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THE PROCESS OF PREMIUM FORMULATION

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ABSTRACT

Actuaries writing on the subject of gross premiums have often limited themselves to the techniques of premium calculation. When actuaries study for the actuarial examinations, they learn various premium calculation "methods" and the considerations involved in selecting appropriate assumptions. This paper sets the task of pricing insurance products in the larger framework of company planning and management. It also presents a generalized description of the pricing function, which is applicable to any insurance company product. The author feels that all of the actuarial functions should be discussed in relation to company goals and strategies. He also feels that generalizations of the various actuarial functions provide valuable insight into the functions themselves.

The premium formulation function has meaning only in the context of the total insurance company management scheme. In practice, premium rates cannot be set simply by "building in" profit along with the other assumptions—mortality, morbidity, persistency, expenses, and other expected characteristics of the business. Instead, premium rates must balance the various differing and often conflicting requirements of management, shareholders, marketing personnel, and policyholders (both present and future), within the overall restrictions resulting from the need to preserve company solvency.

These differing requirements can be outlined as follows:

1. Requirements of management
   a) Maintaining solvency
   b) Sustaining sales growth
   c) Maximizing expected profits
   d) Minimizing operating costs
   e) Maintaining high agent morale
   f) Maximizing service to policyholders

2. Requirements of shareholders
   a) Maintaining solvency
   b) Maximizing expected profits
3. Requirements of marketing personnel
   a) Maintaining solvency
   b) Maximizing compensation levels
   c) Minimizing competitive pressures
   d) Maximizing sales
4. Requirements of policyholders
   a) Maintaining solvency
   b) Minimizing cost (or maximizing benefits)
   c) Obtaining adequate service from company
   d) Obtaining adequate service from marketing forces

The "maximizing expected profits" requirement listed under 1 and 2 above demands additional comment. There are many measures of profit, and each insurance company has its own priority of profit objectives. In the uncertain environment that appears to be a permanent fact of life, it is critical that this profit-objective priority be clearly defined; only in this way can short-term and long-term goals be properly balanced.

Premium formulation is necessarily a dynamic process. Experience must be monitored continuously to ensure that the company's goals are being achieved. When objectives are not being met, appropriate controls or changes should be instituted wherever possible. The purposes of this paper are (1) to provide some insight into a general process for developing premiums that is applicable to all lines of business and (2) to discuss the relationship of the premium formulation function to the management of an insurance company.

Sophisticated forward planning is a critical element of the premium formulation process. The nature of the business environment demands the ability to react quickly to changes and new opportunities. Actuaries, as guardians of the pricing process, are called on to develop detailed forecasts and evaluate anticipated and future scenarios, and at the same time work with assumptions that are difficult to predict with accuracy. Although the particular procedural details of premium formulation may vary from company to company and from one line of business to another, the general pricing process can be divided into four phases: (1) defining the pricing plan, (2) establishing the actuarial assumptions, (3) determining products and prices, and (4) operating and managing the results. Premium formulation is a continuous and circular process; the experience from one round of product development is used as the basis for the next round.

PHASE 1: DEFINING THE PRICING PLAN

Insurance companies' statements of purpose vary, but the following basic goals are common to many companies:

1. To provide insurance (or financial security) to current and potential future policyholders.
2. To provide this insurance at the minimum possible cost and on an equitable basis.
3. To provide a fair return to owners—the shareowners in a stock company, the policyowners in a mutual company.

Once this basic "reason for being" is clarified, the definition of a pricing plan will involve (1) the definition of the marketing plan, (2) the definition of general corporate growth and surplus objectives, and (3) the evaluation of the capabilities of the home office and field organizations.

The basis of any viable corporation is a *realistic marketing plan*. Each company has its own unique definition of desired markets, distribution systems, and products. The elements of a corporate marketing plan include analysis of the markets available to or desired by the company, identification of the nature of the perceived competition, and determination of the distribution techniques to be used by the company.

A marketing plan must also encompass the design of the sales compensation system and the basic pricing strategy. This information is then utilized to design the products and to project future production by product and amount.

Once the life company marketing plan has been initially documented, management must evaluate the company's basic goals with respect to growth, profit, and the capabilities of the home office and field operations. If there were no limits to the availability of capital, manpower, and expertise, management would merely decide what to achieve and proceed to do it. In reality, however, the marketing plan must recognize the realistic growth and profit objectives of the company as well as the capabilities of the home office and field support organizations.

