

## ACTUARIAL CONSIDERATIONS IN COST ANALYSIS

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### I. INTRODUCTION

**A**CTUARIES have always had a strong interest in analysis of life insurance costs, most particularly in connection with determination of the price for insurance (*i.e.*, premiums and dividends) and allocation of such costs for annual statement purposes.

In recent years there has developed increased emphasis in two other areas of cost analysis, one dealing with control of expenses generally and the other with insurance problems involving the broader aspects of company policy and practices.

These insurance problems include such questions as when and under what circumstances a branch of the business—or, for that matter, a particular plan of insurance—may be considered to be “profitable” or to contribute to surplus. At another, and closely related, level are such problems as how to examine the cost of a particular office procedure or company practice in terms of the advantages to be derived from it. Such analyses are necessarily based on over-all company cost analysis; in fact it should be the objective of cost analysis to furnish the information needed for cost control and policy determination.

These broader considerations contain, therefore, to a greater or lesser extent, virtually all cost problems encountered in the insurance organization. Such problems may be summarized rather generally as follows:

- i) Allocation of costs to different lines of business of which a special case is entry of a company into a new line of business.
- ii) Use of cost analysis to help determine how profitable a line of insurance (or plan of insurance) may be or whether to adopt, continue, or change a practice, procedure or plan of insurance. This suggests:
- iii) Examination of the kind of analysis that can most effectively both measure the cost and evaluate the efficiency of life insurance operations. This leads to:
- iv) Some consideration of types of company operations and of improving them so as to reduce or limit expenses.
- v) Relation of the effective measures mentioned in (iii) to unit cost and work unit measures, particularly as work volume increases or decreases.
- vi) Adaptation of results of analysis used for cost control to give unit costs necessary in determining premiums and dividends. (This reverses the order frequently followed, of using unit costs to control expenses.)

This paper attempts to place these problems in a logical framework so as to indicate their interrelation, with perhaps development of some underlying ideas. Also, bringing together the highlights of ideas and methods in cost analysis with emphasis on an actuarial point of view makes available to actuaries a comprehensive treatment of the subject, at least in its broader aspects.

Several of the problems are here discussed far short of a final definitive solution; the objective is rather to suggest some coherent patterns for developing effective practical methods of cost analysis. Furthermore, in the very nature of the subject there is often no unique answer to practical cost problems. As is well known, these problems call for ideas ranging from purely theoretical to grossly practical, applied to discover simple and effective solutions.

Although insurance costs will be dealt with primarily, applications to investment costs will be apparent.

The above listed problems will be here considered in the three following broad areas:

- (1) Company Policy and Practices, covering (i) and (ii),
- (2) Operational Cost Control, covering (iii), (iv), (v), and
- (3) Premium and Dividend Calculation (*i.e.*, Pricing), covering (vi).

These areas are, of course closely interrelated. They overlap and have many considerations in common. They are treated separately here in order to bring out certain important differences and to highlight and classify specific cost problems.

## II. COMPANY POLICY AND PRACTICES

Fundamental to the question of whether a line of business is profitable, or a plan of insurance contributes to surplus, or a particular procedure or plan of operation is "worth while" is the level of the costs involved and how they have been measured and allocated.

Problems involved in cost allocation of a company's expenses among the several lines of business are brought out in an interesting and currently important way by analysis of expenses involved in life insurance company entry into individual accident and health insurance. This analysis can be made in different ways depending on its objective.

Costs may be examined for three purposes, namely (1) *Statement Cost Allocation* which allocates a fair proportionate share of expenses (such as would appear in the Company's Annual Statement) to the A & H line, (2) *Standard Cost* which sets up costs on a proposed standard of streamlined and efficient operation, and (3) *Added Cost* which includes only the actual amount of increase in company expenses by reason of entry into the A & H business.

Looking at this another way, (1) Statement Cost Allocation answers the question, "Can A & H carry a proportionate share of operating and overhead expenses?" (2) Standard Cost answers the question, "What would allocated expenses be on the basis of meeting certain predetermined standards of efficient work performance?" and (3) Added Cost answers the question, "What did it actually cost the company to enter and conduct this business?"

Schedule A illustrates these three approaches by hypothetical figures.

