PROBLEMS OF FIRE INSURANCE RATE MAKING

BY

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The purpose of this paper is to survey some of the problems facing fire insurance rate makers and to put forward some proposals for improving the methods at present employed.

OBJECTIVES OF FIRE INSURANCE RATE MAKING

The basic objective of rate makers is simply that the rates should be reasonable, both from the point of view of the insurer and the insured. From the point of view of the insurer, this means that the rates in the aggregate must be sufficient to provide for the payment of claims, expenses and taxation and leave an adequate margin for catastrophes and for profit. Where the rates are made by a Bureau acting for a number of insurers, the sufficiency must apply not only to the total aggregation of all the fire business transacted by all members of the Bureau, but also to the aggregation of the business transacted by any individual prudent member. At the same time, it is important for the insurer that rates in any class should not be excessive because the business may be lost to a competitor making its own rates on a more reasonable basis or offering exorbitant commissions. Unless these requirements are met, it is impossible to maintain a virile insurance market.

From the point of view of the insured, reasonable rates imply that he should not be required to pay more than a sufficient sum to cover the hazard involved, together with a reasonable charge for expenses, catastrophes and profits. What is a sufficient sum is not easy to determine in principle, let alone in an individual case. A large number of factors can be listed which probably affect the risk to at least some extent. They are sufficiently numerous so that it would be impossible to make statistically justifiable allowances for every one of them nor does the requirement of reasonableness demand this. A rating structure which is reasonable should not be so complicated that it becomes difficult or expensive to apply. Clearly, for classes involving small units, the application of the system must be as cheap as possible, while where a class has large individual premiums, greater expenses can be reasonably incurred to produce greater rating accuracy. It is worth noting that in life assurance, where rating has received the attention of actuaries since the inception of the business, the vast majority of lives are accepted at rates which involve only one factor, namely, age, although there are many other factors which are known to have some bearing on mortality. Fire rates can be considered reasonable if they take into account all major factors which affect the risk but ignore minor factors which would not in the aggregate cause more than a small variation in the estimated rate What is a small variation is a matter of personal opinion, but anyway a variation of up to 20% should almost certainly be ignored. Further, the system employed should not produce rates which are anomalous one with another.

It will be seen that rates determined on this basis meet the usual statutory requirement—to be reasonable and adequate for the class of risk to which they apply, and not unfairly discriminatory.

RATE PROMULGATION

Speaking generally, each state has its own fire rating bureau which promulgates the fire rates for properties within the state. The rates for dwellings, small shops, etc., are usually promulgated in the form of "Class Rates". That is, the same rate is quoted for all properties of the same type and construction with similar fire protection in a particular area. For larger properties, rates are calculated individually as required. These rates are called specific or "Schedule Rates", because a schedule is used to develop the rate by a series of credits and debits to allow for the various favorable and adverse features of the risk.

STATISTICAL BASIS

For practical purposes, the only statistical data available in respect of fire insurance are the figures produced by the National Board of Fire Underwriters Actuarial Bureau. These figures show for each year the premiums written and losses paid. The figures are subdivided by state, construction (brick, frame or fire resistive), protection (protected or unprotected), and occupancy classification. There are at present 115 classifications, but the 6 largest classifications represent a total of 46% of the written premiums and the 28 smallest classifications together represent only 1% of the written premiums.

A large amount of fire business is written on a 3 year or 5 year term basis, so that in times of inflation, the premiums written in any year will be greater than the premiums earned. Steps have been taken so that in due course, data will be available on an earned premium, incurred loss basis.

It will be seen at once that these data, when earned premiums and incurred losses are available, are sufficient to determine whether fire rates are reasonable from the point of view of the insurer. They do not provide any justification for the individual rates, nor do they provide a means of checking the suitability of the classifications used.

FAULTS OF THE PRESENT SYSTEM

The principal criticism which has been leveled against the present system is that it is based very largely on judgment and there is no means of determining whether the individual rates are reasonable. It is well to recall that the present method, which has been developed over many years, has worked fairly well and there has been practically no criticism from the purchaser. While it is possible to point out faults in the system, it is more difficult to suggest in detail how the system can be improved.

