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PRICES AND PROFITS

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For thou shalt be in league with the stones of the field. . . .

For many years the author has been concerned about such problems as the following:

1. How should competition be taken into account when determining prices?
2. How should profit be allowed for in prices?
3. How should overhead expenses be treated?
4. How can fair and satisfactory earnings be provided for agents?
5. How can the company achieve the best possible profit level for its owners?

Problems such as these, which apply to all classes of business, led to this paper. The subject is considered under the following headings:

I. The Critical Encounter
II. The Theory Outlined
III. Procedure for Determining the Optimum Price
IV. Life Insurance Application
V. The Critical Encounter Revisited
VI. The Need for Doctrine
VII. Conclusion

I. THE CRITICAL ENCOUNTER

A critical encounter, upon which all else depends, occurs in any merchandising situation. This is the encounter during which the prospect considers purchase of the product and reaches a decision. In the life insurance business, this generally takes place as a result of the efforts of an agent and in his presence.

The encounter is extremely important, because all other activities of the organization, and its very existence, depend upon the outcome. An analysis of the critical encounter may throw light on the problems to be solved.

II. THE THEORY OUTLINED

The Game Parable

An approach is found by considering the critical encounter as a three-person game. The players in the game are (1) the company, which seeks to maximize net gain; (2) the agent, who seeks to maximize commissions; and (3) the prospect, who may or may not buy the product, depending on its value to him.

According to the Theory of Games and Decisions, a three-person game is characterized by the formation of a coalition of two of the players against the third. Such a coalition will form if two players realize that the resulting combined payoff will exceed the sum of the individual payoffs from separate play. The payoff to each player is measured in terms of "utility," which consists of anything (monetary or other) which the player considers of value.

There are three ways in which a coalition can form, and they are all seen in the life insurance industry. One is a coalition of the company and the prospect against the agent; an example of this occurs in certain large group cases where an agreement is reached between these two parties to dispense with the commission and the agent altogether! Another is a coalition of the agent and the prospect against the company; an example of this occurs when the agent agrees to "broker the business" (that is, to seek outside bids which may be of help to the prospect, and will increase the agent's chances of receiving a commission, but will certainly damage the company's chances for a successful outcome). The coalition advocated in this paper is the third one—the coalition of the agent and the company.

Strategy of the Coalition

What is the best strategy of the coalition of the agent and company? What strategy promises the greatest combined utility return to the coalition? *That strategy includes the use of the optimum price,* which will now be discussed.

Consider the merchant who sells his goods at cost of production, hoping to "make up for it through volume"; his sales are enormous, but his profit is nil. Now consider the merchant who charges a price ten times that of his competitors, hoping to reap a huge profit; of course, no one buys, and profit is again nil. Neither of these individuals is charging the optimum price. It lies somewhere between these extremes. The situation can be dealt with in mathematical terms.

Let the variable x represent the price. The net cost of production consists of a constant, c, plus an amount, kx, which must be added because of the likelihood that some expenses, such as taxes, will be directly proportionate to the price charged. The factors c and k are determined on the basis of costs and expenses which will occur if the sale is made but will not occur otherwise.

A price x will contain a margin, consisting of the price less the net cost of production:

$$x - c - kx. \; . \; . \qquad (1)$$

Let P_x be defined as the probability that the sale will be made if a price x is charged. Then the margin expectation consists of the margin multiplied by this probability:

$$(x - c - kx)P_x \dots . \qquad (2)$$

The optimum price is that which maximizes this quantity.

The margin expectation involves c and k, which are cost and expense items that will occur if the sale is made but will not occur if the sale is not made. Consequently, c and k do not contain any allowance for overhead or profit. Apparently, then, the optimum price is absolutely independent of the company's overhead situation and its profit desires. If overhead and profit are not to be included directly in prices, then how are they to be secured? They are to be secured in the only logical way—by requiring the sales-attempt quota necessary for success. This point will be discussed later.

The Compound Sales Attempt

The agent often finds during a sales interview that the first product which he offers is rejected. He then offers another product and continues in the same manner until a product of some sort is bought or the entire attempt is abandoned. This phenomenon is treated by considering each separate step in the process as a separate encounter. In other words, as soon as the prospect rejects one product, he may immediately become a new prospect for a different product, and so forth.

In a life insurance sales situation, several plans and/or amounts may be offered by the agent and considered by the prospect. Each plan-amount combination is considered a separate encounter.

Necessity of Averaging

It is clear that there must be a myriad of optimum prices. Such prices may vary not only by product but according to the prospect's willingness to buy and the agent's sales ability. There may be, in fact, a separate and distinct optimum price for every separate sales encounter. This pure form of pricing is not often found in the life insurance business. However, there is reason to think that individually determined prices, believed to be optimum, are frequently quoted for large group insurance prospects; such prices may be in the form of premium rates themselves or in the form of "retention estimates."

In the main, however, it is necessary in any business to use the average c, k, and P_x values which can be ascribed to practical groupings of the products offered.

Implications of the Optimum Price

It is seen that the optimum price is that which maximizes the margin expectation.

The probability function to be used, P_x, can be selected according to either short-range or long-range considerations. It seems to the author, however, that the P_x function must be considered appropriate for at least the whole of the future sales period during which the price will be used. Clearly, then, the optimum price should not be one which implies an attitude of "price gouging" or an attempt to "charge what the traffic will bear"; any such attempt might seem successful for early encounters but would so discourage the public that sales results over the whole period would be most unsatisfactory. The optimum price is a golden mean which maximizes the total margin expectation for all future sales encounters.

Anything which tends to raise the margin expectation is seen to be of value. This includes any means of reducing the net cost of production (i.e., of lowering c and/or k). It also includes any means of increasing the probability of sale (P_x). The probability of sale can be increased in many ways. Attractive product design, sales aids, agent-training, and advertising are seen to be valuable for this purpose.

Division of the Margin between Company and Agent

The coalition against the prospect will firmly hold together only if the company and the agent can agree on a fair method of dividing the maximized margin which has resulted from the coalition's formation. This agreement should result in a commission method which is as fair as possible to the field force and a sales-attempt quota which will assure the company that its overhead will be covered and its profit desires met. It is obvious then that a strong element in the method of division is the number of sales attempts being made in a given period (or to be more accurate, the potential margin contained in such sales attempts).

Under the usual marketing method (commonly referred to as the American Agency System) the agent is normally required to (*a*) find the prospect; (*b*) "qualify" him, to determine that he represents sufficient potential margin expectation; (*c*) persuade him to be interviewed (i.e., bring him to the critical encounter); and (*d*) make the sales attempt.

The author's paper "Prices and Commissions Based on the Theory of Games," which appeared in the June, 1966, issue of the *Journal of Risk and Insurance*, attempts to determine a method of dividing the margin by treating the situation as a "two-person co-operative game."

That game is played between the entire sales force and the company.

As in all games, both sides have strategy selections to make. The game has in view the immediately ensuing calendar year (for which overhead can be closely estimated). Four important principles arise from a consideration of such a game, and they will now be discussed.

1. The strategies of the sales force consist of agreements to seek various sales-attempt quotas. A sales-attempt quota is measured in terms of the margin expectation contained in it; it consists of finding the necessary number of prospects, "qualifying" them to determine that they represent the margin expectation sought, bringing about the critical encounters, and attempting to make the sales. These are the functions which are in the control of the agent. Note that bringing about sales is not within his control (although it may be assumed that actual sales will, on the average, approximate to the sales-attempt quota involved).

2. The strategies of the company consist of the offering of various commission rates. Such commission rates are expressed in terms of percentages of the margins in actual sales made. This means that all products are commissioned in proportion to the actual margins which they bring to the coalition. (However, commissions may be re-expressed as percentages of price to conform to custom.)

3. The role of commission is not to raise the likelihood of sale, P_x; indeed, the salesman will do his best to make the sale, once he has a live prospect in front of him, whatever the commission is, as long as it is reasonable. *The real role of commission is to encourage the agent to find a prospect for the particular product involved and to bring him to the critical encounter.* A low commission rate often discourages the agent from even finding a prospect, but it does not prevent him from trying his best to make the sale, if he does determine to find one.

4. There is a "principle of diminishing utility." The author, and others, have often noticed the extreme difficulty in bringing about really dramatic increases in sales results, despite the offering of many different inducements. This appears to be due to the principle of diminishing utility. It is believed that the agent attaches "difficulty" (i.e., negative utility) to the finding of a sales-attempt quota and that this difficulty increases approximately according to the square of the sales-attempt quota involved.[1]

[1] This can most easily be demonstrated in the simple case where only one product is offered for sale. Suppose that the "difficulty" of finding and interviewing one prospect is D, if one year is allowed for this job. Now suppose that the required quota for a year is N prospects; this allows $1/N$th of a year, on average, to find each prospect. The difficulty of finding a prospect can be assumed to be inversely proportionate to the time allowed. (The job would be a virtual impossibility in one second but would almost be

For example, if the quota for a year is doubled, the agent will attach not twice but four times as much difficulty to the finding of it. (He will attach twice as much difficulty if he is given *two* years to find it.) Furthermore, income taxes cut into additional moneys received (whether received by way of higher commission rates or higher quotas). In any event, all human beings probably attach less than proportionate importance to a net increase in income received. As the sales-attempt quota is raised, the agent may for a while attach greater utility to its outcome; however, because of the principle of diminishing utility, he will eventually attach less utility to its outcome, despite the higher monetary reward resulting.

The author's paper "Prices and Commissions Based on the Theory of Games" seeks to resolve this situation by treating it as a "two-person co-operative game," in which the individuals eliminate all strategies which are senseless to both of them and finally use the services of an impartial arbitrator to examine the remaining strategies and to arrive at a commission rate which is as fair as possible to the sales force and a sales-attempt quota which is as fair as possible to the company, taking account of all realities. The suggested final result is a commission rate of 45 per cent of the present value of margins secured and a sales-attempt quota of $4,500,000 for the particular company involved (measured in present value of margin secured).

Implications of the Sales-Attempt Quota

The sales-attempt quota is an important concept of this paper, and it deserves further comment.