**SCHEDULE A**  
**A & H OPERATIONS—COST ANALYSIS**  
**FIRST YEAR ADMINISTRATIVE EXPENSES\* FOR ASSUMED**  
**1ST YEAR ANNUAL PREMIUMS OF \$500,000**

	Cost Allocation (for Annual Statement)	Standard Cost	Added Cost
<b>a) Direct Operating Costs</b>			
Issue	\$170,000	\$145,000	\$100,000
Underwriting			
Prem. Collection			
Other Accounting			
Branch Offices	50,000	35,000	15,000
	<b>\$220,000</b>	<b>\$180,000</b>	<b>\$115,000</b>
<b>b) Actuarial, Sales Training and Other Special Functions</b>	25,000	25,000	5,000
<b>c) Furniture, Fixtures, Equipment and Other Nonrecurring Expenses</b>	70,000	70,000	60,000
<b>d) General Company Overhead†</b>	5,000	5,000	0
	<b>\$320,000</b>	<b>\$280,000</b>	<b>\$180,000</b>
Of which directly chargeable			
(i) to this block of business	\$195,000	\$155,000	
" (a)	15,000	15,000	
" (b)	0	0‡	
" (c)	5,000	5,000	
" (d)			
Total (i)	<b>\$215,000</b>	<b>\$175,000</b>	
(ii) to general A & H Surplus	\$ 25,000	\$ 25,000	
" (a)	10,000	10,000	
" (b)	70,000	70,000	
" (c)	0	0	
" (d)			
Total (ii)	<b>\$105,000</b>	<b>\$105,000</b>	

\* I.e., Expenses other than Commissions, Claim, Inspection and Taxes.

† Allocated in proportion to premiums. If allocated in proportion to other expenses would be less for Standard Cost.

‡ Nonpredictable, except in terms of a definite anticipated change.

In order to present basic differences more clearly, costs are listed in broad categories.

Expenses are broken down into group (i), the type of expense incurred in the first year of every block of new business, and group (ii), expenses considered nonrecurring and incurred in connection with the setting up of the new operation. Standard Cost is therefore the same as Statement Cost for group (ii) expenses.

Group (i) expenses would presumably be the basis for first year's expenses in the premium rate (dividend, if participating) and asset share calculations. Group (ii) expenses would be charged to the A & H business as a whole and be met out of surplus for that line of business.

Statement Cost Allocation, in effect, analyzes emerging costs of the A & H operation, while Standard Cost, through methods of work procedure analysis (discussed in section III) sets a standard of efficient operation for the volume of business involved. When this standard is achieved in actual operation, it presumably becomes the Statement Cost. The latter may reasonably be taken as a measure of whether the business is self-sustaining from the point of view of cost.

Added Cost covers actual added expense to the company in conducting A & H as compared with what it would have been if there were no A & H. Although Added Cost represents a realistic situation from the point of view of over-all company operation, it is hardly the basis by which the business can be considered self-sustaining. Some considerable expenses of office operation are either not increased at all, or at any rate not increased as much as the Statement Cost allocated to A & H, by reason of the introduction of the new line. This is true, for example, of considerable branch office expense, actuarial and statistical work, home office sales and other overhead. At the same time it must be realized that although the introduction of increased work volume (because of A & H) does not necessitate getting more personnel or equipment immediately, in an agency for example, the time is brought closer when it will be necessary to do so.

A related factor present in all three analyses is the level of premium volume since there is not a smooth and regular variation in administrative expense as premium volume varies. This important factor, whereby sizable variations in premium (or work) volume create no changes in expense, runs throughout all phases of cost analysis and comes up in several parts of this paper. This factor is in turn closely related to an important problem of office and service operations in many organizations, including life insurance companies, namely full utilization of clerical and equipment time. This problem arises from the comparatively fixed capacity of such an organization to perform various services for a market with fluctuating

demands for these services. Until insurance companies began development of career agents this situation was not as true of sales operations. If an agent sold a policy, he received his commission out of the premium. If he sold no policy he was not paid, so that ostensibly the company's cost was confined to that paid for productive selling service.

However, the picture has changed considerably. It is increasingly recognized that a sales force represents an investment in both the unproductive as well as the productive (*i.e.*, sales producing) time of the agent. Development of sales methods and sales training, including sales supervisory time, to say nothing of certain elements of agents' financing plans, represents costs not related to sales in the same way as agents' commissions, but more like fixed operational expenses. In this broader perspective, agents' unproductive time represents a real cost to the company. The extension of operations into another line such as A & H or the adoption of new life insurance plans, can result in more productive utilization of such time. These are some of the other considerations with cost implications involved in a major extension of operations. In the above instance they center around the interrelation of Life and A & H sales, how and to what extent Life production would be affected by introducing the new line, the resultant effect on agents' earnings and so on. These problems call for development of operational and sales methods calculated to achieve the best possible results from addition of the new line.

Obviously, this is only part of the complete picture of full and efficient utilization of agents' time which is the subject of much present-day agency research. Increasing overhead costs and the fact that many such costs permeate areas formerly thought independent of them are important to actuaries interested in cost problems.

