EXPENSE ANALYSIS IN RATEMAKING AND PRICING

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INTRODUCTION

This paper analyzes the traditional method of including non-loss expenses in property-liability insurance ratemaking processes and makes several suggestions concerning procedures for including expenses in profitability analyses and planning activities.

BACKGROUND

The traditional methods of including expenses in the ratemaking process are of two basic types. First, there is the constant percentage loading approach as used in automobile liability ratemaking. In this approach, a permissible, or expected, loss ratio is calculated by first determining the portion of the premium dollar required for expenses, profits and contingencies on a percentage basis. The complement of this percentage is the permissible loss ratio. This permissible loss ratio, which includes loss adjustment expense, is then used in setting rates for all policies in the state. An example of this calculation is shown in Exhibit I where the commission expense is a budgeted item; general expenses are determined from Insurance Expense Exhibits; taxes, licenses, and fees depend on the state tax structure; and profit and contingencies are set at a flat percentage of written premium. After the pure premium (expected loss and loss expense per unit of exposure) is determined, it is divided by the permissible loss ratio to determine the base rate for the territory. All other rates are then calculated as percentage deviations from this base rate. Thus, if a particular class of business has losses which are 10% higher (lower) than average, its premium rate will also be 10% higher (lower) than the base rate. This means that commissions and expenses are also treated as being 10% higher (lower).

This approach is more fully described in Stern's article on automobile ratemaking.

Exhibit 1
Calculation of Permissible Loss Ratio

Commissions (or production cost)	15%
General Expenses	10
Taxes, Licenses & Fees	3
Underwriting Profit and Contingencies	5
Total Expenses	33%
Permissible Loss Ratio (100% Total Expenses)	67%

Another approach used in current ratemaking procedures involves the use of expense constants. The rationale for this approach is that the cost of certain functions performed in the administration of the insurance process does not vary with the size of the risk. Therefore, in those lines of business (e.g., workmen's compensation) where there is a substantial difference in premium between small and large risks, it is difficult to justify the large risk's paying the same percentage of his premium to cover these administrative costs as does the small risk. The problem is solved in workmen's compensation by the use of premium discount plans and expense constants. The premium discount plans give increasingly larger discounts as premium size increases, while expense constants assign a minimum fixed cost on each policy below a given size. Technically, this treatment of expenses is not part of the ratemaking process as the same rates are used for all sizes of risk, it is the premium that reflects expense gradations through the use of both expense constants and premium discounts. A more detailed example of this approach is given by Morison, within the context of workmen's compensation insurance.[2] Some companies also use premium discount tables in pricing commercial liability insurance, although there is no reflection of their use in the ratemaking process.

Both of these approaches to ratemaking utilize a full absorption basis. That is, all costs within the organization are allocated to an individual line of business. This is to be contrasted with the contribution method which

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[1] Stern, P. K., "Ratemaking Procedures for Automobile Liability Insurance", *PCAS*, Vol. LII, p. 139.

[2] Morison, G. D., "The 1965 Study of Expenses by Size of Risk", *PCAS*, Vol. LIII, p. 61.

allocates only those expenses that are closely related to a line of business. Since the full absorption basis allocation is required for completing the Insurance Expense Exhibit filed with the various state insurance departments, it represents a concept which has been sanctioned by the National Association of Insurance Commissioners. This makes it very appealing to use when a rate increase is desired. Also, any variation in the accepted approach requires the maintenance of an additional set of accounting documents. This full absorption method is also intuitively appealing because if all of these allocated costs are covered by the ratemaking process and if the rates for all lines of business are adequate, then it would appear that all expenses will be paid for and profit will be maintained.

ANALYSIS—CONSTANT EXPENSES

It can be demonstrated that the use of constant expenses to cover those costs which are incurred at a constant level per policy, regardless of premium size, is a dominant pricing strategy as compared to using a constant percentage of premium to cover the expenses for each policy. The strength of this dominance is in direct proportion to the degree of price consciousness exhibited by the consumers for a given line of insurance. The following example is taken from automobile insurance rates in Pennsylvania. A male insured, age 35, with no violations, using the car for pleasure only, and residing in Reading would pay $62 annually for $50,000 single limit liability coverage with $2,000 medical expense and 10/20 uninsured motorists coverage. The same individual, with the same coverage, but living in Philadelphia and driving more than ten miles to work would have an annual premium of $277. Assuming an expense loading of 10% was used in the ratemaking process, the first individual would pay $6.20 for expenses and the second individual would pay $27.70.

If we now use the constant expense approach and assume that one-half of all expenses are not related to premium size (e.g., are related to writing the policy, keeping the policy on file, etc.) and our product mix consisted of the above two policies, then a constant expense of about $8.50 would be required along with a 5% loading for other expenses.

Under this latter mechanism for computing expense, the premium for the insured in Reading would be about $67 and the premium for the Philadelphia resident would be $272.