This planning activity will quantify what the company wants to achieve, reflecting a balance between long-term and short-term goals. Once priorities have been established and specific goals have been set down, the succeeding stages of the pricing process are easier to implement.

PHASE 2: ESTABLISHING THE ACTUARIAL ASSUMPTIONS

The goal of this section is to describe a typical procedure for establishing the primary actuarial assumptions that must be made before price testing

can begin. This procedure can be divided into four steps for purposes of this discussion: (1) reviewing external factors, (2) making preliminary strategy decisions, (3) reviewing trends in specific pricing assumptions, and (4) establishing specific assumptions for price testing. Each of these steps will be described in more detail in the remainder of this section.

STEP 1: REVIEWING EXTERNAL FACTORS

The business environment is often described in such terms as "hostile," "bewildering," "volatile," and "uncertain." External environmental factors nevertheless must be carefully appraised and projected as a prerequisite to setting any pricing assumptions.

One critical external factor that must be evaluated is the *economy.* Each actuary must appreciate the interrelationship between it and many of the basic actuarial assumptions that are made in the premium formulation process. For example, expected investment earnings rates and unit expenses depend on anticipated inflation. Similarly, anticipated rates of unemployment and business failure would affect assumptions as to policy persistency or the incidence and duration of disability income claims.

A second major external factor to consider is *regulatory influence*, including legal restraints on pricing, such as nonforfeiture values, policy loan requirements, deficiency reserve statutes, and premium taxes. Costs of complying with regulatory reporting, record-keeping, and disclosure requirements, and costs of obtaining governmental approvals of forms and procedures, are increasingly important. It is also important to assess the effects of the federal income tax law and its interpretation.

Other external influences that must be evaluated along with the economy and the regulatory environment include the following:

1. Changing public attitudes toward savings, insurance, insurance agents, and insurance companies.
2. Changing levels of consumer awareness and resulting potential constraints on price structures of life insurers.
3. New marketing developments and trends.
4. Changing competition, including insurance companies, other financial institutions, other types of corporations, and the government.
5. Changing relationships between the individual, the employer, and government, with respect to financial security plans (the impact of changing tax laws, changes in social insurance programs, national health insurance programs, state and provincial health plans, HMO options, and the like).

STEP 2: MAKING PRELIMINARY STRATEGY DECISIONS

Certain basic decisions must be made by insurance company management at this point. They comprise what might be called the *pricing strat-*

egy. The most important element of the pricing strategy is the development of the company's financial objectives.

There are a number of different ways in which a company might define its financial objectives, and they are well covered elsewhere in the actuarial literature. In establishing profit and surplus goals, a company generally will evaluate such things as the level of risks involved in the proposed products, the expected volume of business, and the available capital. These goals are often more difficult to establish in a small company because of the limited experience and the overriding critical nature of expenses in a small insurance operation.

As a result of the introduction of GAAP accounting for stock life insurance companies, corporate profit objectives often are defined on a GAAP basis and thus are reflected in the pricing process. Most companies do not rely on GAAP standards alone, however, since the impact of the initial acquisition costs on cash flow and statutory earnings cannot be fully evaluated if only GAAP numbers are observed.

Among the strategic decisions which must be made are the following:

1. The level of financial (profit/surplus) objectives, and a determination of how these objectives will be reflected in the detailed pricing process.
2. Expectations for federal income taxes and their impact on policy design.
3. Desired price relationships (premium, dividend, and cash-value levels) and competitive position.
4. Expected underwriting, claim administration, and sales philosophies.
5. Specific policy or certificate form provisions (e.g., settlement option basis, availability of options).
6. Special product characteristics, such as age basis (individual or by age groups, last birthday or nearest birthday, etc.), valuation basis, modal premium loading systems, methods of handling premium grading by size (policy fee versus band), and female premium procedures.

STEP 3: REVIEWING TRENDS IN SPECIFIC PRICING ASSUMPTIONS

Each important actuarial assumption should be reviewed in light of recent company experience, available intercompany experience, or both. Mortality, morbidity, expense, and persistency studies should be developed, if possible. The actuary should analyze investment earnings rate experience, including emerging trends in the type of assets, maturities, asset rollover characteristics, capital gains and losses, and new-money rates by business category.