Another aspect of company policy in the field of expenses calls for weighing advantages (or disadvantages) of a change in procedure against the increase (or decrease) in cost involved.

For a number of years, the value in underwriting of a medical examination has been weighed against its cost in setting the boundaries of non-medical insurance. Recently, in considering the underwriting of substandard insurance, E. A. Lew pointed out<sup>1</sup> the necessity of determining "whether the cost of particular procedures is warranted by the mortality savings attributable to them"—particularly in view of declining mortality rates and increasing operational expense rates.

Similar considerations are involved when considering bases for changes of plan, premium extension and discount, optional settlement and other procedures. The question is often asked, how complicated (and expensive)

<sup>1</sup>"Substandard Insurance," *Proceedings*, H.O.L.U., 1951.

an optional settlement may be justified under certain conditions governed by actual needs of the insured, amount of insurance, and merchandising policy of the company. Informal discussions at Society meetings have dealt with questions of this type.<sup>2</sup>

In all these problems measurement of the cost before and after the change in procedure for the particular function involved, whether it be substandard underwriting, change of plan, or optional settlement, is called for. This type of cost measurement and analysis is described in section III and in the Appendix.

It is apparent that actuarial consideration of cost aspects of insurance problems involving company policy and practices is not complete without some background in operational cost control itself, particularly the field of cost measurement.

### III. OPERATIONAL COST CONTROL

The objective underlying analysis for cost control is the reduction or limitation of expenses of operating the home office and agency organization. Some detailed work in that area, reported in *Proceedings L.O.M.A.* and elsewhere, deals mainly with specific cost situations. An attempt will be made here to bring together some of the principal aspects of this work in rather broad pattern emphasizing underlying principles of interest to actuaries rather than going into details of methods used.

Expenses such as commissions, taxes, and certain medical and inspection fees are generally related in an obvious way to premiums received or work done. Such expenses are disbursed either as percentages of premiums collected or fixed sums per applicant considered, so are not included in the kind of control we are talking about here. Office expenses, mainly salary costs, do not on the other hand depend on premium income or issues in the same way. Cost analysis for this type of expense (where the relation is not as apparent) is actually an attempt to relate clerical time as closely as possible to the work done. In that way, use of clerical time can be evaluated and methods for its more complete and efficient use more readily evolved.

Obviously, the value of a method of cost measurement depends on how well it determines the efficiency of an operation. Conversely, examination of more efficient methods of operation should aid in developing more effective measurement procedures.

Methods of cost measurement have developed on two bases which, al-

<sup>2</sup> For example in *TSA* III, 93, where question for discussion was, "In view of improved mortality and increased costs of obtaining business, what types of changes, if any, have been made in (1) Nonmedical rules, (2) Medical fees, (3) Underwriting safeguards?"

though related, have certain important differences. In this section the two methods are described and the more important features are examined, in the following order:

- a) Two Bases for Cost Measurement
- b) Job (or Performance) Analysis
- c) Cost Measurement for Changes in Operation
- d) Work Unit and Unit Cost Measures

*Two Bases for Cost Measurement.*—The methods used in the two general bases for analysis and control of cost are described in publications of the Life Office Management Association and in the actuarial journals. One basis (job analysis) analyzes each operation in terms of clerical performance at various levels; the other (functional cost analysis) allocates emerging expenses to various company functions, such as underwriting, changes, claims and the like. As against emphasis in the former on work production control, with a type of analysis developed that is needed for such control, the latter uses the analysis of final costs as a cost control method.

The former usually sets up an employee performance standard in terms of work units against which current performance is measured. The latter often compares current unit cost of functions with similar costs for a prior period.<sup>3</sup> It is difficult to obtain a proper standard for functional unit costs and where it is felt that a particular functional unit cost is high, further analyses involving actual procedure and clerical performance are practically always necessary before a satisfactory answer can be found.

Some companies make performance analyses, often at the same time as some type of functional cost allocation. In one company where functional cost analysis of the type described in the L.O.M.A. (January 1948) Manual has been used for a number of years and has proven to be of some value, it was felt that in working out improved methods of operation a shift in emphasis would be effective. This was actually a shift in emphasis from *allocation to production, i.e.*, from the analysis of the cost of the completed job to analysis of actual employee performance. At the same time, the desirability of a functional cost allocation was still recognized.

An allocation of costs by functions is of course desirable for premium and dividend purposes. However, for the purpose of cost control an analysis of the particular job being done is more direct and should therefore be more effective.

<sup>3</sup> Examples of the first approach are, among others, in *Proceedings L.O.M.A.*, F. S. Quillan, "Development and Use of Departmental Budget System," Sept. 1946 and W. J. Adams, "Some Practical Uses of Life Office Cost Accounting," Sept. 1941. The second approach is described in C. F. B. Richardson, "Cost Analysis," *RAIA XXXV* and in the L.O.M.A. *Cost Analysis Manual*, January 1948.