The sales-attempt quota is not a "sales quota" in the normally accepted sense. Rather, it is a "prospect-seeing" quota. An agent cannot guarantee to make sales; he can, however, undertake to see prospects. The quota is measured in terms of the margin expectation contained in the prospects.

Use of the optimum price makes the job of the sales force easier in securing a given sales-attempt quota, because each prospect will be valued at a maximum in potential margin content.

Actual sales volume flows and results from the sales-attempt quota. Contrary to common opinion, alteration of price does not of itself lead to an alteration in sales volume; sales success depends on sales attempts.

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automatic in a very lengthy period, such as ten years, because some prospects arise of their own volition.) Consequently, if the difficulty is D in the case where one year is allowed, then it is $D/(1/N)$ in the case where only $1/N$th of a year is allowed. Finally then, the difficulty of finding all N prospects during the year is $N[D/(1/N)] = N^2D$.

Every effort should be made to consider the sales-attempt quota (for a given period) as binding[2] on the field force, just as the commission rate should be binding on the company. As a practical matter, the sales-attempt quota should be set at a relatively low level to help assure that it will be met. This leads to the possibility that a commission bonus could be paid if the sales-attempt quota is exceeded.

Summary of the Theory

To further their best interests, the agent and the company should form a coalition.

There is a best price; it is the one which gives the largest possible expectation of securing margin over net cost of production. Margin is crucial because it covers overhead and generates sales commission and profit. Sales commissions are not to be included in net cost of production. Rather, they are to be a portion of margins secured. The company agrees to give the sales force, as commission, a certain portion of margins secured, and the sales force agrees to a sales-attempt quota. This portion and this quota are fair to both parties, considering all realities.

Overhead and profit are not to be included in net cost of production. Overhead can be covered, and adequate profit secured, only by the achievement of sufficiently large sales leading to sufficiently large margin results. The sales-attempt quota seeks to bring this about.

The ideas presented are believed to be applicable to any product which is sold. The sales attempt may, however, take on different forms, depending on the type of product involved. These can vary from mere display, such as in the case of vending-machine and supermarket operations, to face-to-face sales interviews, as in the case of life insurance.

III. PROCEDURE FOR DETERMINING THE OPTIMUM PRICE

This paper contains an attempt to produce a more realistic model of how prices are finally determined in practice. The next few pages contain the only material in the paper of a mathematical nature. This is not an esoteric mathematical exercise; it describes the model and shows how optimum prices can be obtained with greater precision.

The optimum price is to be determined by maximizing the function

$$(x - c - kx)P_x \ldots . \qquad (2)$$

The probability of sale, P_x, may sometimes be ascertainable across a sufficient range of x from actual sales results. This will not often be the

[2] The Theory of Games, when considering a "two-person co-operative game," requires that the strategies of each player be considered as binding.

case, however. The following analytical method is suggested as a means of procedure:

Let

$_1p_x$ = the absolute probability of sale = absolute probability that the prospect will have an inherent willingness to buy the product at price x, if it is presented to him by a person with the sales ability of the salesman. This probability takes account of all the pressures on the prospect to decline the company's product in favor of some entirely different type of product (e.g., to buy a television set instead of life insurance). It is not an independent and innate characteristic of the prospect but is dependent on the relationship between the prospect and the salesman.

$_2p_x$ = the probability of competition = probability that the company's product, if offered at price x, will encounter competition offering the same type of product (e.g., life insurance of any sort) during the course of the sales attempt. Competition may be encountered from one or more competitors.

$_3p_x$ = the probability of control = probability that the prospect will prefer the company's product offered at price x over the products of all competitors that are encountered, at whatever prices the competitive products are offered. This probability may well be large if x is less than any competitive price but could be greater than zero even if x is greater than any competitive price.

P_x is equal to the probability of sale if no competition is encountered, plus the probability of sale if competition is encountered.

$$P_x = (1 - {}_2p_x)\,{}_1p_x + {}_2p_x \cdot {}_1p_x \cdot {}_3p_x\,. \qquad (3)$$

The three probabilities must therefore be measured separately.

In determining $_1p_x$, the absolute probability of sale, assume that (1) $_1p_x = 1$, if the price x is zero, and (2) $_1p_x = 0$, if the price x is infinite.

If it can be stated that $_1p_x = a$, where $x = \phi$ (which is referred to as the pivotal price), then a function possessing these properties is

$$_1p_x = a^{(x/\phi)^l}, \qquad \text{where } l > 0\,. \qquad (4a)$$

Thus, it is possible to determine or to estimate $_1p_x$ for every x, if it is possible to determine or to estimate the absolute probability of sale at the pivotal price ϕ and if a suitable value is available for the parameter l.

The parameter l controls the slope of the curve of $_1p_x$. From the differential calculus, it is known that the derivative of expression (4a) is

$$a^{(x/\phi)^l} \log_e a \cdot l\,\frac{x^{l-1}}{\phi^l}. \qquad (4b)$$

At the privotal price, where $x = \phi$, the value of this derivative (in other words, the slope of the graph at this point on the curve) is

$$\frac{al \log_e a}{\phi}. \qquad (4c)$$

The slope at $x = \phi$ can, of course, be made steeper (i.e., made more negative) by increasing the parameter l.

Estimation of a (the absolute probability of sale at the pivotal price) should be within the realms of reason; furthermore, if any estimate of the slope is available, it may be put equal to expression (4c), which may be solved to secure a suitable value for l.

In all cases where $0 < a < 1$, function (4a) has a slope equal to zero, where x is infinite, provided that l is greater than zero. This is a very desirable attribute, because it is reasonable to believe that the absolute probability of sale must be very small indeed where x is exceedingly large, although not infinite.

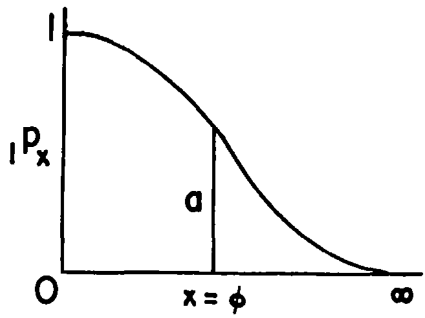


Fig. 1

Furthermore, the slope is zero where x is zero, provided that l is greater than 1. This again is a desirable attribute, since the absolute probability of sale must be very close to 1 where a negligibly small price is offered. In such cases, then, expression (4a) is of the general form shown in Figure 1. This curve resembles the "demand curve" known to economists.

In the minor portion of the range, where $0 < l \leq 1$, the slope is not equal to zero where x is zero. Although a zero slope seems desirable at this point, it is felt that l can still be allowed to take on values in this portion of the range; for practical purposes, the values of $_1p_x$ entering into calculations never approach the area near $x = 0$.

It is now necessary to determine $_2p_x$, the probability of competition. This probability is assumed equal to d where $x = \phi$ (the same pivotal price made use of above). It can be speculated that more competition will be encountered if the price x is raised and less if it is lowered. Competitors will be more aggressive if they know the company has a high price, and vice versa; also, the company's customers may have more intuitive desire to invite competition if its price is high, and vice versa. Going to the extremes, it can perhaps be assumed that (*a*) if the company's price is 0, there will be no competition, and ${}_2p_x$ would equal 0 (all competitors will be driven out of business); (*b*) if the price is infinite, there will always be competition, and ${}_2p_x$ would equal 1.

A curve possessing these properties is

$$ {}_2p_x = 1 - (1 - d)^{(x/\phi)^m}, \qquad \text{where } m > 0 . \qquad (5)$$

This curve is the opposite of curve (4a) and has the general form shown in Figure 2, where d is less than 1. (The slope is not zero at $x = 0$ in the minor portion of the range where $0 < m \leq 1$, although it is zero for any larger m.) Again, the slope at $x = \phi$ can be made steeper by increasing m.[8]

For purposes of determining ${}_3p_x$ (the probability of control), assume the following: (1) ${}_3p_x = 1$, if the price is zero, and (2) ${}_3p_x = 0$, if the price is infinite.

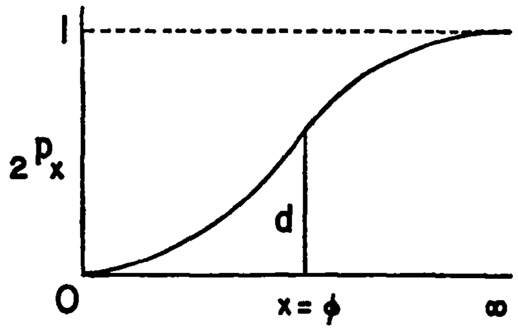


FIG. 2

If ${}_3p_x = j$ where $x = \phi$ (the same pivotal price used above), then a curve possessing these properties is

$$ {}_3p_x = j^{(x/\phi)^n}, \qquad \text{where } n > 0 . \qquad (6)$$

This curve has the same form as that of ${}_1p_x$. Its slope where $x = \phi$ can be made steeper by increasing n. As in the case of ${}_1p_x$, the same considerations regarding slope at $x = 0$ apply to the minor portion of range where $0 < n \leq 1$.

Putting these functions into equation (3), the following is obtained:

$$ P_x = (1 - d)^{(x/\phi)^m} a^{(x/\phi)^l} + [1 - (1 - d)^{(x/\phi)^m}] a^{(x/\phi)^l} j^{(x/\phi)^n} . \qquad (7)$$

If $(1 - d) = f$, this simplifies to a slightly more convenient form, and, if this is substituted for P_x in formula (2), the formula for the margin

[8] A value of $m = 0$ may possibly be admissible. This is the simple case in which ${}_2p_x = d$ for all values of x.

expectation, the x being sought is that x which maximizes the function

$$(x - c - kx)[a^{(x/\phi)^l} f^{(x/\phi)^m} + a^{(x/\phi)^l} j^{(x/\phi)^n} - a^{(x/\phi)^l} f^{(x/\phi)^m} j^{(x/\phi)^n}] . \quad (8)$$

Function (8) contains three parameters—a, f, and j—which govern the values of the three separate probabilities into which P_x has been broken, and three additional parameters—l, m, and n—which govern the slopes of these separate probabilities. Consequently, function (8) is a model of very considerable generality. If the six parameters are known, or can be estimated, electronic computers may be used to maximize function (8) by a trial-and-error process, so that the optimum price may be discovered.