However, now that insurance has been brought within the orbit of the anti-trust laws, it is not sufficient to claim that the system has worked well in the past. Nor is there much force in the argument that there has been no criticism from the purchaser. Fire claims are sufficiently infrequent to make it impossible for the normal purchaser to judge the appropriateness of the price he is paying by reference to his own experience. It is as well, therefore, to inquire, on the evidence of the data available, to what extent the present rating

system produces results which are reasonable from the point of view of the insured.

An examination of the loss ratios in the statistics of the National Board of Fire Underwriters Actuarial Bureau reveals marked variations in these ratios from group to group. It is, however, difficult in most cases to prove that the variations in any state may not be due to chance fluctuation. When the only figures available are premiums and claims, it is difficult to establish a credibility test for the loss ratio. Hence, the position often arises that a rating bureau is not justified in revising rates for a group showing a low or high loss ratio, because either its figures are not credible or it cannot measure the credibility of its figures. The nationwide figures may show that a certain class is generally rated too high (or too low), but because of the difference between the states in the rating structures employed, these figures do not provide any supporting justification for the revision of the rates in an individual state when the experience within the state, because of lack of credibility, is insufficient in itself to justify the revision.

An examination of a typical set of class rates shows that they can be broken down into a comparatively few "base" rates and a number of "rate differentials" by which the rate for one property can be obtained from that for a similar but not identical property. The same position holds in schedule rating, but the rate differentials are here more complex. In trying to determine the reasonableness of individual rates, careful consideration must be given to rate differentials. These are often sufficiently numerous and large to make the final rate very different from the base rates, in which case the reasonableness of the final rate will depend upon the reasonableness of the rate differentials. Nearly all rate differentials have been fixed entirely by judgment and lack any statistical support, but a few are open to some investigation. The two most obvious cases are the difference in rate between brick and frame buildings and the difference in rate between buildings and their contents.

The nationwide figures when subdivided according to construction indicate that overall the rate differentials for brick and frame construction are reasonable. A consideration of the building-contents rate differential produces rather a different picture. For simplicity, the discussion will be limited to residential risks where there is a classification division between dwellings and contents for a large volume of business. First, it is noted that contents differential differs from state to state. Pennsylvania can be taken as typical of the most usual pattern. For protected property, the yearly rate of premiums per $100. of contents insurance is 4 cents greater than the yearly rate of premium for $100. of building insurance. For unprotected property the contents rate is equal to the building rate. In western states, however, the contents rate is equal to the building rate for both protected and unprotected property while in the southeastern states there is a 5 cents difference for protected property and a 10 cents difference for unprotected property. It is most improbable that actual loss experience will vary from state to state in such a way as to justify these different patterns of rates.

When we come to try to determine what are suitable rate differentials, we are presented with the difficulty of estimating what the experience would be if some other rate differentials had been employed. It is unfortunate that class rate differentials are usually expressed as flat additions to the

base rate, while with the statistics available, only percentage additions can be handled with accuracy. A tabulation of the liabilities at risk would to some extent overcome this difficulty. However, in the case of the contents rate differential, it was found practicable to make reasonable estimates of the effect on the premium income of changes in the differential. Proceeding in this manner for each state separately, it is not very difficult to show that a percentage addition of 40% to the dwelling rate normally provides a reasonable contents rate differential if it is assumed that it is desirable to produce the same loss ratio for both dwelling and contents business. This is an appreciably larger rate differential than that used at present and it has an entirely different incidence from that of the rate differential actually used in the majority of states.

It is of interest to note that Harold C. Atkiss of the New York Insurance Department in Part I of his extensive study of Fire Insurance Rate Making writes:

> "For a particular type of construction and a group or class of risks, the differential between contents rates and building rates should narrow as the hazard increases."

While it is not intended to discuss here the truth of this statement generally, it is clear that statistical investigation shows it is false for dwellings.

To sum up, the rating structure used in fire insurance contains a large number of rate differentials which may by their cumulative action produce an unreasonable rate, even if the original base rate were correct. The rate differentials are not supported on any statistical data and no attempt is made to justify them. Judgment must play an important part in any insurance rating scheme, but good judgment requires the accumulation of good statistical records where possible and the fullest use of all knowledge available, whether statistical or otherwise.