If we now assume that two companies are competing for these two risks, and that one company uses constant expenses in ratemaking and

the other does not, then it is likely that the company using constant expenses will insure the Philadelphia risk for $272 and the other company will insure the Reading risk for $62. The company which does not use constant expenses will obtain $6.20 for expenses. Since this amount is even insufficient to cover the $8.50 of policy writing costs, the firm will be forced to file for a rate increase. If this firm's ratemaking policies do not change, then the rate increase could generate profitable sales in Reading, but its prices in Philadelphia will become even further out of line.

ANALYSIS—CONTRIBUTION METHOD

The use of constant expenses is also a complement to a technique for analyzing pricing and marketing operations which is being increasingly used outside of the insurance industry. This technique is called the contribution method. The contribution method is based upon the principles of marginal cost analyses. Its goal is that, after all costs directly associated with selling a particular product are included in the price, the dollars generated to cover overhead expenses are maximized for the product line on the basis of a volume-price tradeoff.

This differs from the use of constant expenses discussed previously in that the constant expense approach assumes that the premium volume is fixed at the level of the previous time period. Thus, the expenses which were not covered by the constant expenses are divided by the premium volume to obtain a percentage loading to be used in the ratemaking process (5% in the example given above). Under the contribution method, the dollars of overhead expense are considered to be independent of the premium volume. If more policies are sold, then the price of each one could be lowered and overhead expenses could still be met. Conversely, if prices are raised, then less volume will be needed to meet overhead expenses. If knowledge concerning the elasticity of demand is available, then the contribution method makes it possible for a company to more nearly maximize its profit. However, the type of knowledge concerning markets and the effect of price differentials on premium volume, which is required for performing marginal analyses, is generally not available in the insurance industry. An example of a profit statement using the contribution method is shown in Exhibit 2.[3]

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[3] This is a modification of an example contained in *Techniques of Profitability Analysis* by Sam R. Goodman, Wiley-Interscience, New York, 1970, p. 38.

First the costs of the product, in the form of loss and loss expenses, are subtracted from earnings to identify the variable gross profit. Next, the other variable costs which can be specifically identified with the product are subtracted to obtain the variable profit. This process is sometimes referred to as "direct costing". The variable profit represents the contribution that a particular product makes to a given line of business. Those costs which pertain to the entire line of business are then determined and subtracted from the variable profit to obtain the line of business contribution margin. For example, in the homeowners line of business it might not be possible to split out different marketing costs for Form A and Form B and thus variable profit would not include those marketing costs. When looking at the line of business as a whole, however, it may be possible to specifically identify those marketing costs associated with homeowners.

Exhibit 2
Contribution Method Profit and Loss Statement

Earned Premium			$200
Loss and Loss Expense (variable cost of goods sold)		$130	
Variable Gross Profit			$ 70
Commisions Premium Taxes (other variable costs) Policy Writing		$ 38	
Variable Profit (distribution contribution margin)			$32
Product Promotion Underwriting Marketing Actuarial	(direct line of business costs)	$ 12	
Line of Business Contribution Margin			$ 20
Administration Marketing Management Building and Maintenance	(allocated company overhead)	$ 10	
Line of Business Profit			$ 10

The next group of items to be subtracted represents the allocated company overhead. After completing this subtraction the final result, called line of business profit, is obtained.

This approach can be embellished by adding in considerations for investment income and by ensuring that expenses are assigned to the appropriate policy periods, but these adjustments are outside the scope of this paper.

Under the contribution method, the primary objective of the line of business management is to maximize the line of business contribution margin rather than maximizing the line of business profit.

In addition to permitting management to more realistically assess the impact of changes in volume on profits, this approach also eliminates much of the traditional discussion concerning the appropriate method to be used for allocating overhead costs. Thus, line management is free to devote their energy toward improving the operations under their control rather than toward correcting perceived deficiencies in mechanical allocation procedures.

The value of this approach to analyzing expenses is shown in Exhibits 3 and 4 where two alternative commission structures are being evaluated. In the first case, 10,000 policies are written at a $100 premium in a particular line of business. In the second case, it was assumed that raising commissions by one point would increase the production to 12,000 policies. In going from Exhibit 3 to Exhibit 4 there is an increase in other variable costs of one dollar per policy to reflect the increase in commission, while the direct line of business costs and the allocated company overhead stay at a fixed total for the line of business. Under the usual full absorption technique of expenses analysis, as seen in Exhibit 3, the overhead (general expense) costs would have been assumed to stay at a constant per policy amount even though the actual expenditures for those items would not increase. Thus the full absorption technique would have shown a line of business profit per policy of $4, due to the $1 increase in commission, and a total profit of $48,000 as compared to $50,000. This would result in an unfavorable outlook for strategy B, which is the opposite of the indications using the contribution method as shown in Exhibit 4. In effect, increasing the total amount of allocated company overhead would tend to make other lines of business appear more profitable whenever one line increases its sales. The reason for this is that more of the overhead would be allocated

to the line of business under examination. This implies that other lines will receive smaller overhead allocation and therefore will appear more profitable even though they have not changed any of their operating procedures.