Comments about the Pivotal Price

Function (8) makes use of a pivotal price, ϕ. The best pivotal price is a frequent competitor's price or the average of the prices charged by frequent competitors. The six parameters can be estimated with less difficulty if a competitive price is used for ϕ. (For example, the probability of controlling competition should be .50 if there is only one competitor, and the price and other conditions are the same).

If a competitive price cannot be used, the price presently being charged may be used, if the product is now on the market. In such circumstances, it may be possible to determine a, f, and j fairly accurately by studying sales attempts, competitive encounters, and sales results.

Other possible pivotal prices would include prices calculated by "orthodox" means.

The Graph of the Margin Expectation

It is rather interesting to graph the margin expectation (function [8]) for various values of x. This has been done in Exhibit I. The case shown is that of the annual premium per thousand for a $25,000 whole life policy issued to a male who is age 35 last birthday, and the input for function (8) is as follows:

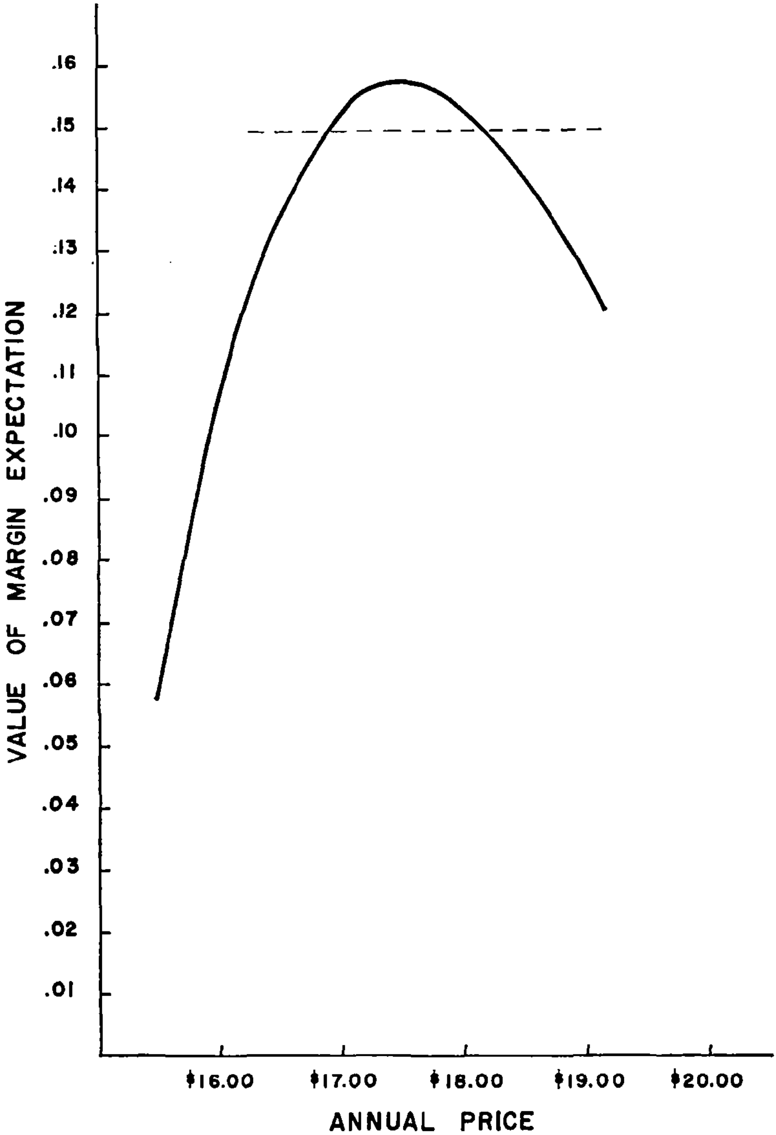
$c = 13.13$	$k = 0.127$
$\phi = 18.05$	$\ddot{a} = 12.31$*
$a = 0.075$	$l = 2$
$d = 0.400$	$m = 4$
$j = 0.450$	$n = 10$

* The function $\ddot{a}$, which is used to determine the present value of margin, is simply the present value of an annuity of $1, taking into account all the assumptions used to calculate c (i.e., age, plan, mode, mortality, morbidity, interest, and persistency) but not including any allowance for expenses. The present value of margin is obtained by multiplying $\ddot{a}$ by the quantity $(x - c - kx)$.

The optimum price works out to be $17.55 per thousand.

EXHIBIT I

GRAPH OF THE MARGIN EXPECTATION



NOTE.—For a $25,000 whole life prospect, male age 35 last birthday. Value shown is margin expectation contained in each annual per thousand price. The optimum price is $17.55 per thousand.

Portion of graph above dotted line is price plateau.

Discovery of the Plateau

Any graph of the margin expectation reveals that there is a considerable range in which the price is optimum for all practical purposes. Such a range is known as the price plateau. In this paper the price plateau has been defined as the price range within which the margin expectation is at least 95 per cent of its maximum.

The plateau, which ranges from $16.92 to $18.24 in the example shown in Exhibit I and is of comparable width in other examples, seems to indicate that pricing is not nearly as exact as previously supposed. Indeed, there are other indications of this; for example, there seems to be little or no correlation between the growth of companies and their price (e.g., net cost) positions. (As an aside at this point, the sales-attempt quota is much more likely to influence company growth.)

Where examples are worked from function (8), it is recommended that they be obtained for the low of the plateau, the optimum, and the high of the plateau.

Allowable sales commissions will vary considerably from the low of the plateau to its high. Sales commission for the example has been taken as 45 per cent of the present value of margin; the results vary from 54 per cent of annual premium at the low of the plateau ($16.92) to 69 per cent at the optimum ($17.55) to 85 per cent at the high of the plateau ($18.24). These commission figures include all fringe benefits triggered by commission payments and all sales commissions payable to supervisory personnel. However, they do not include servicing commissions.

The existence of the plateau, and the difference in commission across its range, seem to give considerable room for judgment in the determination of specific price and commission rates; such judgment has always been used, of course, as a matter of historical fact. There seems to be considerable room within which a company can decide to be a "high-cost, high-commission company," a "low-cost, low-commission company," and so on.

Selection of the Parameters

Formula (8) contains six parameters. Three of them (a, f, and j) control the absolute probability of sale, the probability of encountering competition, and the probability of controlling competition. It may not be too difficult to obtain information about these three parameters, at the pivotal price ϕ, either by experimental or other means. The other three parameters (l, m, and n) control the slopes of the three probability functions. Information about l, m, and n may be more difficult to obtain.

In some cases it may be possible to obtain estimates of the changes in

a, f, and j that will be caused by a \$1 increase in the price, ϕ. Such estimates can be obtained, for example, by a common procedure known as "consensus of informed opinion." The estimates can be considered as, and put equal to the formulas for, the slopes of the three applicable functions. For example, the estimated change in a, caused by a \$1 increase in the price ϕ, would be put equal to expression (4c), as previously determined:

$$\frac{al \log_e a}{\phi}. \qquad (4c)$$

This, can, of course, be solved to obtain a value for l.

Appendix I of this paper refers to another possible method. It contains certain instructions and tables and is designed to be of assistance in the selection of values for l, m, and n.

If the realities of a particular product and sales situation are kept clearly in mind, it seems entirely possible to assign realistic values to all six parameters. In any event, there is considerable room for inaccuracy, because of the width of the price plateau which emerges. Furthermore, the final result is far more affected by the known quantities c and k than it is by the six parameters.

The Pricing Tables

The optimum price, and the high and low of the plateau, are normally found by maximizing function (8) and by finding the points which cause it to be 95 per cent of its maximum. This is an extremely tedious process if done manually but can easily be done by electronic computer.

Computer time is seldom available on a moment's notice. Tables have therefore been constructed to facilitate easy manual application. Each such table is suitable only for a single combination of the six parameters (a, d, j, l, m, and n) but has the important advantage of being good for any c, k, and ϕ.

Several pricing tables are shown in Appendix II of this paper, together with a complete description of their method of derivation and instructions for their use.

IV. LIFE INSURANCE APPLICATION

To this point, the ideas apply to any product—automobile, television, home mortgage, cigarettes, or life insurance. Special life insurance uses will now be explored.

To review, the optimum price is that value of x which maximizes function (8):

$$(x - c - kx)[a^{(x/\phi)^l} f^{(x/\phi)^m} + a^{(x/\phi)^l} j^{(x/\phi)^n} - a^{(x/\phi)^l} f^{(x/\phi)^m} j^{(x/\phi)^n}]. \qquad (8)$$

The price plateau is that price range for which function (8) is at least 95 per cent of its maximum.

Before discussing the application to life insurance in detail, it will be necessary to consider two special topics—"The Installment Product" and "The Role of the Mutual Company."

The Installment Product

Many products are paid for in installments, sometimes extending over a very lengthy period of time. Life insurance is an example of such a product. How are these theories affected by installment prices?

Life insurance is usually sold on the basis of fixed-level installments, and the sale is made on the basis of a particular frequency mode, such as monthly, annual, and so on. The illustrations shown in this paper are based on the particular installment prices involved; for example, an optimum monthly price is obtained by maximizing the margin expectation in a monthly installment, an optimum annual price is obtained by maximizing the margin expectation in an annual price, and so forth.

Once the optimum installment price has been obtained, the margin in it $(x - c - kx)$ is then determined; the present value of all margins is then determined by multiplying by the factor $\ddot{a}$, which has already been described. It is this present value which is used to determine the sales commission. (In the illustrations, the sales commission is 45 per cent of this present value.)

Life insurance pricing is of an installment nature. This fact has other implications, and the matter will again be discussed later in the paper.

