DISTRIBUTION OF SURPLUS BY CASUALTY COMPANIES WRITING PARTICIPATING INSURANCE

BY

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There are two principal things, in the opinion of the writer, that make the distribution of surplus by casualty companies a matter well worth discussing. In the first place, participating insurance in the casualty field has had a steady growth since the inception of workmen's compensation laws. At the present time it is written by some of the stock corporations, and by all mutual corporations, interinsurance or reciprocal exchanges and state funds. The absence of any literature bearing upon the methods employed, or which should be employed in the distribution of surplus among policyholders, is a commentary upon the importance thus far attached to this phase of casualty insurance. It is true that some states have, by law, imposed certain requirements, and that in others supervising officials have set up more or less arbitrary rules relative to dividends to policyholders. But on the whole, the subject has been pretty thoroughly neglected; the individual carriers have acted independently and mainly with an eye to competitive possibilities; the enactment of regulatory legislation, where such exists, has been without thorough investigation of the fundamentals involved and in some instances has been influenced mainly by considerations of expediency. The existing situation warrants a thorough examination of the principles which should underlie the distribution of surplus, the ultimate goal being the development of a sound philosophy and correct actuarial technique. Whether any or all of the methods developed by independent companies or imposed by law or regulation are sound is a question worth trying to answer.

The second reason relates to the possibility of alleviating through participating insurance many of the present vexatious rating problems. It harks back to the old discussion of retrospective vs. prospective experience rating and invites considera-

tion of some system of dividend distribution which will aid in the adjustment of rates for individual risks in a retrospective manner. There is also the interesting possibility of making effective a graduated expense loading, based upon the expense requirements of individual carriers and the incidence of those expenses upon their individual risks, by giving proper weight to this item in the dividend system.

The scope of the subject is so broad and the ramifications so many that the writer has been forced to limit the paper to a particular phase of the subject. There are three interesting angles or points of view from which one might logically proceed:

1. A review might be made of existing laws relating to surplus distribution, and the subject discussed primarily from the regulatory point of view.

2. Existing systems might be carefully analyzed and discussed primarily from the carrier's point of view.

3. An examination might be made into the underlying principles of dividend distribution and a general philosophy developed primarily from the policyholder's point of view.

Of course these would not be mutually exclusive, but each would stress a different phase of the subject.

It cannot be said that this paper follows any one of these logical divisions. It contains a very general and casual review of existing dividend systems, it touches very slightly upon the regulatory phase and discusses some of the principles which should underlie a sound philosophy of dividends. It is primarily an explanation of the dividend system used by the State Compensation Insurance Fund of California, with such reference to the above divisions of the subject as it was felt would bring out through contrast the special features of the Fund's system.

PART I

As a first step, therefore, it may be well to mention briefly the methods of distributing surplus which are now employed. Because of their large number, it is not possible within the limits of this paper to do more than describe them in terms of their general and more important features. The prevailing systems of

distributing surplus may be classified under three heads, as follows:

(1) The flat percentage of premium method.

(2) The industry group method.

(3) The individual risk experience method.

The first method is the most universal and has an advantage over other methods because it is the simplest to apply. The only problem presented is that of determining the amount of divisible surplus to be apportioned and that of course is a problem found in any system. But, because this determination may be made according to different principles, we find in practice, distinction between the systems of individual companies using the flat percentage of premium method. There are in general use three different bases upon which the percentage of premium to be returned may be determined.

(a) Policies are grouped by year of issue and the actual profits ascertained for the group. The total amount to be distributed may be the total of such profits, or it may be a modification thereof, made in the light of the carrier's general surplus at the time of distribution, or because of a predetermined plan of withholding certain amounts for specific purposes or for future contingencies. The date of distribution may have an important bearing, particularly if the carrier is subject to the general reserve laws and is obliged to put up its reserves on the percentage basis. It is obviously impossible to get any line on the profits by year of issue until the close of the policy year. Three month's additional time is highly desirable to permit developments of losses and the auditing of pay-rolls. But by then many policyholders have waited over a year for their share of the surplus, and the delay may seem to them unwarranted. Also, if the carrier has to maintain reserves upon the percentage basis, it may be unable to distribute the entire indicated profit without borrowing from policyholders of later years of issue or using temporarily surplus withheld in past years for just such a purpose. In some instances, two distributions are made, the second taking place at the end of the period for which the percentage reserve is maintained.

(b) Policies are grouped by date of expiration, the groups consisting of the expirations either for a full year or for some

period less than a year, say six months or even three months. At the end of the period, the amount of surplus to be distributed is determined and may or may not have a relation to the profits earned on the expired policies. The amount, in whatever way determined, is distributed pro rata among the policies which expired during the period. This method permits the payment of returns with reasonable promptness but it offers no assurance to a policyholder that the distribution in which he participates will bear a definite relation to the surplus earned while his policy was in force. As a basis of grouping, it is not usually used for the purpose of accounting for surplus earned, but is rather confined to the sole purpose of describing the policies which are to participate in a particular distribution. The amount of the distribution is dependent in most cases upon the total divisible surplus, which in turn is affected to some extent by the surplus earned on the group of expired policies, and to that same extent there is, therefore, a relation between the surplus earned and the surplus returned on a given group of expired policies. Many carriers that use this method of apportioning surplus have recognized the practical advantage of what might be termed a "fixed dividend policy." They attempt to pay the same rate of dividend year in and year out, in order that their policyholders may have a reasonable assurance of what to expect in the way of returns. Such a practice clearly illustrates the great difference between grouping by year of issue for the purpose of accounting for surplus earned and grouping by period of expiration for the purpose of declaring dividends.