RATE MAKING METHODS

It is comparatively simple to criticize the present fire insurance rating methods, but it is more difficult to make constructive proposals. It is tempting to say that fire insurance rate makers should adopt the more statistical methods used for some of the casualty lines, but this is a very superficial approach to the problem. The rate of premium for a protected dwelling may be as low as 8 cents per $100, hence, if we ignore all partial losses and assume a loss ratio of 50%, this indicates that the dwelling will, on the average, burn down once in 2,500 years. Statistical methods suitable for casualty lines with high claim frequency are unlikely to be directly applicable to business with this very different type of experience.

Before making any detailed suggestions, it is advisable to clarify the problem of rate making by distinguishing between the three main methods which are commonly employed. The first method, which we shall call the statistical system, is not at present used in fire insurance, but is used in other classes of insurance. In this method, every rate has its own statistical support. When the rating structure is complex, it is impractical to provide statistical support for each rate or rate differential and overall statistical support for groups of rates is all that is possible. This method, which is used very extensively in fire insurance will be called the schematic system. The

third method, which we shall call judgment-rating, is used when the factors which must be taken into account are so complex that a schematic system cannot be devised. It is used chiefly in marine insurance, both ocean and inland, and in certain casualty lines. The rate maker naturally prefers the first method to the second and the second to the third, all other things being equal, but the controlling factor is the complexity of the problem in relation to the average size of the policy in the class. This immediately poses the question, is a statistical system practicable for fire insurance?

RESIDENTIAL BUSINESS

The residential class is sufficiently large to be considered separately and it is here that a statistical system is most likely to succeed. The National Board of Fire Underwriters Actuarial Bureau figures for 1949 show residential business has a premium income of $425,000,000, of which nearly one-half represents the premiums for dwellings (buildings only). The schematic system used varies from state to state, some states are content to distinguish between two types of construction only—brick and frame; others have as many as six different types, each with its own rates, and in addition, provide debits and credits for certain constructional features. Again, some states have only four classes of protection, while others have many more. Some states have different rates for different areas of the country (zones). In rating residential risks, the individual premiums are small and any survey of the property would not be justified on the grounds of expense. It is therefore necessary to ignore a number of features which might affect the risk. For this reason, there is no advantage in trying to take into account factors, like the existence of a lightning rod, whose effect is less than that of other factors which have been ignored. It is considered that at least for dwellings in the residential class, there would be no difficulty in designing a rating system which would enable rates to be fixed on a statistical plan.

The rating structure for such a plan would involve no greater change in the present plans than is entailed in combining the features of a number of plans at present in use. The same plan, but not the same rates, should be used in every state, so that advantage could be taken of the experience of areas larger than individual states in determining rates where data would be otherwise inadequate. The plan would probably involve four classes of protection and two of construction. In order to establish the rates, statistical data, on an earned-incurred basis, would be required for each subdivision of construction and protection used in the rate structure, that is, 8 subdivisions instead of the present 4 (or 6, if we include fire-resistive buildings). It would be desirable to record the sums at risk instead of the premiums, so that pure premiums could be calculated. These pure premiums would be loaded for expenses in accordance with the method common in many casualty rating procedures. The extension of these proposals to cover other risks in the residential class—contents of dwellings, apartments, seasonal dwellings, etc.—would present no difficulty, provided the same measures of standardization suggested for the dwelling rate structure were used. For subdivisions with only a small amount of data, rates based on the nationwide experience, subject to a state experience differential, might be used.

GENERAL SUGGESTIONS

For practically all risks outside the residential class, a statistical system of rate making could not be used, but it is possible to put forward other suggestions for improving the present system. Since steps have been taken to provide data on an earned premium and incurred loss basis, this important improvement can be considered to be already adopted and need not be discussed further.

The rating system should be simplified so as to remove the less important rate differentials at present employed. It must be admitted that great accuracy is impossible in a schematic rating system and minor rate differentials only increase the complexity of the system and its expense without improving its accuracy.