Role of the Mutual Company

The ideas presented in this paper seem to apply with special force to the operations of the stock company. But do they also apply to the mutual company? At any given time, the mutual company is owned by its then policyholders. Such a company could discontinue the writing of new business; it would thus save its expenditures which are devoted to the writing of new business and would make all present and future emerging surplus available to its then owners. This course of action can be considered illogical only if the continued writing of new business is judged to be of greater advantage to the owners. Furthermore, it should be the duty of management to see that such new-business operations are carried out in the *best possible* interests of present policyholders. The theories relating to optimum price, sales-attempt quota, and commission determination would seem to be in the best interests of present policyholders. These ideas might call for revisions in traditional dividend-calculation methods.

Method of Determining c

The quantity c is based on those costs which will occur if the sale is made but will not occur if the sale is not made.

It contains provisions for any mortality, morbidity, endowment, annuity, and surrender benefits promised by the policy. It is appropriately discounted for interest, and the persistency factors appropriate to the age, plan, and mode are incorporated in its calculation. However, it does not contain any provision for profit, overhead, sales commission, or percentage expense (which is provided by the factor k).

If the product is participating, there are two possible courses with regard to dividends:

a) If dividends are not being illustrated, the quantity c should contain nothing for dividends; it will, in fact, be the same as if the product were nonparticipating. However, the prospect of dividends will undoubtedly affect the size and slope of the probability of sale, P_x, in such a way as to bring about a higher price than that in the nonparticipating case.

b) If dividends are being illustrated (and this is nearly always true), a strong case can be made for their inclusion in the quantity c, just as if they were contractual payments. As a practical matter, the buyer places considerable reliance on the receipt of the dividends that have been illustrated to him; furthermore, the company has every intention of doing its best to provide these dividends, at least.

Several excellent papers have been published in the *Transactions* on the subject of nonparticipating premium rates. The quantity c would be calculated by methods outlined in such papers but taking into account, of course, the specifications laid down above.

It is well to note at this point that some products, both participating and nonparticipating, appear to be sold on the basis of "net cost," which is the premium outlay minus the benefit receipt (including dividends, if any). The rules for calculating such net costs are often quite illogical; furthermore, they seem to involve the assumption that the buyer cares nothing about the absolute size of the premium. Nevertheless, it would appear that some business is sold almost totally on the strength of net cost. This may be particularly true in some phases of the group insurance business, where the label "retention" is usually applied to net cost. Where business is sold on the basis of net cost, the object will be to determine optimum net cost.

Method of Determining k

The factor k represents expenses which are proportionate to the premium charged and will occur only if the business is sold. In the examples shown later, this is taken to mean premium taxes and servicing commissions (including servicing commissions paid to supervisory personnel). Servicing commission is deemed to be payable both in first and renewal years. Consequently, what is normally thought of as "first year commission" consists of the servicing commission plus the sales commission, which has already been discussed at length.

The quantity $c/(1 - k)$ may be thought of as the company's "break even price."

General Expense Factors

It has been explained that the quantity c contains all benefit costs plus those expenses, other than sales commission and direct percentage expenses, which will occur if the business is sold (but will not otherwise occur). The expenses to be contained in c will now be examined.

There are certain direct expenses which are triggered by the sale, such as medical and inspection fees, postage, and the inventory value of certain supplies used up in the course of the sale and policy issue; such items must be included in c. These are relatively minor; they are all first-year items and make up only a small part of the general expense charges included in c.

An insurance policy is a long-range contract. The company must make provision for its administration during its entire lifetime. Consequently, the phrase "expenses which will occur if the business is sold" must be interpreted to include adequate provision for the administration of the policy in every necessary respect during its entire lifetime. Expense charges of this nature would not, however, include any amounts designed to allow the company to write other business; expenses of that nature are designated as "overhead" in this paper.

The general expenses referred to in the last two paragraphs are to be included in c and are designated in this paper as "functional expenses." Functional expenses may be viewed in three different, but analogous, ways. Apart from the minor expenses referred to above, they are the following:

a) The company's remaining general expenses, if all the expenses related to the maintenance of new business facilities are completely removed.

b) The expenses which the company would continue to have were it to go out of the new-business market permanently and simply devote itself to the administration of existing business.

c) The expenses which would be incurred by another similar company, to which the business has been sold. Sale of the business to another equally reputable company is, indeed, one of the ways in which future administration can be assured; and the other company would be fully justified in treating such purchased business as a closed block, independent of its own new-business activities.

The phrase "expenses which will occur if the business is sold," that is applied to functional expenses, thus turns out to have a curious double meaning. If the break-even price, $c/(1 - k)$, is actually charged, and if such business is transferred to another carrier, such carrier would be expected to pay for it only the unamortized portion of the excess first-year functional expenses; such carrier would then be able to realize no profit or loss on the business, other than return of that purchase price with interest, assuming, of course, that mortality and other assumptions turn out as anticipated in the calculations. Any excess price, over and above the break-even level, forms the framework for determining the value of such business for sales purposes.

The actual determination of functional expense rates is not quite as arbitrary as the corresponding determination of conventional expense rates, because the allocation of sales related expense is not involved. Some arbitrary allocation is still inevitable, however. Table 1 shows a comparison of conventional and functional expense rates that are considered appropriate for a combination company which is only somewhat hypothetical. These factors are shown for illustrative purposes; no claim is made that they are suitable for other companies.

Both sets of expense rates duplicate the company's actual expenses,

TABLE 1

EXPENSE FACTORS*

	Conventional		Functional	
	First Year	Renewal	First Year	Renewal
Industrial life:				
Per policy	3.69	.70	.97	.61
Per $1,000	2.54	.30	.265	.265
Per cent of premium	31.2%	25.1%	25.1%	25.1%
Monthly debit ordinary life:				
Per policy	13.83	4.12	1.92	1.47
Per $1,000	4.03	.63	.44	.44
Medical and inspection costs	See Table 2	Nil	See Table 2	Nil
Per cent of premium	38.0%	15.5%	15.5%	15.5%
Regular ordinary life:				
Per policy	29.62	6.10	8.20	4.47
Per $1,000	2.65	.40	.32	.32
Medical and inspection costs	See Table 2	Nil	See Table 2	Nil
Per cent of premium	36.4%	12.7%	12.7%	12.7%
Overhead	Nil		$ 5,300,000	
Total expenses accounted for	$21,000,000		$21,000,000	

* These factors account for general expenses, taxes, and all servicing commission.

after appropriate exposure units are applied. To do so, however, the functional set requires the inclusion of "overhead," which emerges as a single figure applicable to the company's entire operation. The expenses accounted for include all general expenses, taxes, and servicing commissions, both first year and renewal.

The quantity c, as defined in this paper, includes functional expenses of the type shown in Table 1 under the designations "Per policy," "Per $1,000," and "Medical and inspection costs." The factor k consists entirely of functional expenses such as those designated "Per cent of premium."

TABLE 2

MEDICAL AND INSPECTION EXPENSE FACTORS PER POLICY

Age at Issue	Monthly Debit Ordinary Life	Regular Ordinary Life	
		Below Nonmedical Limit	Above Nonmedical Limit
0–10	$ 1.50	$1.77	$13.59
11–20	1.75	2.04	13.59
21–30	3.50	3.84	13.59
31–40	4.00	4.42	13.59
41–45	8.00	....	16.00
46–55	11.50	....	16.00
56 and over	13.50	....	16.00

Measurement of the Probability of Sale

It will be recalled that the probability of sale is measured by the use of six parameters. Three of these parameters (a, d, and j) reflect the absolute probability of sale, the probability of encountering competition, and the probability of control. The other three parameters (l, m, and n) control the slopes of a, d, and j.

The author discovered that very little reliable information was available in industry circles, or anywhere else, on the subject of "closing ratios" or of competitive encounters. This is surprising in view of the importance of the critical encounter to the operation of life insurance companies.

As a result, a survey was conducted by the field force of Life Insurance Company of Georgia, a combination company engaged in all phases of individual and group insurance. The results of that survey are shown in Table 3. The survey was made by use of a questionnaire, a copy of which is shown in Appendix III. Table 3 shows, for the sales attempts made, the number for which competition was reported and the number of sales made. The results, which are quite interesting, vary considerably according to the type of business.

A survey of this type can be expected to contain some underreporting of the following kinds: (*a*) failure to report some interviews, particularly unsuccessful ones; (*b*) failure to report the existence of competition (this may occur because the agent may not always know that competition exists); and (*c*) failure to report all the plans and amounts which are attempted. This last failure may be fairly prevalent. As will be recalled, the successive presentation of various plans and/or amounts constitutes a "compound sales attempt," and each separate step in this procedure is

TABLE 3

COMPETITION AND CLOSING RATIOS

	Sales Attempts	With Competition		Sales	
Weekly premium	827	9	1%	387	47%
Monthly debit ordinary:					
Juvenile	108	7	6	56	52
Adult	790	65	8	198	25
Regular ordinary:					
Small (<$180 A.P.)	119	9	8	36	30
Medium ($180–$250)	134	19	14	8	6
Large (>$250)	96	11	11	6	6
Grand total	2,074	120	6%	691	33%

considered a separate sales attempt. As a matter of interest, the 2,074 sales attempts reported in Table 3 arose from 1,825 actual interviews, the great majority of which were reported in terms of only one plan and amount.

If underreporting were not present, the ratio of cases with competition to sales attempts, from Table 3, would approximate the parameter d, applicable if the present price is taken as the pivotal price. Similarly, the ratio of sales to sales attempts would approximate to $P_\phi = [a(1 - d) + adj]$. Table 3 gives very little information from which j can be estimated. However, for the 120 cases on which competition was reported, the closing ratio was 23 per cent, compared with 34 per cent on the 1954 noncompetitive cases.

Using this information at hand, the author and his colleagues assembled values for the parameters a, d, and j. This was done after due consideration for the underreporting involved in Table 3 and after taking account of whatever informed judgment was available. Values of the parameters l, m, and n were also assembled, by the "consensus of informed opinion" method. The results are thought to represent conditions reasonably well for the sales operations of Life Insurance Company of Georgia and are shown in Table 4.

The author's main purpose is to indicate the procedure followed. No claim is made as to the accuracy of the value shown; this is especially true concerning possible application to the operations of other companies.