*Job (or Performance) Analysis.*—An example of analysis of operational unit performance is shown in Schedule B which appears in the Appendix.

This schedule is designed primarily for the larger company. The question often comes up as to how to set up controls for the smaller company without using a system that is too elaborate and expensive. No completely satisfactory answer seems to have been evolved; however, certain considerations within the broad objectives discussed in the Appendix suggest themselves. Dovetailing of operations, for example, arises out of the very nature of a small company organization (less than about 200 employees or so). A higher proportion of the staff is called upon for diverse duties, supervisory officers often cover more divisions or departments, and so on. Increase in work volume can be met by temporary or probationary employees until operations achieve higher levels. Consultants could be brought in for special problems in company policy and operation. These problems, although characteristic of smaller companies, are, in many aspects, similar to the cost problems of larger companies.

An operational analysis such as is illustrated in Schedule B, and the subsidiary work record of the individual employee needed for this schedule, provide a direct method of measuring the effectiveness of methods of operation. As improvements and changes are made, standards are correspondingly changed.

*Cost Measurement for Changes in Operation.*—This type of measurement is used to estimate the change in cost involved in an extension of operations or change in procedure such as described under Company Policy and Practices. Such changes in cost, which are measured by the effect on the figures of Schedule B, are summarized in a different form of analysis illustrated by Schedule C in the Appendix.

Schedule C, as described in the Appendix, introduces monetary costs and lends itself to setting up a sort of debit account of savings (or added expenses) anticipated as the result of an operational change. Actual cost results are then compared with those anticipated and any difference reconciled.

Freeing clerical time as the result of a change in procedure is only the first step in realizing savings therefrom. The analysis of Schedule C Estimated Saving column should show when this free time<sup>4</sup> has been utilized or eliminated.

The same general method may be used in finding the cost of a company

<sup>4</sup> It should be noted that by "free time" or "unused time" is not meant simply idle time. It is that time over and above the required time to do the work based on the standard hours measure. Schedules B and C bring this out.



practice, either already in use or to be adopted. For example, term riders added to policies between premium dates may be under consideration. Here the change analyzed is either one involving the dropping of the practice or its adoption. After an estimate of the cost is made, the benefits of the practice in terms of service to policyholders and agency forces can be weighed against the cost.

In connection with entering into a new line of business, the question might be asked, "To what extent has unused clerical and equipment time been absorbed by introduction of the new line?" These items of expenditure appear in the first two columns of Schedule A. The answer to this question should be available from analysis of the information of Schedule C for any operational units with employees or equipment involved in this extension of operations. Some available clerical and equipment time may of course have been reduced or absorbed in other company operations without entry into the new (A & H) field, but a by-product of this expansion can be a tightening of the existing organization.

Sometimes a change in one procedure affects another procedure. For example, a simplification in accounting for first year premium collections may omit some information useful in actuarial valuation. Or, what looks like a good change in valuation procedure may result in certain figures no longer being available for mortality studies. Increase in work time of a procedure other than that directly being changed should be incorporated in Schedule C.

Functional cost allocation and resulting unit costs are by-products of the direct cost control analysis. In the company where functional cost allocation is the only cost analysis made, the opposite is usually the case—cost control methods do what they can with functional cost information as their tool. An advantage for expense control of direct cost analysis (Schedule B) is that it is carried through at the time the work is done instead of sometime later. It stems directly from the particular job which determines the work unit for a particular grade.

*Work Unit and Unit Cost Measures.*—Obviously any analysis depends on how readily the individual job itself can be measured. Furthermore, the cost of certain functions can be more closely identified with the individual work unit and therefore the measurement necessary for control can more easily be made. Of the many diverse clerical operations in a life insurance organization, some types of work performance lend themselves to easier measurement than others. Those characteristics which make a job more readily measurable in work units and therefore more amenable to expense control, may be stated as:

1. Few (perhaps one or two) types of work units (*i.e.*, different duties) at a given clerical grade in a particular job.
2. Work unit of small time value occurring in large numbers, *i.e.*, large scale routine production.
3. Uninterrupted flow of work of the same nature calling for less shifting from one task to another, and cutting down on unused time.

It is apparent that certain jobs can be more readily cast in these characteristics. Also the development of machine methods and simplification and rationalization of methods and routines favor these characteristics. At the same time there are other aspects of organization and control problems, such as personnel and the nature of a particular job itself, which limit the extent to which the above characteristics can be introduced. It is often advisable throughout cost analysis to temper general theory with practical considerations involved in office operations.