Exhibit 3
Evaluation of Alternates—Full Absorption Method

Strategy A—10,000 policies	Per Policy	Total
Earned Premium	$100	$1,000,000
Loss and Loss Expense	65	650,000
Commissions	15	150,000
General Expense	12	120,000
Taxes, Licenses and Fees	3	30,000
Total Underwriting Deductions	$ 95	$ 950,000
Underwriting Profit	$ 5	$ 50,000

Strategy B—12,000 policies		
Earned Premium	$100	$1,200,000
Loss and Loss Expense	65	780,000
Commissions	16	192,000
General Expenses	12	144,000
Taxes, Licenses and Fees	3	36,000
Total Underwriting Deductions	$ 96	$1,152,000
Underwriting Profit	$ 4	$ 48,000

Exhibit 4
Evaluation of Alternatives—Contribution Method

	Per Policy	Total
Strategy A—10,000 policies		
Earned Premium	$100.00	$1,000,000
Loss and Loss Expense (65%)	65.00	650,000
Variable Gross Profit	35.00	350,000
Other Variable Costs (19%)	19.00	190,000
Variable Profit	16.00	160,000
Direct Line of Business Costs ($60,000)	6.00	60,000
Line of Business Contribution Margin	10.00	100,000
Allocated Company Overhead ($50,000)	5.00	50,000
Line of Business Profit	$ 5.00	$ 50,000
Strategy B—12,000 policies		
Earned Premium	$100.00	$1,200,000
Loss and Loss Expense (65%)	65.00	780,000
Variable Gross Profit	35.00	420,000
Other Variable Costs (20%)	20.00	240,000
Variable Profit	15.00	180,000
Direct Line of Business Costs ($60,000)	5.00	60,000
Line of Business Contribution Margin	10.00	120,000
Allocated Company Overhead ($50,000)	4.20	50,000
Line of Business Profit	$ 5.80	$ 70,000

It should be pointed out that the contribution method does not permit growth at any cost. In Strategy B above, if commissions had to be raised three dollars per policy in order to achieve a 20% increase in growth, then the line of business contribution margin would have been $96,000. This would be an undesirable strategy as compared to Strategy A which had a contribution margin of $100,000.

This example may also be used to demonstrate a misuse of the contribution method. The contribution margin per policy should not be used alone as a criterion for performance. For example, under both Strategy A and Strategy B, the contribution margin per policy is $10, even though Strategy B would result in more total profit. The reason for this anomaly is that, on a per policy basis, the cost of generating the increase in premium volume is offset by a decrease in the direct line of business costs. There is also a tendency to express the contribution margin as a percentage of premium. In this case, if two lines of business are compared on the basis of their contribution rates, it is equivalent to allocating all overhead expenses according to premium volume. This defeats the entire purpose of using contribution margins in the first place.

The contribution margins should only be used for marginal analysis problems as large changes in premium volumes will affect the overhead costs (e.g., larger office space). It is therefore inaccurate to use a contribution margin as a measure of performance for an entire line of business.

In summary, the difference between the contribution method of analysis and conventional ratemaking techniques lies in the treatment of fixed costs. In conventional ratemaking, the fact that a variable cost is constant on a per dollar, or per unit, basis simplifies the ratemaking procedure. Thus, commissions, a variable cost which is generally constant per dollar of premium, are readily loaded into the ratemaking process on a percentage basis. Policy record keeping, a variable cost which is constant on a per unit basis, can be treated as a constant expense, as recommended in the first portion of this paper. This same treatment of variable costs can be preserved when using the contribution method. Fixed costs, however, are not constant on a per unit or per dollar basis and thus are difficult to treat in the conventional ratemaking process. The current solution is to treat fixed costs as if they were variable costs similar in nature to commissions. This results in a distorted view of profits, when used for planning purposes, since these fixed costs will not change with small changes in premium volume.

A more detailed discussion of the contribution method and how it can be used for managerial accounting purposes in the insurance industry is given in the book by Schuchardt. [4]

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[4] Schuchardt, Robert A., *Managerial Accounting in the Property and Casualty Insurance Business: A Critical Study*, The National Underwriter Company, Cincinnati, 1969, 209 pp.

CONCLUSION

It seems clear that the use of constant expenses is a preferred method for ratemaking and that the contribution method offers an opportunity for better decision making. The major obstacle to the implementation of these techniques is the type of data available in most insurance companies. One of the reasons for this lack of appropriate data is the statutory requirement for allocating expenses in the Insurance Expense Exhibit, and the general acceptance by state insurance commissioners of information in such form. This means that expenses must be maintained on two different bases if the contribution method is to be used.