TABLE 4

Type of Business	Parameter Set	a	l	d	m	j	n	P_ϕ
Weekly premium life insurance	1	.250	.9	.05	3	.50	5	.244
Monthly debit ordinary life insurance:								
Juvenile	2	.250	.9	.20	3	.50	5	.225
Adult	3	.150	1.0	.15	3	.50	6	.139
Regular ordinary life insurance:								
Small	4	.250	1.0	.20	3	.50	6	.225
Medium	5	.075	1.4	.25	3	.40	7	.064
Large	6	.060	1.8	.30	4	.40	10	.055
Group life and health insurance	7	..850	3.0	.95	2	.25	12	.244

NOTE.—This table shows:
a, the absolute probability of sale at the pivotal price ϕ, and l, a parameter controlling its slope;
d, the probability of encountering competition at the pivotal price, and m, a parameter controlling its slope;
j, the probability of controlling competition at the pivotal price, and n, a parameter controlling its slope; and
P_ϕ, the probability of sale at the pivotal price, being equal to $[a(1 - d) + adj]$.
In all cases, the parameters have been selected on the assumption that the pivotal price is equal to the company's present price.

Table of Examples

Table 5 shows certain examples based on monthly debit ordinary insurance and regular ordinary insurance. (The monthly debit ordinary plans contain the following supplementary benefits: accidental death, travel accident, specific losses, waiver of premium disability benefit, and guaranteed insurability option.) These results are shown merely to illustrate the method; they are, of course, dependent upon all the various estimates and judgments that have been made.

The commission results are based on 45 per cent of the present value of all future margin and are expressed as a percentage of one year's premium. The commission figures shown in the table do not include the servicing commission, which would be payable both in the first year and subse-

TABLE 5

Selected Examples

Plan	Age Last Birthday	Amount	c	k	ϕ	$\ddot{a}$	Parameter Set	Calculated Functional Premiums per Thousand and Sales Commission: Low — Price	Low — Commission	Optimum — Price	Optimum — Commission	High — Price	High — Commission
Monthly debit ordinary:													
Life paid up at 65.......	5	$ 1,000	$ .57	.155	$ 1.11	$82.16	2	$ 1.07	96%	$ 1.19	113%	$ 1.33	128%
Whole life.....	25	1,000	.98	.155	1.71	70.49	3	1.65	66	1.81	80	2.00	94
	35	1,000	1.39	.155	2.35	75.16	3	2.30	68	2.53	83	2.79	98
	45	1,000	2.12	.155	3.40	74.72	3	3.43	64	3.75	78	4.14	93
	55	1,000	3.23	.155	5.31	73.34	3	5.29	64	5.79	79	6.38	93
Regular ordinary (annual premium):													
Whole life.....	25	5,000	9.08	.127	14.39	9.92	4	14.65	113	16.01	137	17.65	160
		10,000	8.59	.127	13.14	10.38	4	13.62	113	14.86	138	16.38	163
		25,000	8.46	.127	12.39	12.27	6	11.20	65	11.71	83	12.27	101
	35	5,000	13.75	.127	20.05	10.40	4	21.33	107	23.21	131	25.59	157
		10,000	13.26	.127	18.80	10.76	5	18.02	66	19.01	85	20.18	105
		25,000	13.13	.127	18.05	12.11	6	17.03	56	17.70	72	18.47	88

TABLE 5—*Continued*

Plan	Age Last Birthday	Amount	c	k	ϕ	$\ddot{a}$	Parameter Set	Calculated Functional Premiums per Thousand and Sales Commission					
								Low		Optimum		High	
								Price	Commission	Price	Commission	Price	Commission
Regular ordinary (annual premium):													
Whole life....	45	$ 5,000	$21.78	.127	$ 29.30	$10.05	4	$ 32.70	94%	$ 35.50	117%	$ 39.18	143%
		10,000	21.20	.127	28.05	10.32	6	27.18	43	28.17	56	29.32	70
		25,000	20.99	.127	27.30	11.27	6	26.78	45	27.72	59	28.84	74
	55	5,000	34.63	.127	44.99	9.01	5	45.91	48	48.18	63	50.98	79
		10,000	34.06	.127	43.74	9.21	6	43.30	36	44.80	47	46.57	59
		25,000	33.92	.127	42.99	9.89	6	42.97	37	44.42	49	46.16	62
Endowment at 65.......	25	10,000	12.20	.127	18.19	9.80	5	16.84	66	17.84	83	19.00	102
	35	10,000	20.28	.127	27.94	10.06	6	26.32	46	27.37	60	28.55	74
	45	10,000	36.93	.127	47.60	8.84	6	46.99	35	48.62	45	50.56	57
	55	10,000	86.84	.127	101.75	6.39	6	108.25	20	111.64	27	115.88	36
Five-year term renewable and convertible..	25	25,000	2.14	.127	3.95	3.83	4	3.75	52	4.14	61	4.59	70
	35	25,000	3.92	.127	5.85	3.98	4	6.14	42	6.69	51	7.38	61
	45	25,000	7.48	.127	10.59	4.12	5	10.16	25	10.72	32	11.38	40

quently. The sales-commission figures do include allowance for supervisory personnel who receive overriding commission and all provision for employee benefits which are triggered by the commission payment itself. One factor which heavily influences the commission result is the persistency assumption made in the calculation. The reader will notice that some sales-commission results exceed 100 per cent of a year's premium. Where this happens, the sales-commission payments will generally be spread over several years.

The reader will also notice that the result for $25,000 whole life insurance at age 35 differs from that shown in Exhibit I. This happens because the parameters used are slightly different; the author retained the different treatment of Exhibit I so that a comparison of the effect of the differing parameters would be available.

Critique of Theoretical Prices

Theoretical prices are seldom used exactly as they emerge. This well-known fact is applicable to theoretical prices obtained by all methods, including the methods of this paper. Rather, theoretical prices are used as an essential guide to the prices which will actually be used.

Appendix IV of this paper is entitled "The Actual Process of Price Determination." It demonstrates how theoretical prices are actually made use of.

Planning for Profit

Every price contains a margin, and it was defined at expression (1) as $(x - c - kx)$. The costs contained in c and k make full provision for all benefit costs and for functional expenses which will occur if the business is sold. No provision is included in c and k for sales commission, profit, or overhead. Consequently, sales commission, profit, and overhead must arise from margins on business sold.

Overhead can be estimated or budgeted quite easily for a forthcoming sales period, as a single figure applicable to the company's entire operation. Profit can be considered to arise if the present value of the margins in total sales exceeds the sum of the overhead and the sales commission.

No elaborate illustration will be given, only a simplified statement to demonstrate a method of planning for profit. Make the following assumptions:

1. Overhead for the coming sales period is $5,300,000.
2. Sales commissions are known to average 45 per cent of present values of margins.

3. Present value of margin averages 112 per cent of annualized premium.
4. Average annualized premium, per thousand of business written, is $25.

Items 2, 3, and 4 have been obtained by model-office methods.

Table 6 shows sales results (i.e., sales-attempt quotas) necessary to achieve profit results of zero, $5,000,000, and $10,000,000. It is clearly seen that overhead can be covered, and profit achieved, only if sales results are sufficiently large.

Of course, it is not possible to "write one's own profit" by this method. The required sales (i.e., the sales-attempt quota) must be kept within bounds which represent reasonable achievement levels for the sales force.

TABLE 6

REQUIRED SALES TO ACHIEVE VARIOUS PROFIT LEVELS

1. Desired profit	$ 0	$ 5,000,000	$ 10,000,000
2. Overhead	5,300,000	5,300,000	5,300,000
3. Sales commission (equal to 45 per cent of item 4)	4,336,000	8,427,000	12,518,000
4. Required total sales (expressed in terms of present value of margin content)	$ 9,636,000	$ 18,727,000	$ 27,818,000
5. Required total sales (expressed in terms of annualized premium)	$ 8,604,000	$ 16,721,000	$ 24,838,000
6. Required sales (in volume)	344,000,000	669,000,000	994,000,000

If sales remain at a high level for a lengthy period, it is very likely that overhead will trend upward, and vice versa. Furthermore, the commission rate, shown uniformly at 45 per cent in this example, should vary with the sales-attempt quota. For a comparatively short future sales period (such as one year), however, it is believed that overhead and commission rate can be estimated or budgeted quite closely, making possible an analysis of the type shown in Table 6.

Installment Product Re-examined

Life insurance is an installment product. The illustrations in this paper were obtained by finding the optimum installment price and then the present value of the margins in all installments. Other approaches should be briefly discussed.

Installment prices are not always fixed and level. It is possible in some instances for the company, and even the policyholder, to change the frequency, and even the benefits, from time to time. Group insurance is an example. This type of flexibility may be adopted more and more for individual insurance and may prove highly attractive to policyholders and companies alike.

Under such flexible arrangements, the company is still interested in maximizing the margin expectation in all future installments. However, each occasion when an installment is due can be looked at as a new and separate sale. In its attitude toward price, frequency, and product decisions (and even commission decisions), the company would conduct itself in the light of any changes desired by the policyholder but with the main object of maximizing margin expectation from the remaining future installments.

V. THE CRITICAL ENCOUNTER REVISITED

A critical encounter occurs in any merchandising situation, during which the prospect considers purchase of the product and reaches a decision. In the life insurance industry, this encounter nearly always occurs as a result of an agent's efforts and in his presence. The ideas presented in this paper have arisen from an examination of the critical encounter.

Surprisingly little is known about the critical encounter. This may be a result of the difficulty in defining it or the reluctance of agents to discuss it. Nevertheless, any company must see to it that (*a*) enough critical encounters occur and (*b*) the success rate is satisfactory. These are supreme problems for any company and its field force.

The critical encounter should be investigated to determine and measure all the factors, psychological as well as monetary, which have any bearing on its outcome; such measurements should be used in reaching strategy solutions. (In the language of the Theory of Games, "utility" measurements should be used.)

This paper has advocated that the company and agent form a coalition in their approach to the critical encounter. This idea was examined at length in connection with price and commission implications. There are other implications, too. The company must make every conceivable effort to assist the agent in his task. This approach is known as the "total marketing concept"; under it all company personnel are indoctrinated with the need to increase the number and success rate of critical encounters.