(c) Policies are grouped by month of expiration and the return allowed bears the same ratio to the premiums on expired policies that the total surplus earned while the policies were in force bears to the total premiums earned during the same period. This basis is not very satisfactory in workmen's compensation insurance, because of the large outstanding losses and the estimated pay-rolls, both of which make it an extremely uncertain measure of the correct extent to which such policies should participate.

The first basis is used extensively by state funds. In some funds all policies are written to expire on the same date, in which event the three bases are one and the same. When this is the case the delay in apportioning surplus is minimized, although

even then some of the funds have found it desirable to withhold part of the surplus for later distribution, usually at the end of two or three years, in order to mature their losses.

The second basis is employed largely by mutual corporations. Its use is required by law in many cases, although there is usually a good deal of latitude in the actual determination of the amount of surplus to be distributed. It carries with it the implication that the surplus on any date belongs to the existing policyholders and may be distributed by them, through their board of directors, as they see fit, provided of course, that requirements of law are fulfilled. Presumptively the directors will act in the best interests of the policyholders as a whole and their judgment as to the amount to be distributed can be relied upon with safety.

The third basis is found mainly among reciprocal or inter-insurance exchanges writing automobile insurance, although the language of the power of attorney, required by some compensation insurance exchanges, seems to involve substantially the same basis. The exchanges do not usually speak in terms of earned premiums and generally describe their systems as involving the prorating of losses and expenses among their members, the balance of the original deposit being returned as unused. The exact basis of prorating differs with different exchanges but in general it provides as follows:

Losses and expenses incurred in each month are divided by the deposits (premiums) in force at the end of the month, the result being the fraction of the deposit put up by each policyholder that has been used during the month. Members are charged for a full month's expenses in their month of entry but are not charged any expenses in their month of exit. The sum of the charges for the twelve months commencing with the month of entry gives the total proportion of the deposit that has been used and the remainder is the amount to return. Exactly the same result is obtained by dealing in terms of earned premiums provided it is assumed that all policies become effective on the first of the month, to comply with the requirement that a full month's expenses be charged in the month of entry and none in the month of exit. The ratio of losses and expenses incurred to premiums earned being determined for each month, they are averaged for the twelve months that the policy was in force and the result is identical with that of the prorating system. The variations in

this system among different exchanges are mainly in the way of greater refinements respecting the charging of losses and expenses for the months of entry and exit. The basis seems to be quite suitable for exchanges writing lines other than compensation.

The second method, which has been called the industry group method, is one in which policies are grouped by industries for the purpose of determining the amount of surplus to be distributed. Each industry group is a unit in itself and receives its allotment of divisible surplus upon some basis that reflects the extent to which it created that surplus. Except for this feature, the individual risk participation may be in all respects the same as under the flat percentage of premium method. The plan offers some practical difficulties in the creation of proper industry groups and the assignment of individual risks involving overlapping classifications. It has some competitive advantages when dealing with that type of employer who does not want to carry the burden of other industries, which he believes are extra-hazardous or underrated, or both. On the other hand, it is probably just as often a disadvantage when dealing with that other equally common type of employer who believes all the other risks in his own industry are worse than his own. It represents an attempt, however, to correct through the distribution of surplus the inequalities in the rates between industry groups and to that extent has a scientific justification. It is found in both mutual companies and state funds.

The third method involves the distribution of surplus in accordance with the individual risk experience. It differs from the first method primarily in the fact that policyholders do not receive a uniform percentage of premium as a dividend but rather a varying rate, which is dependent upon the surplus earned by the individual risk. The three bases of determining the amount of surplus to be distributed enumerated under the first method can equally well be present under this system, producing again distinctions between the practices of different carriers. It is also possible to combine this method with the industry group method, first apportioning the surplus among industry groups and then distributing the group surplus among the various risks upon the basis of the individual risk experience. The variations in the methods that can be employed in determining the individual risk participation are innumerable, there being an even

wider latitude than in the development of a plan of experience rating.

The individual risk experience method is the least used of any of the three general methods described. This may be accounted for in several ways:

First, the laws of the states in which most of the mutuals are incorporated do not permit the use of any but the flat percentage of premium method.

Second, there are certain practical difficulties, such as the determination of the true risk experience, which incline many carriers to take the easier course of paying a flat percentage, with or without the grouping by industries.

Third, there is a belief upon the part of many that a variation in the rate of dividend for individual risks is unfairly discriminatory.

Fourth, it is not in consonance with the idea of a "fixed dividend policy," which has the effect of enabling an employer to forecast with considerable certainty his final insurance cost.

