned surplus in that interest earned thereon is available in full to increase earnings. It might appear that there would be considerable error in forecasting surplus and special re-

TABLE 10

ESTIMATE OF REQUIRED INTEREST FOR CURRENT YEAR

Dec. 31	Ledger Assets (after appropriations) (1)	Surplus and Special Reserves (see below) (2)	Interest-Bearing Liabilities (1)−(2) (3)	Mean Interest-Bearing Liabilities (4)	Required Interest (5)	Ratio (6)
1952...	$400,030,000	$25,000,000	$375,030,000	....	....	......
1953...	415,105,000	27,245,000	387,860,000	$381,445,000	$11,306,000	2.964%
1954...	432,280,000	27,570,000	404,710,000	396,285,000	11,777,590	2.972
1955*..	450,300,000†	28,700,000	421,600,000	413,155,000	12,300,000	2.977

* Estimated.

† Projection is made assuming no investment appropriations or "write-downs" in current year. The further assumption is inherent both here and elsewhere that company policy pertaining to such investment appropriations and "write-downs" will be closely related to the capital gains and losses occurring in the current year. If this is the case, profits on sale, for example, affect neither earnings nor assets, since such profit is canceled by writing down other assets a corresponding amount.

TABLE 11

ESTIMATE OF SURPLUS AND SPECIAL RESERVES FOR CURRENT YEAR

	1953	1954	Estimated 1955
Unassigned Surplus..	$17,000,000	$18,000,000	$19,000,000
Provision for Dividends..............	9,020,000	9,480,000	10,000,000
Contingency Reserve................	6,000,000	6,000,000	6,000,000
Group Contingency Reserve..........	1,700,000	2,000,000	2,400,000
Reserve for future expenses...........	586,000	645,000	700,000
Unreported Claims..................	700,000	725,000	750,000
Contingent Liability for Reassurance..	45,000	45,000	45,000
Suspense...........................	1,742,000	1,698,000	1,800,000
Reserve for Settlement Options.......	500,000	550,000	600,000
	$37,293,000	$39,143,000	$41,295,000
Nonledger Assets...................	10,048,000	11,573,000	12,595,000
	$27,245,000	$27,570,000	$28,700,000

serves, but in practice some of the larger items are determined as a matter of policy, and the remainder usually follow a fairly uniform pattern. Required interest is then calculated by applying the projected average interest rate to the mean interest-bearing liabilities. If the experience trend of average interest is not considered smooth enough for projection in total, it is not a difficult matter to allocate previous year's interest-bearing liabilities and those of the current year into divisions by interest rate, thus permitting more accurate estimates of required interest under each valuation interest rate. The estimate of required interest likewise hinges on successive approximation, in that surplus accounts are used before they are estimated. However, the effect on earnings arising from the first "guess" of the size of surplus accounts is not large, being only the amount of the *required interest* on any error in surplus and not an amount equal to the error in surplus itself, as would be the case if the estimate of current year's earnings were based on a comparison of assets and liabilities. Furthermore, in normal years, judgment as to amounts of appropriations is substantially correct unless the total forecast of earnings proves otherwise, in which event a correction is applied by making a second approximation.

The only adjustment made to required interest in the intermediate estimate is that arising out of the change in the forecast of assets and special reserves.

MISCELLANEOUS PROFITS AND LOSSES

No generalizations can be made as to items to be included in the miscellaneous section except to say that all nonrecurring profits and losses (other than from investment transactions) which would distort normal patterns are transferred from the sources of profit which they would otherwise affect, to a special section. Not only will the quantities that should properly be classified as "miscellaneous" vary from one company to another, but they will vary also from year to year within the same company. In one case it may be an error in reserves or elsewhere that was discovered too late to correct before the previous year-end. In another, it may be a release of reserves resulting from a reinsurer becoming licensed in a state in which the company transacts business and in which it can lawfully take credit for reserves of licensed reinsurers only. Or then again, it may be a major nonrecurring expense item that should be shown separately.

The majority of the nonrecurring transactions will usually be known by the time of the "follow-up" on the initial estimate.

CONCLUSION

It is quite true that some phases of the procedure outlined in the foregoing lean heavily towards judgment rather than depend on statistical analysis. But no apology is needed for this. The same comment applies with equal weight to many other phases of the actuary's work. Moreover, the theoretical structure of the method is sound, and it is only within the confines of this structure that judgment must be exercised.

However, one might ask the question: "Why not estimate the total earnings from all sources in one stroke, using only judgment?" For instance, the reasoning might run along these lines: "There will be only a slight increase in new business in the current year, together with an improvement of about 20 hundredths of a percent in the earned interest rate, and no major changes in rates and dividends; therefore, earnings will likely increase from $9,138,000 to $10,300,000." The statistical fallacy in this type of reasoning is obvious, for by breaking the problem down into segments, and applying one's best techniques and judgment to each such part, the final total estimate should, from the point of view of "most probable" earnings, be more accurate, since errors in the individual estimates tend to be offsetting.

There is one further important question, and that is: "What degree of accuracy might be expected from an estimate carried out along the foregoing lines?" It is difficult to give any precise criterion of accuracy. The limits will depend not only on the size of the company, but also on the detail with which the estimate is made and the degree of expense analysis that is available. Moreover, the individuals making the forecast must have an intimate knowledge of all phases of the transactions of the company's business. For the writer's company, which is approaching two billions of business in force, it has been reasonable to expect that a preliminary estimate of gross operating earnings carried out in February would be within 5% under normal circumstances. However, the most important consideration regarding accuracy is this: that by eliminating the effect of fluctuations in the variables which can be followed readily throughout the year—mortality, volume of new business, interest and, for reasons previously explained, realized and unrealized capital gains and losses—the accuracy of forecast is brought to within 2% (assuming, of course, that there are no unusually large nonrecurring profits or losses). The logic in omitting these factors in assessing accuracy lies in the fact that a constant check can be kept on their progress throughout the course of the year.

The fundamental considerations involved in producing early forecasts of surplus are conveniently summarized in two parts:

(1) Using the preliminary estimate as a control, management can be kept fully sensitive to the financial effect of abnormal fluctuations and changing trends in mortality, interest and expenses.

(2) Knowing the amount of earnings that will arise under one set of assumptions, it is possible to demonstrate the effect of any given variation in assumptions. It would not, for example, be difficult to calculate the cost of increasing the new business target by 50% in terms of earning power. An appreciation of the effect of such an increase on earnings might be of vital importance to a company during periods when new business is increasing rapidly.

In fact, these constitute the strongest arguments in justification of the effort required to explore a company's prospective surplus earnings.

It was not intended to imply that the tabular costs and reserves released, which have been used freely throughout this paper, would be automatically available in all companies. However, no useful purpose would be served by attempting to describe methods of calculating them, since the material available, and hence the details of calculation, would vary considerably from one company to another. It might also be mentioned that, within the framework of the principles outlined above, there is no limit to the amount of refinement with which such an estimate can be carried out. The amount of detail required for good results and justified by the labor involved is a factor to be determined only after lengthy acquaintance with the problems facing the company making the forecast.