The coalition of the company and agent might somehow be construed as a harmful conspiracy against the prospect. Any such thought is a serious misinterpretation of this paper. Indeed, the coalition should strive to provide for the wants, needs, and best interests of prospects, to an extent never yet achieved. Furthermore, the optimum price can be considered a model of equity, in the sense that prospects are asked to pay the applicable benefit and administrative costs, plus only those amounts toward sales commissions, overhead, and profit which they (collectively) are willing to pay.

Under the American Agency System, the agent is expected to participate in all the preliminaries to the critical encounter. The agent is expected to (*a*) find the prospect, (*b*) determine that he represents sufficient margin expectation, (*c*) persuade him to the critical encounter, and (*d*) make the sales attempt.

Is there a better way? Much soul-searching goes on to discover a better way to merchandise the products.

As pointed out earlier, the major role of commission is to induce the agent to find a prospect; qualify him, to assure that worthwhile margin expectation is present; and persuade him to the critical encounter. A small commission may dissuade the agent from seeking prospects, and a large one may result in many prospects. The major role of commission is *not* to persuade the agent to try harder during the actual sales attempt; if the agent engages in a sales attempt, he will surely try his best. Should commission always be totally contingent on making a sale, when that is not its major role?

If sufficient critical encounters occur, containing enough margin expectation, success will be assured. This naturally leads to the proposition that an agent should be paid for (*a*) his work in bringing about a critical encounter and (*b*) his services in conducting the encounter itself, whether it is successful or not. There are practical difficulties with such a method. For one thing, how would one know that the encounter for which payment is being made was completely genuine, if it did not result in success? For another, how would a scale of fees be devised which would vary in accordance with the margin expectation contained in the prospect? Perhaps these difficulties are not insuperable. Any compensation scheme, which involves a system of fees for bringing about and engaging in critical encounters, should no doubt also involve commission payments, of a reduced amount, for actual sales made. Another, but less satisfactory, variation would involve a salary for services in bringing about encounters plus commission for actual sales made; this system is used in many other lines of business and has been attempted in the life insurance industry.

The theory of the coalition and its corollary, the total marketing concept, lead one to wonder whether the company could play a much greater role in assisting the agent in some of his duties which lead up to the critical encounter—that is to say, finding the prospect, qualifying him, and persuading him to the critical encounter. Electronic equipment could be used to compile great stores of information about prospects, from numerous sources. Such prospects could be prequalified, preinspected, and preapproached to the extent possible, and transmitted to the right agents at the right times. Such activity (and a limited amount of it is already done) greatly assists the agent with the most difficult part of his task. Organized methods of this type, coupled with a system of fees for interviews plus commission for actual sales, could generally stabilize the job of the agent with much resulting good.

VI. THE NEED FOR DOCTRINE

Every company should search for guiding doctrine. The search should be diligently pursued, and resulting doctrine should often be reviewed.

What follows is a pattern by which the search may be pursued. Several questions can be asked: What is the role of the industry? What is the philosophy of the company? How is that philosophy to be fulfilled?

Role of the Industry

A fundamental search must start with the role of the industry. Indeed, much concern and inquiry occur today in this regard.

At root, the industry exists to assist all people in times of need. Such need may arise from loss of the provider, sickness, old age, and other causes. Surely the industry's reason for existence is a most noble one. The nature of the role imposes special responsibilities for successful performance.

The industry's reason for existence is tied up with the needs of *all* people and must be examined in that light. Indeed, there are reasons to believe that the industry is gradually failing in this responsibility; for example, the failure to increase the *number* of individual policies sold is disquieting. Furthermore, it is evident that many carriers are striving more and more toward upper-income markets, to the neglect and even the abandonment of other markets.

The role of the industry must be assessed with the knowledge that its possession of the stage is by no means exclusive. Church, family, social agency, and government (ever more and more) play parts also. The industry must again find and perfect its worthy role in this ensemble.

Role of the Company

In the light of the industry's role, the company must determine the functions that it wishes to perform as an individual participant. The company, in searching for its role, should carefully examine the level and quality of the industry's performance in various areas. If there are fields of activity in which the industry's performance is deficient, these should be favored; if there are fields which are overcrowded, these should be avoided. Furthermore, the abilities of the company, actual and potential, must be carefully considered.

Such considerations will lead to philosophy defining (*a*) the geographical areas to be served, (*b*) the economic strata to be reached, and (*c*) the classes of products to be offered. Philosophy of this type should often be reviewed in the light of changing conditions and must be effectively communicated to all personnel.

Organizational Decisions

When the company has determined its role, it must then make organizational decisions dealing with the location, size, and characteristics of the operating staff that will be required, both in the field and at the home office; it must also make plans for the acquisition and training of such a staff. There are other decisions concerning the nature of the services to be provided, in the light of the markets to be reached and the products to be offered.

Operating Decisions

The operating decisions are those which will influence and in the long run determine the nature of the costs and expenses which will occur when business is sold. In other words, these are the decisions which will ultimately determine the items which have been called c and k in this paper. These decisions concern themselves with the following:

a) The level of mortality to be aimed for—should it be higher or lower than the average for the market involved? Purely and simply, this is a decision about the planned severity of underwriting practices.

b) The level of morbidity experience to be aimed for. This is again an underwriting decision.

c) The quality of the business to be sought, from the viewpoint of its probable persistency.

d) The nature and extent of the services required to deal most effectively with written business of the type which has been defined by all previous decisions. These considerations will influence the functional expenses which will be incurred in servicing such business.

e) The nature of the company's investment operation.

These operating decisions are of great importance. They should be arrived at deliberately, not by a process of drift or semiconscious evolution. They can vary a great deal from company to company, even among those which have similar market and product goals. A decision to have the "best" mortality, the "best" morbidity, the "best" persistency, and the lowest functional expense may be unwise in the extreme. Many companies can and do plan for outcomes in all these areas which are "worse" than industry average; such a decision can be beneficial from a sales standpoint. At any rate, every company should arrive at its own conscious decisions concerning these operating matters.

Price, Profit, and Commission Decisions

Finally, and in the light of all previous decisions, the company must reach the decisions which will lead to the best possible earnings for its field force and the best possible profits for its owners, be they stockholders or policyholders. These decisions concern themselves with pricing policy, commission policy, the sales-attempt quota, and the approach to the critical encounter. Hopefully, this paper throws some light on these matters.

VII. CONCLUSION

The ideas of this paper have arisen from an examination in depth of the critical encounter. The findings and implications are many in number. Some subjects have been treated adequately; others could be explored at greater length; still other subjects, and other valid approaches, have not been explored at all. The paper has many ramifications which seem to call for future study.

The author will summarize the main conclusions by attempting to give ideal answers to the question "What should be done as a result of these theories?"

1. The company should adopt specific doctrine dealing with the type of business to be engaged in and the organization required.
2. The company and the field force should act as a coalition. This leads to three things:
   a) adoption of the total marketing concept, under which intelligent help is given to the agent in the approach to the critical encounter;
   b) loyalty of each to the other, including the renouncement of direct dealing and the abandonment of brokerage;
   c) use of the optimum price, which is not too low and is not too high but is the best price for securing margin, the only thing from which sales commission and profit can emerge. The optimum price should be determined by probability considerations, and not by haphazard judgments.
3. The field force should agree to a sales-attempt quota. This is an agreement to conduct a required volume of sales interviews.

4. The company should agree to a field compensation system, which is related to the margin contained in the sales-attempt quota and which contains a strong financial incentive for the bringing-about of sales interviews. The field compensation system must be considered as fair as possible to the field force.

APPENDIX I

SELECTION OF PARAMETERS

The three parameters (*l*, *m*, and *n*) control the slopes of the three probability functions contained in function (8). Information about *l*, *m*, and *n* may be difficult to obtain. Tables 7A and 7B in this appendix are designed to be of assistance in the selection of appropriate values for these parameters. Table 7A shows the values of the function $b^{(1.1)^p}$ for various values of *b* and for *p*'s ranging from 1 to 17. It shows the effect on a probability, *b*, of raising the price exactly 10 per cent for various values of *p*. The user must consider the effect of a 10 per cent price rise on the probability that he has in mind; Table 7A is an aid to intuition in the selection of the appropriate value for *l*, *m*, and *n*. At the same time, Table 7B shows the values of the function $b^{(.9)^p}$ and therefore indicates the corresponding effect of a 10 per cent drop in price.

As an example, suppose that a value of .05 has been selected for *a*, the absolute probability of sale. According to Table 7A, if the price is raised 10 per cent, this will become .037 for an *l* value of 1 and .027 for an *l* value of 2. Higher *l* values soon make the probability almost disappear. For most products the user would probably feel that an *l* value of 1 or 2 would be appropriate in this case.

For another example, suppose that the probability of controlling competition, *j*, has been set at .50. According to Table 7A, this probability will shrink only to .432 if the price is raised 10 per cent, if an *n* value of only 2 is used. Virulence of the competition has to be considered, but most observers would feel that a much greater shrinkage than this would occur in the probability of control. If *n* is put equal to 10, the probability of control shrinks to .166 if the price is raised 10 per cent. This would seem much more reasonable. From Table 7B it is seen that a 10 per cent drop in price, with *n* equal to 10, will raise the probability of control to .785. Indeed, there may be occasions where an even higher value for *n* is called for. The slope of the control curve may typically be much steeper than that of the others.

The parameter *m* controls the slope of *d*, the probability of encountering competition. When using tables to aid in assigning a value to *m*, it becomes necessary to enter a table with the value for *f*, which is, of course, equal to $(1 - d)$ and is the probability of *not* encountering competition. The values for *m* may typically not be very high, although there may be examples to the contrary; for one example, even a moderate increase in price for group insurance will often precipitate the client into "seeking bids." If this situation is anticipated, a high value for *m* would be in order.