Premium billing and central filing meet the above characteristics about as well as any operations. Machine tabulating operations have achieved the second characteristic of large numbers of work units of small time value to so high a degree that the work unit itself is measured in terms of operations of 1,000-card (or even larger) groups instead of the common one policy or one record. On the other hand the attainment of characteristic 3, which in this case amounts to maximum machine utilization, is a basic problem in large scale office machine use.

At the other end of the scale there are jobs of a general nature, such as research or special correspondence whose characteristics are far removed from the three given above. It is doubtful whether these can be measured at all except in the most general way.

Since a functional unit cost ultimately depends on the work units entering the jobs (or parts thereof) concerned in that particular function, it may be expected that those characteristics that make the work unit easier to measure will also make the unit cost more meaningful. For example, the unit cost per premium notice for premium billing is usually more indicative of the efficiency of the operation than is the unit cost per optional settlement prepared or per change of plan. In the latter case, work units are much less likely to meet the characteristics described above.

The significance of functional unit operating costs for cost control is rather limited unless compared with a standard unit cost covering efficient operation at full capacity. Frequently, the comparisons made are with the unit cost at a previous period of time, the unit cost of another company for the same function, or the average unit cost for a number of companies. It is generally agreed that these have their limitations but

they do serve to spot costs which are out of line when there are large disparities between unit costs for similar functions.

In a way this type of comparison is like comparisons of crude mortality rates. It is not until mortality rates are broken down by age, policy duration, and sometimes occupation, sex, policy amount, etc., and then set against a standard of some kind that the significance of a mortality experience may be evaluated. So with unit costs. The functions compared should cover the same area, the same type of company with similar salary and rental rates and so on to achieve some comparison of economy of operation.

Actually comparisons between companies<sup>5</sup> of unit cost of operation of various functions can lead to fruitful results in re-examination of routines in those companies where unit cost appears high. Comparison of unit costs of new business operations of agency offices, whether taken against premiums or face amount, involves an element which is much more prominent here than in home office operations. A high first-year unit cost may be the result of low production where the agency is set up to handle a much larger volume efficiently and economically. Because of the lack of work volume, unused capacity is introduced in the unit cost. On the other hand a high unit cost may indicate an inefficient operation. The only way to find out is through a direct analysis of the agency office operation. Then the company will be in a position to decide what can be done. The solution may be increased production or smaller agency office setup rather than any change in operational methods. One might add that similar considerations influence home office operations, particularly those involving new business.

Throughout the measurement of work performance it is apparent that the amount of work units that can be performed by a given installation of employees and equipment, working at an efficient level (*i.e.*, the Standard Performance) is not a fixed quantity but falls within a range of values. If, therefore, a change in procedure results in fewer work units, it may not be possible or practical to reduce personnel or equipment. Similarly, an increase in work volume should not necessarily be followed by a larger installation. This is particularly true of smaller operational units with diverse duties, such as agency offices.

In agency offices, particularly smaller ones, clerical work contains so little of the three characteristics listed at the beginning of this section,

<sup>5</sup>L.O.M.A. Cost Committee has made comparisons of this type for issue, claim, policy loan, and other functions, which are reported in *Proceedings*, L.O.M.A., for recent years.

that measurement of work units and setting up standards thereby is very difficult. Change in work volume is also a more important factor here than elsewhere in the insurance organization. As business increases, the clerical staff remaining unchanged, work volume handled per clerk per day (or hour) increases until the pressure of work brings an addition to the clerical staff. Then the work volume per clerk per hour goes down, presumably rising again as business continues increasing.

Measurement of cost should recognize this situation and may do so by setting up standards in terms of a range of work volume. A standard office arrangement involving a definite number of personnel and amount of equipment to take care of a range of new business applications and renewal policies could constitute the work standard for an agency.

It must be remembered that this same situation of a range in work volume capable of being handled during a unit of time by a given section of employees runs through the whole life office organization only in lesser degree. There is, however, more latitude in home office operations for planning work so as to meet changes in work volume more effectively.

#### IV. PREMIUM AND DIVIDEND CALCULATION

For a number of years determination of the cost for insurance has increasingly emphasized broad considerations of company policy. E. W. Marshall in his paper<sup>6</sup> before the Institute of Actuaries Centenary Assembly suggests, as the first of the principles of approach to equity and surplus distribution, that "the safety and integrity of the company and the interests of the policyholders as a whole take precedence over considerations of strict equity between policies."

It seems to be generally agreed that in the allocation of costs for determining the price of insurance there is a wide area of judgment, all within the broad principles of equity. There is no question that unit costs are necessary for obtaining the unit price (*i.e.*, premium and dividend per policy). Any question is really one of how the unit cost should be obtained and at what refinement and expense.