STEP 4: ESTABLISHING SPECIFIC ASSUMPTIONS FOR PRICE TESTING

After external factors and experience have been studied and the preliminary strategy decisions made, the specific price-testing assumptions

can be established. Obviously, these predictions of future experience involve a considerable degree of subjectivity. The final assumptions necessarily will reflect a blend of the available relevant experience and the actuary's judgment. As a company grows larger and its experience base builds, more credibility can be assigned to its own experience.

If the objective is to develop realistic assumptions, it is desirable to break down the results of each study as finely as practicable (while maintaining statistical significance) in order that each cell being priced reflect its likely future experience. Such a procedure reduces the likelihood of failing to meet profit or surplus objectives because of unexpected changes in the distribution of sales.

In addition to reflecting past experience and judgment as to the impact of external factors and trends in experience, the actuary must also relate each assumption to his company's particular marketing approach and to the strategy decisions already made. To the extent that anticipated future markets, products, and distribution approaches differ from those that gave rise to the studied experience, the pure experience assumptions must be suitably adjusted.

The following list sets forth some of the various assumptions that might be necessary prior to development of a product:

1. Mortality.
2. Persistency.
3. Morbidity.
4. Investment earnings rate.
5. Commissions.
6. Expenses—appropriate values have to be established for marketing and acquisition costs (other than commissions), annual maintenance costs, and overhead. These values are often reflected in unit cost factors (calculated separately for first-year and renewal) on a per policy, per $1,000, and percent of premium basis. (Although generally not reflected directly in the unit cost factors, *developmental expenses* must be considered somewhere in the pricing process. The expected margins in any rate structure must pay back these developmental costs and also produce an acceptable profit return or contribution to surplus.)
7. Taxes—federal, premium, and so forth.
8. Average size.
9. Distribution by age, sex, mode of premium payment, and policy size (by premium, volume, and number of policies, where appropriate).
10. Dividend approach and tentative year-by-year values.
11. Reinsurance costs.
12. Options (such as convertibility and renewability), including rates of election and costs of election.

PHASE 3: DETERMINING PRODUCTS AND PRICES

Even within one specific set of pricing objectives, two actuaries most likely would arrive at two different sets of premium rates for a given plan. Because of the importance of the actuary's professional judgment in the premium formulation process, there is rarely a unique solution to any premium formulation problem. There usually are a number of acceptable premium scales that will sufficiently satisfy the preliminary objectives, and thus frequent interplay is necessary between the actuary and other members of management to discuss the possible alternatives.

Once the actuarial assumptions are set, a number of steps, many mechanical, must be completed before the final products and prices are determined. Although each company probably has its own particular method, the following steps will be present in the procedures of most:

1. Deciding what basis to use for pricing studies (e.g., statutory, GAAP, or combination).
2. Performing pricing studies according to the chosen premium formula using the previously established actuarial assumptions. The additional costs of any special product characteristics, such as extremely competitive settlement option rates, conversion allowances, and the like, should also be reflected at this point.
3. Evaluating the pricing results in terms of company objectives, competition, legal requirements, adequacy and equity requirements, and marketability.
4. Setting final prices (premiums, dividends, and cash values) that meet the objectives.
5. Ensuring consistency within and between plans, ages, occupational classes, and so on.
6. Designing and pricing supplementary benefits and riders.

Steps 3 and 4 involve a considerable amount of judgment, compromise, and reevaluation. The profit, price, and sales compensation goals usually will be balanced and rebalanced several times. Often certain points in the final portfolio will not meet all of the preset profit objectives, although it is important that the portfolio *as a whole* not be compromised with respect to profit goals. Where a company operates in a market and through operations that involve minimal competition, the primary effort often is only one of setting the commissions and prices at reasonable levels. In most cases, however, competition is a material consideration. When, because of competition, desired rate levels *and* profit objectives cannot both be achieved, it frequently is necessary to adjust compensation levels. In such circumstances, it is valuable to compare the profit impact of the lower sales that might result from a high-compensation, uncompetitively priced product with the profit impact of the higher sales that might result from

a more competitively priced product with lower compensation. This type of analysis usually is repeated several times by the actuary in order to balance the varying requirements of management, stockholders, marketing personnel, and policyholders.

Once the final prices and products emerge, the next phase, the design of the management and control systems, is begun. At the same time, the actuary often is involved in the design aspects of sales materials, cost comparisons, cost illustrations, and administrative systems.