TABLE 7A

VALUE OF THE FUNCTION $b^{(1.1)^p}$ SHOWING THE EFFECT OF A 10 PER CENT INCREASE IN PRICE

b	*p* VALUE																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
.05	.037	.027	.019	.012	.008	.005	.003	.002	.001	.000	.000	.000	.000	.000	.000	.000	.000
.10	.079	.062	.047	.034	.025	.017	.011	.007	.004	.003	.001	.001	.000	.000	.000	.000	.000
.15	.124	.101	.080	.062	.047	.035	.025	.017	.011	.007	.004	.003	.001	.001	.000	.000	.000
.20	.170	.143	.117	.095	.075	.058	.043	.032	.022	.015	.010	.006	.004	.002	.001	.001	.000
.25	.218	.187	.158	.131	.107	.086	.067	.051	.038	.027	.019	.013	.008	.005	.003	.002	.001
.30	.266	.233	.201	.172	.144	.118	.096	.076	.058	.044	.032	.023	.016	.010	.007	.004	.002
.35	.315	.281	.247	.215	.184	.156	.129	.105	.084	.066	.050	.037	.027	.019	.012	.008	.005
.40	.365	.330	.295	.261	.229	.197	.168	.140	.115	.093	.073	.056	.042	.031	.022	.015	.010
.45	.415	.381	.345	.311	.276	.243	.211	.181	.152	.126	.102	.082	.064	.048	.036	.026	.018
.50	.467	.432	.397	.362	.327	.293	.259	.226	.195	.166	.138	.114	.091	.072	.055	.041	.030
.55	.518	.485	.451	.417	.382	.347	.312	.228	.244	.212	.182	.153	.127	.103	.082	.064	.049
.60	.570	.539	.507	.473	.439	.405	.370	.335	.300	.266	.233	.201	.171	.144	.118	.096	.076
.65	.623	.594	.564	.532	.500	.466	.432	.397	.362	.327	.293	.259	.226	.195	.165	.138	.113
.70	.675	.649	.622	.593	.563	.532	.499	.466	.431	.396	.361	.326	.292	.258	.225	.194	.165
.75	.729	.706	.682	.656	.629	.601	.571	.540	.507	.474	.440	.405	.370	.335	.301	.267	.234
.80	.782	.763	.743	.721	.698	.673	.647	.620	.591	.561	.529	.496	.463	.429	.394	.359	.324
.85	.836	.821	.805	.788	.770	.750	.729	.706	.682	.656	.629	.600	.571	.539	.507	.474	.440
.90	.891	.880	.869	.857	.844	.830	.814	.798	.780	.761	.740	.718	.695	.670	.644	.616	.587
.95	.945	.940	.934	.928	.921	.913	.905	.896	.886	.875	.864	.851	.838	.823	.807	.790	.772

TABLE 7B

VALUE OF THE FUNCTION $b^{(.9)^p}$
SHOWING THE EFFECT OF A 10 PER CENT REDUCTION IN PRICE

b	*p* VALUE																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
.05......	.067	.088	.113	.140	.171	.204	.239	.275	.313	.352	.391	.429	.467	.504	.540	.574	.607
.10......	.126	.155	.187	.221	.257	.294	.332	.371	.410	.448	.486	.522	.557	.591	.622	.653	.681
.15......	.181	.215	.251	.288	.326	.365	.404	.442	.480	.516	.551	.585	.617	.648	.677	.704	.729
.20......	.235	.272	.309	.348	.387	.425	.463	.500	.536	.571	.603	.635	.664	.692	.718	.742	.765
.25......	.287	.325	.364	.403	.441	.479	.515	.551	.584	.617	.647	.676	.703	.728	.752	.773	.794
.30......	.338	.377	.416	.454	.491	.527	.562	.596	.627	.657	.685	.712	.736	.759	.780	.800	.818
.35......	.389	.427	.465	.502	.538	.572	.605	.636	.666	.693	.719	.743	.766	.786	.806	.823	.839
.40......	.438	.476	.513	.548	.582	.614	.645	.673	.701	.727	.750	.772	.792	.811	.828	.844	.858
.45......	.487	.524	.559	.592	.624	.654	.683	.709	.734	.757	.778	.798	.816	.833	.848	.862	.875
.50......	.536	.570	.603	.635	.664	.692	.718	.742	.764	.785	.805	.822	.838	.853	.867	.879	.891
.55......	.584	.616	.647	.676	.703	.728	.751	.773	.793	.812	.829	.845	.859	.872	.884	.895	.905
.60......	.631	.661	.689	.715	.740	.762	.783	.803	.820	.837	.852	.866	.878	.890	.900	.910	.918
.65......	.679	.705	.730	.754	.775	.795	.814	.831	.846	.861	.874	.885	.896	.906	.915	.923	.931
.70......	.725	.749	.771	.791	.810	.827	.843	.858	.871	.883	.894	.904	.913	.922	.929	.936	.942
.75......	.772	.792	.811	.828	.844	.858	.871	.884	.895	.905	.914	.922	.929	.936	.942	.948	.953
.80......	.818	.835	.850	.864	.877	.888	.899	.908	.917	.925	.932	.939	.945	.950	.955	.959	.963
.85......	.864	.877	.888	.899	.908	.917	.925	.932	.939	.945	.950	.955	.960	.964	.967	.970	.973
.90......	.910	.918	.926	.933	.940	.946	.951	.956	.960	.964	.967	.971	.974	.976	.979	.981	.983
.95......	.955	.959	.963	.967	.970	.973	.976	.978	.980	.982	.984	.986	.987	.988	.989	.991	.991

APPENDIX II

THE PRICING TABLES

Tables may be constructed to facilitate manual calculation of the optimum price and the high and low of the plateau. Each such table is suitable only for a single combination of the six parameters (a, d, j, l, m, and n) but has the important advantage of being good for any c, k, and ϕ.

The tables are constructed from function (8) by the following method. First of all, put $z = x/\phi$. The object of the table is to specify the optimum z; in other words, the ratio of the optimum price to the pivotal price. Of course, $x = \phi z$. Substituting this, function (8) becomes

$$[\phi z(1-k)-c]\,(a^{z^l}f^{z^m}+a^{z^l}j^{z^n}-a^{z^l}f^{z^m}j^{z^n}). \qquad (9)$$

This may be divided by $\phi(1-k)$, giving another function which can just as easily be maximized, and so on, to determine an optimum value and the plateau. The new function is:

$$\left[z-\frac{c}{\phi(1-k)}\right](a^{z^l}f^{z^m}+a^{z^l}j^{z^n}-a^{z^l}f^{z^m}j^{z^n}). \qquad (10)$$

Now the quantity $c/(1-k)$ happens to be the "break even price." Place $R = c/\phi(1-k)$. R can be thought of as "the ratio of the break even price to the pivotal price." The function to be maximized is now stated as follows:

$$(z-R)\,(a^{z^l}f^{z^m}+a^{z^l}j^{z^n}-a^{z^l}f^{z^m}j^{z^n}). \qquad (11)$$

It is this function (11) for which tables may be constructed. Each table is based on a single combination of the six parameters but shows, for a large variety of R's the optimum z and the z's which represent the low and high of the plateau. Some examples of these tables are shown in Tables 8A–8F of this appendix.

The instructions for using a pricing table are as follows:

1. Select a pivotal price, ϕ.
2. Select a pricing table which is based on parameters believed appropriate for the particular ϕ and the particular product involved.
3. Determine the break-even price $c/(1-k)$ and its ratio R to the pivotal price.
4. Enter the pricing table at the appropriate R to determine the z's representing the low, optimum, and high points. Interpolation between the R values shown will likely be necessary.
5. Multiply by the pivotal price to arrive at the actual prices representing low, optimum, and high values. The pricing table is also designed to show the probabilities of sale at the low, optimum, and high points.

TABLE 8A

PRICING TABLE FOR MONTHLY DEBIT ORDINARY LIFE INSURANCE—JUVENILE

(Parameters: $a = .250$; $l = .9$; $d = .20$; $m = 3$; $j = .50$; $n = 5$; $P_\phi = .225$)

R	Low		Optimum		High	
	z	P	z	P	z	P
.1	.612	.41	.785	.32	.954	.25
.2	.689	.37	.845	.29	.999	.23
.3	.760	.33	.901	.27	1.043	.21
.4	.827	.30	.955	.24	1.088	.19
.5	.893	.27	1.010	.22	1.136	.17
.6	.958	.24	1.067	.20	1.189	.15
.7	1.026	.21	1.129	.17	1.249	.13
.8	1.099	.18	1.199	.14	1.320	.11
.9	1.178	.15	1.278	.12	1.403	.08
1.0	1.267	.12	1.369	.09	1.494	.07
1.1	1.361	.09	1.462	.07	1.581	.05
1.2	1.455	.07	1.551	.06	1.661	.04
1.3	1.545	.06	1.635	.04	1.738	.03
1.4	1.633	.04	1.717	.03	1.815	.02
1.5	1.719	.03	1.799	.03	1.892	.02

TABLE 8B

PRICING TABLE FOR MONTHLY DEBIT ORDINARY LIFE INSURANCE—ADULT

(Parameters: $a = .150$; $l = 1.0$; $d = .15$; $m = 3$; $j = .50$; $n = 6$; $P_\phi = .139$)

R	Low		Optimum		High	
	z	P	z	P	z	P
.1	.474	.41	.621	.31	.791	.22
.2	.570	.34	.711	.26	.868	.19
.3	.662	.28	.793	.22	.935	.16
.4	.747	.24	.867	.19	.996	.14
.5	.827	.20	.937	.16	1.056	.12
.6	.904	.17	1.005	.14	1.118	.10
.7	.980	.15	1.075	.11	1.187	.08
.8	1.060	.12	1.153	.09	1.268	.07
.9	1.148	.09	1.243	.07	1.365	.05
1.0	1.245	.07	1.344	.05	1.464	.04
1.1	1.345	.05	1.440	.04	1.552	.03
1.2	1.439	.04	1.529	.03	1.634	.02
1.3	1.530	.03	1.616	.02	1.717	.02
1.4	1.620	.02	1.702	.02	1.799	.01
1.5	1.711	.02	1.789	.01	1.883	.01