In view of the discretion in allocation of costs for this purpose, it would appear that a great degree of refinement would not be called for. Moreover, if the emphasis in cost analysis is on cost control, then unit costs for premiums, dividends, and asset shares may be obtained with a minimum degree of refinement, as by-products of the analysis described earlier in this paper.

These ideas are often involved in a special way in allocation of expense

<sup>6</sup> "Surplus Distribution under Ordinary Insurance in United States and Canada."

to a new or special plan (such as perhaps term or juvenile). Can less expense per \$1,000 be allocated to the new plan than to other plans, so as to meet its general market price? The introduction of the new plan will not increase operating costs proportionately. However, such costs are increased by *less than* the amount available in the new plan's premiums. Company operation as a whole is improved if the new plan is issued, as the following figures indicate.

		Before Introducing New Plan	Introduced by New Plan (with Less Than Proportionate Allocation of Certain Costs)	After Introducing New Plan
Face Amount of New Issues . . . . .	Incurred . . . . .	\$200,000,000	\$10,000,000	\$210,000,000
		\$ 3,500,000 (at \$17.50 per \$1,000)	\$ 100,000 (at \$10.00 per \$1,000)	\$ 3,600,000
First Year Operating Costs (excluding Commissions, Taxes, Medical and Inspection fees)	Supported by Premiums . .	\$ 4,000,000 (at \$20.00 per \$1,000)	\$ 150,000 (at \$15.00 per \$1,000)	\$ 4,150,000

Introduction of the plan has increased the margin from operating expenses (excluding commissions, taxes, medical and inspection fees) from \$500,000 to \$550,000. This is also true of the renewal years as an extension of these figures along the same general lines would show. Commissions, taxes, and medical and inspection fees are carried by the new plan just as they are on existing insurance.

It is important to recognize limitations in the application of this idea. If the addition of the new plan is made at the expense of business customarily written, the cost picture could be altered considerably. This could happen with introduction of a Preferred Risk type of contract, particularly if it embodied a much lower premium for the first three or five years as do the so-called modified plans. In fact it could also happen with Term insurance issued extensively at lower premium levels, especially where there is very little conversion of the Term. If issuance of such plans reduces considerably the volume of normal Ordinary Life issues, the net result might be a reduction in expense margins. Such a result could occur even where the new plan's premiums came closer to bearing its proportionate share of overhead than did those of a plan whose issuance did not

cut into existing volume. In that case a realistic appraisal of the situation would produce a different picture than that shown in the above schedule.

It is well known that industry generally has long recognized the complications in cost allocations arising from the strong influence of realistic market price policy.

Speaking of cost allocation and pricing in casualty insurance, J. J. Higgins, Chief of the Uniform Accounting Bureau of the New York State Insurance Department, sets out several "minority" propositions in opposition to what he designates as the orthodox view.<sup>7</sup> One of the propositions states that "the buying public and the companies are best served when rates are set at levels calculated to result in the largest possible market and a fair contribution to over-all profits. Rates should not necessarily be based on company cost allocations." Another proposition states that such rates "even though not based on company allocated costs are not unfairly discriminatory." That is, "discrimination which can be removed only by pricing desirable risks out of the market is not unfair discrimination."

These propositions are illustrated by examples from casualty insurance lines which are rather similar to that given above for life insurance. Basic to these considerations is the fact that a large volume of expense does not increase (or decrease) at the same rate as increase (or decrease) in premium volume but tends to do so at a rather slower rate, many elements of expense being practically fixed.

Profits, and margins available for surplus, are thereby affected, as may be seen from the following figures which assume two different levels of premium volume in A & H insurance.

Premiums . . . . .	\$500,000	\$1,000,000
Claims & Reserves . . . . .	\$250,000	\$ 500,000
Expenses		
Commissions & Taxes . . . . .	175,000	350,000
Other Expenses . . . . .	80,000	130,000
Net Income . . . . .	\$-5,000	\$ 20,000

There are other factors involved in the over-all problems of pricing insurance. For example, germane to the above discussion is the very practical question of whether one of the reasons that additional plans can be added with so little increase in overhead is that overhead costs were excessive to begin with. This emphasizes the need for careful control of unused capacity as described earlier in this paper.

<sup>7</sup> "Problems in Expense Allocation," *Proceedings*, Insurance Accounting and Statistical Association, 1951. Mr. Higgins points out that his "exposition does not represent the adoption of an official position by the New York Insurance Department."

## V. SUMMARY AND CONCLUSIONS

Actuarial approach to cost analysis had for many years centered around (1) determination of the unit costs needed for pricing insurance fairly and (2) allocation of costs for annual statement purposes. In more recent years there has been more emphasis on cost control and the relation of costs to profit margins arising from various segments of the business.