The method of collecting statistics of fire premiums and losses is the same for all states and a standard classification is employed. The schedules used for ratemaking have not, however, been standardized. It is important that rate making methods should be the same in all states so that the statistical data could be more closely linked with the rate making, countrywide data could be used to augment state data for classifications with small experience, and comparison between states would be possible. It is not necessary that the same base rates and rate differentials should be used in different states, although some standardization of rate differentials which are based solely on judgment is probably desirable. In order to provide the most satisfactory statistical control, the base rate should correspond to the average risk, not the best risk nor the worst risk. It is only by standardization that the maximum value can be obtained from the statistical data available.

Once rate making methods and schedules have been standardized, the classifications used for the collection of statistics should be collated with the schedules so that the experience of an individual classification will provide a control of a base rate or an important rate differential in the schedules. Classifications should be selected also with an eye to the volume of data available. Very small classifications should be avoided and large classifications subdivided.

If the above suggestions were adopted, there would be adequate statistical control of base rates but not of rate differentials. Is it possible to provide any statistical control of rate differentials? Insofar as the data are large enough to allow sub-division corresponding to rate differentials, these can be controlled, but it is impossible to control every differential. A statistical method could be devised to control the general size of the differentials on the same lines as we measure the standard deviation of a distribution. The same result can be obtained rather more easily by grouping rates within a classification into three groups: non-hazardous, medium hazard, and severe hazard. The separate experience of these three groups would provide a reasonable control of the general size of differentials.

RATEMAKING BY CLASSIFICATION

It is often held that in fire rate making, it is undesirable for rates to be devised to reflect the experience of a particular classification alone. This is partly true. A catastrophe fire will upset the statistics for the particular state and classification in which it occurred to such an extent that slavish rate

making based on past experience will lead to most unreasonable rate increases. However, this is no justification for not using classified experience for rate making purposes. The problem can be dealt with mechanically by allocating a percentage (varying with the classification) of the premiums to catastrophe losses and taking out of the classified experience those premiums and all catastrophe losses. This is probably unnecessary as an experienced rate maker should be able to deal with the problem without setting up special arrangements of this nature.

PURE PREMIUMS

It is sometimes suggested that fire statistics should yield pure premiums instead of loss ratios as at present. A little consideration will show that pure premiums can be produced only if a statistical rating system is used. With a schematic system, loss ratios must be developed. If the suggestion of a statistical system for the residential class were adopted, the statistics for this business would be limited to sums at risk and losses. For other classes, where the schematic system is retained, premiums and losses must be recorded but, in addition, sums at risk are most desirable in order to assist in the calculation of the financial effect of rate revisions.

It is just as practicable to make accurate allowance for expenses with loss ratio statistics as with pure premiums when all expenses are expressed as a percentage of the premium payable.

ALLOWABLE EXPENSE RATIO

Fire rates are usually based on the assumption of an allowable expense ratio of about 50%, the same ratio being used for every classification and all sizes of policy. On this assumption, every basic rate and rate differential must be considered to include an appropriate charge for expenses. It has been suggested that it would be more satisfactory to develop the expense and the risk portions of the premium separately.

There are three possible departures from a fixed allowable loss ratio: (1) by size of policy, (2) by classification, and (3) by territory. The actual expenses of a policy for a particular classification and territory in general decrease as the size of the policy increases, because certain expenses remain very nearly constant whatever the size of the policy. However, because of the practice of limiting retentions, it is often necessary to effect a number of policies to cover a large risk. There is, therefore, a very practical objection to graduating rates according to the size of premium, as larger companies with larger retentions would quote lower premiums than smaller companies for the same risk. Equity could to some extent be preserved by varying the allowable expense ratio by classification, so as to take into account the average size of the policy within each classification. Such variation could at the same time take account of differences in inspection expenses and in commission when they exist. The allowable expense ratio used in rating those territories where exceptional rates of commission are payable should, and presumably does, reflect this special feature.

For the above reasons, it is desirable that an appropriate allowable loss ratio should be developed for each classification and territory. At the same

time the rating schedules should be revised so as to develop a risk premium. This premium would then be loaded for expenses, profit and catastrophes.