TABLE 8C

Pricing Table for Regular Ordinary Life Insurance <$180 Annual Premium

(Parameters: $a = .250; l = 1.0; d = .20; m = 3; j = .50; n = 6; P_\phi = .225$)

R	Low		Optimum		High	
	z	P	z	P	z	P
.1	.591	.44	.759	.35	.923	.26
.2	.670	.39	.820	.31	.967	.24
.3	.741	.35	.876	.29	1.009	.22
.4	.808	.32	.929	.26	1.052	.20
.5	.872	.29	.982	.23	1.098	.18
.6	.936	.26	1.037	.21	1.149	.16
.7	1.003	.22	1.098	.18	1.210	.13
.8	1.075	.19	1.169	.15	1.288	.11
.9	1.159	.15	1.258	.12	1.386	.08
1.0	1.256	.12	1.360	.09	1.482	.06
1.1	1.356	.09	1.453	.07	1.564	.05
1.2	1.447	.07	1.537	.05	1.641	.04
1.3	1.534	.05	1.618	.04	1.717	.03
1.4	1.621	.04	1.701	.03	1.795	.02
1.5	1.708	.03	1.784	.02	1.874	.02

TABLE 8D

Pricing Table for Regular Ordinary Life Insurance $180–$250 Annual Premium

(Parameters: $a = .075; l = 1.4; d = .25; m = 3; j = .40; n = 7; P_\phi = .064$)

R	Low		Optimum		High	
	z	P	z	P	z	P
.1	.377	.52	.472	.40	.582	.30
.2	.458	.42	.549	.33	.654	.24
.3	.542	.33	.628	.26	.727	.19
.4	.627	.26	.707	.20	.798	.15
.5	.710	.20	.784	.16	.866	.11
.6	.792	.15	.858	.12	.931	.09
.7	.872	.11	.930	.09	.997	.06
.8	.952	.08	1.005	.06	1.067	.05
.9	1.037	.05	1.087	.04	1.149	.03
1.0	1.130	.03	1.181	.02	1.245	.02
1.1	1.230	.02	1.281	.01	1.342	.01
1.2	1.326	.01	1.374	.01	1.431	.01
1.3	1.419	.01	1.465	.00	1.519	.00
1.4	1.513	.00	1.556	.00	1.608	.00
1.5	1.607	.00	1.648	.00	1.697	.00

TABLE 8E

PRICING TABLE FOR REGULAR ORDINARY LIFE INSURANCE >$250 ANNUAL PREMIUM

(Parameters: $a = .060$; $l = 1.8$; $d = .30$; $m = 4$; $j = .40$; $n = 10$; $P_\phi = .055$)

R	Low		Optimum		High	
	z	P	z	P	z	P
.1	.379	.61	.465	.49	.560	.37
.2	.449	.51	.529	.41	.619	.31
.3	.523	.42	.598	.33	.682	.24
.4	.601	.32	.670	.25	.748	.19
.5	.682	.24	.745	.19	.815	.14
.6	.763	.18	.818	.14	.879	.10
.7	.841	.12	.888	.10	.940	.07
.8	.918	.08	.957	.07	1.001	.05
.9	.997	.05	1.030	.04	1.070	.03
1.0	1.086	.03	1.119	.02	1.161	.01
1.1	1.184	.01	1.217	.01	1.255	.00
1.2	1.277	.00	1.306	.00	1.340	.00
1.3	1.369	.00	1.395	.00	1.426	.00
1.4	1.463	.00	1.486	.00	1.514	.00
1.5	1.556	.00	1.578	.00	1.603	.00

TABLE 8F

PRICING TABLE FOR GROUP LIFE AND HEALTH INSURANCE

(Parameters: $a = .85$; $l = 3$; $d = .95$; $m = 2$; $j = .25$; $n = 12$; $P_\phi = .244$)

R	Low		Optimum		High	
	z	P	z	P	z	P
.1	.709	.93	.792	.86	.856	.75
.2	.728	.92	.804	.84	.864	.73
.3	.749	.90	.817	.82	.872	.71
.4	.772	.88	.832	.80	.882	.68
.5	.797	.85	.849	.76	.895	.64
.6	.827	.81	.871	.71	.911	.59
.7	.863	.73	.898	.63	.931	.52
.8	.907	.60	.933	.51	.960	.40
.9	.963	.39	.980	.32	1.000	.24
1.0	1.035	.13	1.047	.10	1.061	.08
1.1	1.190	.01	1.224	.01	1.265	.01
1.2	1.283	.01	1.315	.00	1.353	.00
1.3	1.377	.00	1.406	.00	1.442	.00
1.4	1.472	.00	1.499	.00	1.531	.00
1.5	1.529	.00	1.531	.00	1.531	.00

APPENDIX III

REPORT ON SALES INTERVIEW

(Please complete after each interview, whether it results in a sale or not)

Name of Prospect (First - middle - last)	Age	Sex ☐Male ☐Female	Rating Class

How did you get this prospect? ☐Referred Lead ☐Other (describe):
☐Insurance already in the home ☐Cold Canvass

Is this interview a follow-up on an earlier interview with same prospect in the past 30 days? ☐No ☐Yes

What did you try to sell? If you presented more than one plan or amount, please list the various presentations in the order you made them.

PLAN	AMOUNT	PREMIUM	MODE
1.			
2.			
3.			
4.			

At the time of this interview, was the prospect considering purchase of insurance from another company?
☐No ☐Yes If "Yes", give name of company:

Outcome of Interview:
☐Bought Plan and amount on line ______________ above.
☐Postponed decision until later date. ☐Refused to buy.

If you care to comment on the reason for postponement or refusal, please do so here:

Date	Debit	District	Agent's Signature

To the Agent: Your help in completing this form on all your interviews is very much appreciated. The Company needs this information on each interview, whether it results in a sale or not. The results will help Life of Georgia to provide you with the best of products and sales assistance.

APPENDIX IV

THE ACTUAL PROCESS OF PRICE DETERMINATION

Much has been published about theoretical prices. However, very little has been published about the actual steps followed in determining ratebook premiums. Practices no doubt vary, and the following remarks are only the personal observations of the author; for the sake of brevity they have been restricted to nonparticipating ordinary policies sold for amounts of $5,000 or over. The steps follow.

1. Determine the appropriate interest basis; the appropriate select mortality basis; persistency rates varying by plan, age, and mode; and expense factors, both on a conventional basis (including all general expenses, taxes, and commissions) and on the functional basis described in this paper. Also determine rates charged by principal competitors at quinquennial ages for all plans.

2. Calculate conventional premium rates at quinquennial ages for all the plans to be quoted for various amounts, such as $5,000, $10,000, and $25,000, and for several modes, including annual and monthly modes, at least. Do this by any published method which takes persistency into account.

3. Calculate premium rates by the methods described in this paper. These are known as "functional" premiums, and they emerge in the form of low, optimum, and high rates, as described in this paper. Do this for the same cells as in step 2.

4. Determine the relationship which is desired among various size amounts and among the various modes. This is essentially a judgment process and is accomplished by considering the relationships among the premium rates that have been calculated. This process, among other things, results in a decision among (*a*) no grading by size, (*b*) the quantity discount or banding system, or (*c*) the policy-factor system. Here is an example of one relationship under which the policy-factor system was used:

A. The premium for a particular policy is derived by (*a*) multiplying its amount by a basic per thousand rate and (*b*) adding a policy factor.

B. The relationship between the basic per thousand rates is as follows:

Semiannual:	103½% of annual rate, divided by 2
Quarterly:	105% of annual rate, divided by 4
Monthly:	107% of annual rate, divided by 12
Bank mode:	100% of annual rate, divided by 12

Bank-mode business consists of all business with premiums collected by automatic bank check, postdated check, or salary deduction.

C. Policy factors are as follows:

Annual	$12.50
Semiannual	6.50
Quarterly	3.50
Monthly	1.25
Bank mode	1.05

Policy factors are not applicable to riders attached to policies.

5. Determine policy regarding female rates. Generally, the choices are (*a*) no difference from male rates, (*b*) use same rate as for a male three years younger, and (*c*) use entirely separate, and independently calculated, rates.

6. For each plan, quinquennial age, amount, and mode cell, collect together all the available information, including (*a*) rate presently being charged; (*b*) calculated conventional rate; (*c*) calculated functional rates—low, optimum, and high; (*d*) rates being charged by principle competitors; and (*e*) break-even price $[c/(1 - k)]$. For each such cell, show also a comparison of present and proposed cash values, at representative durations.

7. Select as a framework one amount, such as $10,000, and one mode, such as the annual mode. Take a large work sheet upon which all plans and all quinquennial ages can be shown. Taking account of all the information collected in step 6, write down (for this amount and mode) the proposed premium rates for each plan and quinquennial age. This is a judgment process; it makes use of all available information, and it also pays attention to the question of reasonableness in the differences which emerge between the various adjacent age and plan cells. It is well to arrange the plans on the work sheet roughly in ascending order of price. Exact consistency must be observed where two plans intersect (e.g., twenty-pay life, and life paid up at 65, both issued at age 45).

8. Using electronic equipment, interpolate between the quinquennial rates to obtain rates at all ages. This should be done by an osculatory formula. At the same time, apply the relationships which have been adopted in step 4, so that what emerges is the actual schedule of rates to be published, for each mode; if a policy factor is to be used, the emerging rate will be the basic per thousand rate, which is to be multiplied by the amount before addition of the appropriate factor.

9. Check these results for reasonableness. One thing to look for is a slight dip which can show up at intermediate ages in some cases if the quinquennial rates are very flatly graded. Such dips should be arbitrarily removed.

10. Enter proposed rates along with the information collected at step 6 for all available cells. Critically examine the proposed rates against all other information gathered; if unsatisfactory, modifications may have to be made.

11. Enter all rates in the actual format and order in which they are to be published. They should then be critically examined again; if the rates are to be published in the "by age" format, with plans in ascending order of cost, this job will be made fairly easy. It is often not until this stage that a really satisfying check can be made for reasonableness and consistency. There are many cases where the rates should be the same for two different plans (or term riders); there are other plans where the differences in rate should be meaningful.

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