These latter areas of analysis inevitably include practically all aspects of cost analysis to a greater or lesser extent. In this connection, two general approaches to cost analysis, one for premium and dividend calculations and the other for control of expenses, may be differentiated broadly as follows:

	<i>Premium and Dividend Calculations</i>	<i>Cost Control</i>
<i>Purpose:</i>	Pricing of policies as equitably as possible with, however, overall policyholder interests to be considered.	Control of expenses of operation, thereby increasing margins for dividends and surplus.
<i>Method:</i>	Examination of costs as they <i>emerge</i> allocating them through various functions to units of benefits and service.	Analysis of work operations as they <i>create</i> costs of operation.
<i>Measure:</i>	Unit Cost so as to produce unit price for policy.	Work Unit to be compared to a standard.

The latter of the above-described analyses is more effective than the former in measuring the efficiency of methods of operation and results of changes in procedures and extension of operation. This is due to some extent to the comparatively fixed nature of company operational costs against fluctuating volumes of issues, lapses, claims, and other demands on company services. Functional unit costs may be obtained as a by-product of analysis by means of work units. Certain office operations are easier to measure in terms of work units, which tends to make unit costs for such operations more meaningful.

Pricing and other cost matters involving company policy often need a broader cost perspective comprising essentially the effect on the whole company (as well as one line or plan) of a particular course of action. Such a perspective should also take into account the relatively fixed nature of many costs, as well as the close interrelation of many operating costs, both of which factors make any method of cost allocation arbitrary to some degree.

In bringing together various aspects of cost analysis, it is hoped that this paper will be helpful in suggesting means of further investigation and discussion of significant areas of the subject.

## APPENDIX

## JOB OR PERFORMANCE MEASUREMENT

Schedule B, which illustrates how work operations may be analyzed in a specific organizational unit, does not follow any particular one now in use, but is of a general nature so as to illustrate better the main points under consideration.

The important element in this schedule is the definition of work unit. The work unit is usually the most frequent job performed at a particular clerical level and standard hours per work unit is the standard time set for performance of this job. Other duties at the same clerical level are related to this work unit in proportion to the length of time set by the standard to perform such duties. In that way each duty is expressed as so many work units depending on the amount of time needed for such duty. Methods for evolving work units are described in L.O.M.A. 1948 *Cost Manual* and in earlier papers in *Proceedings*, L.O.M.A. Two methods seem to be in use for defining standard performances. One takes the standard as the actual clerical performance over a given base period with the idea of improving the standard as time goes on and personnel becomes aware of the objectives of the system.<sup>8</sup> The other establishes, through time study methods, standard performance at efficient levels of operation for the various duties of each clerical grade.

Schedule B may be looked upon as a method which helps the supervisor achieve fullest possible utilization of the time of his section. The ratio of *Total Standard Hours* to *Net Actual Hours* is significant in this regard.

At the department management level, Schedule B, for each of the various sections, is available and comparisons can be made. Items of expense other than clerical salaries are introduced, such as supervisors' salaries, indirect personnel costs, lunch, salary taxes, rent, and so on. For the section supervisor's purpose, the important facts are covered by the Schedule B analysis. Obviously, throughout a cost control system schedules and facts furnished should be as simply presented as would meet the purpose at hand. For the section supervisor, the important fact is the use of clerical time; if equipment is important enough in his operations, a control of equipment time along lines similar to Schedule B is set up. He is not as a rule interested in such things as subsidiary employee costs (luncheon, pension, etc.) and rent and the like, so they do not appear in his copy of the Schedule.

Functional cost analysis can be obtained from Schedule B by the usual

<sup>8</sup> See L. R. Menagh, Jr., "Home Office Departmental & Functional Costs," 1937 *Proceedings*, L.O.M.A., and F. S. Quillan's paper referred to previously.



SCHEDULE B

DEPARTMENT \_\_\_\_\_ SECTION \_\_\_\_\_

MARCH	(1) EMPLOYEE GRADE	(2) TOTAL WORK UNITS	(3) STANDARD HOURS PER WORK UNIT	(4) TOTAL STANDARD HOURS	(5) (6) (7) NUMBER OF EMPLOYEES			(8) NET ACTUAL HOURS
					REGULAR	BOR- ROWED +	LOANED (L) VACA- TION (V) SICK- NESS (S) -	
1	1				2			
	3				4			
	5				8			
	6				10			
	7				8			
	Total				32			
2	1				2			
	3				4			
	5				8			
	6				10			
	7				8			
	Total				32			

Figures are entered on the daily record from individual employee records. The daily record is brought together for a monthly summary of the same type which includes also column (4) translated into salary costs to compare with actual salary costs.