PHASE 4: OPERATING AND MANAGING THE RESULTS

The previous section assumes that the company develops its rates on "best-estimate" actuarial assumptions, building in a specific desired margin for profit. Although it is possible to build in a profit implicitly by choosing conservative actuarial assumptions, fewer and fewer companies are relying solely on this approach to price their products.

If the premium scale is developed utilizing realistic actuarial assumptions (including an explicit profit margin), the management of the results is made less difficult. The assumptions underlying the gross premium (or dividend) studies then function as performance standards for the company. The development of projections based on the realistic gross premium assumptions provides a base against which to monitor future experience; decision-making is thereby facilitated.

The details of developing the five-to-ten-year (or longer) forecasts that are required are beyond the scope of this paper. In general, however, the basic forecast procedure might be structured something like this:

1. Establish expected future year-by-year production levels, along with several possible variations both in volume and in the plan/age mix of business.
2. Establish the basic actuarial assumptions for projecting future issues—usually based on the assumptions underlying the gross premiums.
3. Apply the projected future production to the final gross premium rates and other actuarial assumptions, typically using model office techniques. Each profit component should be projected separately in developing the expected future gains and/or losses. Typically such components would include at least the primary Summary of Operations elements—premium income, investment income, reserve increases or decreases, expenses (by major category), and benefits paid (by major type). The projections often are run on several bases, including some combination of the following: statutory basis, GAAP basis, cash-flow basis, and federal income tax basis. An additional basis occasionally used is the "value-added" basis, under which the statutory earnings of a particular year are adjusted by the change in the value of the business on the books (i.e., the present values of future profits) from the beginning to the end of that year.

4. Perform similar projections using *currently* realistic assumptions for the existing block of business.
5. Develop alternate projections under variations in production and also under possible variations in assumptions. These alternative forecasts will enable management to assess the possible range of potential results.

Similar projections would be developed for each line of business. Interest on capital and surplus often is added as a separate item after the projected results for the various lines are combined, since it is difficult to allocate capital and surplus among the company's lines of business; similarly, the federal income tax item and certain developmental or marginal expenses (for example, some "overhead expense" items) might also be projected in aggregate.

Good price management requires systematic comparison of actual with expected results, with action taken wherever possible to rectify any significant deviations from expected results (such action might be a rate increase on an individual health block of business, a revision in a dividend scale, or a new ratebook). The projections described above provide a basis for creating the expected results. A typical price management system will include a periodic *comparison* of these results with the emerging actual experience. Each specific gain and loss component included in the projection will be so compared.

Where significant deviations occur, the *reason* for the deviations must be determined. Additional studies often are needed: for example, if the volume of claims appears high, a detailed mortality or morbidity study will help to pinpoint the particular area or areas where the problem exists. Some common types of adverse results, with typical (illustrative only) reasons for the adverse experience, are set forth in the list below.

1. *High mortality or morbidity*—possibly a result of changes in external variables (e.g., economic conditions cause health insurance claims experience to worsen) or a change to more liberal underwriting.
2. *Poor investment performance*—possibly a result of increased policy loan activity, economic conditions, or changes in investment policy.
3. *High expenses*—possibly a result of inefficient administration, inflation, increases in underwriting costs, an increase in the rate of business issued but not taken, or an increase in the failure rate of new, financed agents.
4. *Premium income lower than anticipated*—possibly a result of poor persistency or a distribution of business by plan and age less favorable than originally assumed.

Where modifications are indicated, the company must determine what changes are required in product, marketing strategy, prices, dividend for-

mula, underwriting, and so on. Such changes should be implemented as soon as possible.

Where the changes cannot be made without creating other unacceptable results (e.g., required premium increases might price the company out of particular critical markets), there may be a need for reassessment of the company's pricing plan.

Once the deviations have been defined and corrective action has been implemented, the process continues on to its next sequence. There is a continuous circle of planning, product review, and experience analysis.

Between full portfolio revisions, a new product often must be added to the existing ratebook. The same general process of clarifying objectives, setting assumptions, and determining prices is followed, although there rarely is the information or time to do a complete analysis for each new product. It is desirable to attempt to price the new product on a basis consistent with the other plans in the existing portfolio.

An additional dimension to the above process exists for the typical one-year-term group policy, since modifications to the gross premium basis may be made both for new business and for the entire in-force block. The group contract permits rate revisions at stated intervals, a right that is exercised more often than not, and opportunities to change rates should not pass by without an experience review and a definite decision to change or to maintain existing rates. This review is particularly vital in the case of medical coverages because of substantial secular trends in both the costs and utilization of services. Sensitivity to economic conditions exists to a lesser extent in other group health coverages. In the case of group life insurance, periodic checks are advisable to determine whether the characteristics of the insured group have changed.