CREDIBILITY

It has already been pointed out that one of the difficulties in using the limited data available is the lack of any standard of credibility which can be applied to the figures. The first idea likely to occur to anyone considering this problem is the advantage which would accrue from recording the number of losses as well as their total amount. Unfortunately this would not be a very great help because of the practice in fire insurance of covering an individual risk with a number of similar policies effected with different insurance companies. The number of losses would, therefore, include a number of duplicates, the proportion of which would vary from class to class. Probably the best solution is to prepare, by means of an adequate sample inquiry, a schedule giving the average size of claim for each classification. With such a schedule, an estimate of the number of losses involved in any classification could be obtained and hence, a reasonable relative measure of credibility.

THE TERM RULE

The term rule which grants a three-year policy for 2½ years' premiums and a five-year policy for four years' premiums, paid in advance, has a very long history. Originally limited in scope, it has been extended with the passage of time to a large number of classifications (the position varies from state to state). It might now be held to be discriminatory to restrict its application at all so long as the rule exists.

Clearly, the discount, while reasonable for the smaller residential risks, cannot be justified for the larger policies where the discount is too large to be justified on any expense saving, as there is no reason to assume any better experience under term policies.

Some people have proposed the abolition of the term rule with a suitable adjustment in rates to maintain equity. A consideration of some of the effects of such a step shows that this solution is not practicable. First, if the rule were abolished entirely without any substitute scheme, such as yearly renewable policies, the expenses of the business would undoubtedly be increased owing to the necessity to rewrite every policy yearly. This expense must be ultimately met by the insuring public; the term insurers losing slightly more than the yearly insurers gain. Secondly, a sudden cancellation of the rule would have very marked financial effects on the industry. This can be illustrated by setting out some hypothetical figures which approximately represent the actual position.

To use round numbers, let us assume the net premium income of the fire business of the fire companies is constant at one billion dollars (the true figure is rather larger), that the premium income is distributed in the proportion 40%, 45% and 15% between one, three and five year term business; that the term rule will be withdrawn for all policies issued after December 31, 1951; that business will be continued at a level rate with term business replaced by yearly business as the original policies run out and that the yearly rates will be reduced so that the total cost of insurance to the public

is unaltered. Then, ignoring the special problems of installment-provisions, the following financial effects will result:—

(1) When term business is replaced by yearly business, a smaller initial premium is payable for the same coverage. The incomes of the fire companies from fire business would drop in the years immediately following the cancellation. For 1952 the income would be about $600,000,000 and for 1953 about $750,000,000, compared with $1,000,000,000 for 1951. By 1954, the income would return to approximately $1,000,000,000.

(2) The income of insurance agents and brokers from fire commissions would drop to 60% in 1952 and 75% in 1953, of the 1951 figures.

(3) Unearned premium reserves, instead of being about 125% of the premium income, income would be reduced to only 50% over a period of three years. The companies would have to sell $500,000,000 or more of securities on account of this adjustment. This money would be required to meet claims and expenses which, with the exception of commission expenses, would continue at the 1951 level for the years 1952 and 1953, despite the drop in premium income in those years. (If allowance were made for the increased cost of writing all policies yearly, the outgo for expenses, other than commissions, would rise.)

(4) Owing to the release of these reserves which are set up on a full proportionate basis and are therefore more than sufficient to meet expected losses, statutory underwriting profits would be increased above what they would otherwise be by about $100,000,000 in 1952 and by about $40,000,000 in 1953. This would involve very heavy extra taxation.

Under the circumstances, it seems most undesirable to propose the withdrawal of the term rule, but it should be replaced by a rule where the discount is graded according to size of premium if equity is to be maintained.

DEDUCTIBLES, EXCESS-OF LOSS, COINSURANCE AND OTHER PROBLEMS

The problem of rating policies subject to a deductible and the fixing of coinsurance allowances, can only be solved by adequate loss distribution curves for the principal classifications. The preparation of such curves presents many problems, owing largely to the practice of more than one company insuring a single risk, and a discussion of the subject will not be attempted here. For large excess-of loss and catastrophe policies, there is insufficient experience to make the preparation of loss distribution curves practicable and judgment rating is necessary.

There are many other rating problems which have been omitted from this discussion, owing to lack of space. Mention may be made of the provision for profits and catastrophes, time element policies, allied lines, and experience and retrospective rating for cases where large aggregates of property are involved.