Column (1) *Employee Grade* denotes employee status. Thus, Grade 1 may be office girls and messengers, Grade 3 typists, and so on.

Column (2) *Total Work Units* performed from each employee's record sheet. These are translated into common units for each Employee Grade by time study methods.

Column (3) *Standard Hours per Work Unit* for each Employee Grade as worked out by time studies or other methods for setting standards.

Column (4) *Total Standard Hours* is the product of columns (2) and (3).

Column (5) *Number of Employees* of each grade regularly employed in section.

Columns (6) and (7) show number of days of clerical work borrowed, loaned, etc., at each grade.

Column (8) *Net Actual Hours* is the total working hours for the regular number of employees in each grade *plus* column (6) and *minus* column (7). Thus, for a 7-hour day 3.5 employees in Grade 3 (4 regular employees - 1 sickness + .5 borrowed) correspond to Net Actual Hours of 24.5.

Total is taken over weekly and monthly periods for each grade.

**SCHEDULE C**

**LIBERALIZATION OF REINSTATEMENT PRACTICES—*Estimated Monthly Savings*  
TO RESULT FROM (a) REDUCTION IN WORK VOLUME  
AND (b) CHANGE IN PROCEDURES**

	PRESENT SYSTEM		PROPOSED SYSTEM		ESTIMATED SAVING	
	Work Units per Month	Corresponding Salary Cost	Work Units per Month	Corresponding Salary Cost	Work Units	Salary Cost
1. (a) <i>Salaries</i> (other than supervisory) Secretary's Dept. Mail and Correspondence Selection and Issue Dept. Policy Writing Medical Underwriting Actuarial Dept. Change of Plan Comptroller's Premium Collection Accounts Agencies						
(b) <i>Subsidiary Salary Costs</i>						
(c) <i>Supervisors' Salaries and Related Costs</i>						
<i>Total Salary Costs</i>						
2. <i>Rental Value of Space Occupied</i>						
3. <i>Equipment and Supplies</i>						
4. <i>Other Costs</i>						
Total.....						

1. (a) This information is brought together from information in Schedule A for the various sections concerned in the change. The Work Unit and Salary information for each section is broken down for the function represented by the change involved (pretty much as in functional cost analysis) resulting in a subdivision of the above schedule for each section supervisor. He takes the responsibility for successfully carrying through the change in his own section. "Estimated Savings" is a debit account against which actual results of the change will be measured. Periodic reports on the actual results as they develop after the change indicate to what extent expectations are realized.
1. (b) This item includes payroll taxes, pension and luncheon costs. There is no need usually to break this down by department.
1. (c) Supervisory costs need not be included unless there is a change as is not often the case. This is also true of 3. *Equipment and Supplies*, and 4. *Other Costs*.
3. Includes (amortized) monthly charge as depreciation for capital expenditures.

method (described in L.O.M.A. 1948 *Manual*) of allocating salary costs at various employee grade levels by the total units of work entering into each particular function. These total units take into account (1) the value of the function in terms of work units, and (2) the number of times the function has been performed over a stated period.

#### COST MEASUREMENT FOR CHANGES IN OPERATION

Changes in Schedule B due to an operational change are summarized and translated into monetary terms in Schedule C. If the change involves equipment or space, these items are included. New equipment cost would be included on an amortized (depreciation) basis. The depreciation charge (less salvage of replaced equipment) is part of the cost of the proposed system. A particular change in practice would involve either a change in volume (number of work units) or changes in procedures (different salary cost per work unit and perhaps change in space occupied or equipment). For example, a more liberal practice on reinstatement (*e.g.*, not requiring any evidence of insurability for a period of two weeks after the days of grace) would be expected to shift the work volume to a lower clerical grade with a lower salary rate. Presumably the liberalization would be justified by savings in expense as well as other reasons such as better policyholder and agency relations and decrease in lapses. A change may result in the reduction of work volume with perhaps a larger cost per unit involving employees of higher grade.

The answers to the questions of whether the savings contemplated by changes in practice or methods are actually realized, when and to what extent, should be furnished by use of the information in Schedule C.

As indicated in this schedule, an estimate is made of the work units and costs which will result if the change is made. This is done for each section involved, with the cooperation of the section supervisor. After the change is actually made, report on progress with respect to realization of the Estimated Savings is made regularly. This would take the form of a schedule showing the savings listed in Schedule C as a debit account, with savings actually realized credited to this account. Adjustments in estimated savings are almost always necessary as the change in work volume is usually different than expected, or in actual operation it is found that other changes in routine are required for the new procedure. However, with this type of analysis results can more clearly be traced down in concrete monetary terms.