The cyclical process for a typical in-force group case can be described as follows: the initial gross premium is set; the valuation of the liabilities occurs at the end of the year; these liabilities are used in determining surplus to be distributed; the surplus analysis becomes part of the determination of the gross premium to be set for the new policy year just beginning; and so forth. In viewing this continuous cycle, several observations are worth consideration:

1. Corporate strategy may call for premium margins, risk taking, or profit objectives that differ between new and renewal business. The sources and types of information are also necessarily different. Such differences must be recognized and monitored.
2. Additional or revised benefits frequently are added so that the renewal gross premium setting process for a case often becomes a blend of new-business and renewal techniques.

3. Some parts of the cycle frequently are not administered by the actuary. This requires continuous communication between the actuary and other operating departments to ensure that all elements of the cycle are considered on a consistent basis.

The essentials of this cyclical process also apply to many forms of individual health policies, although the right to revise rates is less frequently exercised.

DISCUSSION OF PRECEDING PAPER

HARRY PLOSS:

Mr. Shapiro has written a fine review paper on pricing from a management perspective. It is suitable for the examination syllabus. Mr. Shapiro describes the traditional conflicts and processes that occur instinctively or through conscious planning in the product development process. As the title indicates, the paper assumes that the basic product design, distribution system, and compensation structure have been decided. Only the price and compensation level need to be decided. All the basic strategic planning decisions have been made—at least tentatively.

From a strategic planning/marketing viewpoint, pricing must be tested by three basic criteria.

1. *Cost based:* The traditional actuarial formulas determine price on the basis of profit objectives and cost assumptions.
2. *Market based:* Determine price to optimize profit. A price-versus-sales function is developed. Costs are divided into fixed and variable categories. Profit then becomes a function of price, and we solve for the optimal price.
3. *Income based:* The price maximizes the return on resources. These resources can include capital, field force and contacts, patents and expertise, and low-cost operation.

These three basic criteria can make small, continuous changes in pricing as the differing requirements of management, sales force, shareholders, and policyholders develop a balance as described in the paper. However, in the 1980s there will be many situations where these differing requirements cannot be balanced reasonably, and discontinuous strategic changes will be necessary. Each company must evaluate its strengths and resources to determine how to chart its future course.

For example, some companies will find that their field force is their most important resource. Strategically, these companies are closer to being financial service brokers than straight insurance risk-taking companies. Such companies should consider being brokers for high personal service and commission financial products, such as oil, gas, and real estate tax-shelters, to expand their product line and agent revenue. The syndicating/underwriting expertise of the stockbroker in these areas would not need to be developed unless it were strategically desirable to do so.

Where capital is the primary resource, companies will consider changing their distribution and marketing systems. A differing-requirements deadlock can be resolved strategically by eliminating or changing some of the requirements. More direct marketing alternatives, such as direct mail, payroll deduction, and in- and outgoing telephone sales, are being considered. Insurance is becoming a more important part of other businesses, many of which are acquiring life insurance companies. The lines between stock brokerage, banking, savings and loan, credit card, and insurance companies are blurring. Acquisition activity allows companies to cross these vanishing lines quickly.

When the differing-requirements deadlock becomes particularly severe, discontinuous strategic change will be necessary. It will be difficult for "business as usual" people to develop these alternatives. It was foretold that the Gordian Knot would be untied by the future ruler of Asia. Alexander the Great's solution of cutting the knot with his sword seems easy only in retrospect.

(AUTHOR'S REVIEW OF DISCUSSION)

ROBERT D. SHAPIRO:

I would like to thank Mr. Ploss for taking the time to add his comments to my paper. I set out to describe the pricing process as it would exist within the larger framework of life insurance company planning and management. I agree with Mr. Ploss that there often will be key variables that will be difficult to define, and that modification and compromise often will be necessary in product design, distribution approach, compensation structure, and expected profit levels.

As life insurance companies develop new distribution systems, as well as other financial products and services, the actuary will be challenged to price appropriately within the context of his/her rapidly changing organization. The value of a general planning framework to the pricing process is clear in these situations, which are rapidly becoming the rule instead of the exception.