Finally, it is held by some to be a violation of a fundamental principle of insurance, in that the purpose and justification of insurance is the distribution of losses and that those who suffer heavy losses should not receive less on that account than their more fortunate associates.

In any discussion of methods of surplus distribution, that is based upon practices now existing, it is essential that all the facts of each case be known, otherwise one is very apt to reach the wrong conclusion. It may be very much worth while to generalize but before assuming that a general conclusion is applicable to a specific case, it is necessary to find out whether that case presents peculiarities not hitherto considered. For example, one could not offhand state that a particular system of dividend distribution, which as a general proposition seemed most desirable, would in fact be the best system for any given state fund, mutual, stock company or reciprocal exchange to follow. Requirements of law, rulings of supervising officials, the form of carrier, and its relation to policyholders, have all played their part in the development of the existing systems. At the same time, it is not possible in this paper to attempt a presentation of the various laws, rulings, etc., which have led to the adoption of specific dividend plans. It is the primary purpose of this paper

to present, through a specific illustration, the main features of the third method of surplus distribution, viz., the individual risk experience method, and to hope that through discussion or future papers, other phases of the subject will be covered.

Before proceeding to this end, it is desirable to say just a word or two in a general way about some of the questions which may arise in connection with the distribution of surplus, if a company is engaged in more than one line of insurance or in more than one state.

Should the surplus be ascertained independently for each line and then be distributed according to one of the three previously described general methods, or should the total surplus be distributed without regard to the relative profits or losses from the several lines? This is not an easy question to answer. In mutual companies, where the liability to assessment runs concurrently with the right to receive dividends, it is not difficult to follow the argument that the total surplus should be distributed pro rata without regard to lines, because that is the way assessments would be levied. But, on the other hand, the grouping by lines seems logical when viewed in relation to the circumstances under which the business is written. Rates for compensation insurance are in most cases supervised as to adequacy and, compared to other lines, the underwriting results are much more definite. Competitive situations met by rate reductions may make other lines less profitable, thus forcing a burden on the compensation policyholders, or on the other hand, larger profits in other lines may result in furnishing compensation insurance below its net cost. In either event, the distribution of surplus without regard to the surplus earned by lines is hard to justify. Of course, when considering a mutual company, it is possible to look upon it as "one big union," in which each member has, theoretically at least, acquired an interest measured by the size of his premium, irrespective of the kind of risk he has transferred to the group. Presumptively the relative risk hazard has been correctly measured in advance and if not, the remedy lies in changing the measure for the future and not through accommodation in the plan of distributing surplus. The only objection to this is that the underlying presumption is a practical impossibility, because relative risk hazards are seldom correctly measured and cannot in the nature of things be arbitrarily

changed without regard to rates charged by other carriers. It would seem, from a purely practical point of view, that much might be gained by apportioning the surplus earned on the company's business as a whole among the several lines of insurance in relation to the surplus earned by each, and then proceeding to distribute the surplus of each line among the individual policyholders according to one of the three general methods.

A couple of actual cases may throw light upon the situation. A certain company writes compensation and automobile liability insurance. During a recent year it had a very excellent compensation experience, due in large measure to the fact that its writings were confined mostly to one industry, the compensation rates for which were apparently too high. At the same time it had a very bad automobile experience showing very little profit when its reserves were put up on the legal reserve basis, and a loss when its reserves were put up on the company's own estimates. This condition was due to the fact that competition had forced the automobile liability rates to a very low point for the class of cars insured. The company wished to pay no dividends upon its liability business on the ground that they had not been earned. Technically, under the law this was impossible. The by-laws of the company did not separate the business by lines of insurance but gave each member an interest in surplus earned from any source, just as each one was liable for a pro rata assessment in case of a net loss, irrespective of the source of the loss. The affairs of the company had to be viewed as a whole and the liability policyholders were entitled to a pro rata share of the surplus earned by the compensation policyholders. In this particular case it happened that the two classes of policyholders were pretty generally one and the same so the legal requirement was not as unjust as it might have appeared if they were different sets of persons.

In another mutual company, a peculiar arrangement had been made with a stock company, the practical effect of which was to reinsure all automobile liability risks with the latter upon a basis where 10% of the original premium was retained and the rest paid for reinsurance. The company wished to pay this 10% as a dividend on its liability business and to allow such dividend to its compensation policyholders as had actually been earned on their risks, which, in this case, was greater than 10%.

Again, the company was not legally entitled to make this distinction by lines of insurance, even though it worked an apparent hardship on the compensation policyholders.

But, assuming that we are dealing with a carrier that is not prevented by law from separating its business by lines for purposes of surplus distribution and, further, that the carrier has decided upon such a course, is it possible to properly allocate expenses to each line? In any ordinary case it would seem that this could be done with sufficient accuracy in substantially the same way it is done for Schedule "W". Of necessity, a strict accounting of expenses according to all lines of insurance could not be kept and many items would have to be distributed upon some such basis as premiums. No one would contend that this sort of an allocation of expenses was rigidly accurate but the slight inaccuracy, taken by itself, could not possibly be the justification for combining all lines and disregarding their indicated individual contributions to surplus.

If a carrier is operating in several states, should the business of each state stand on its own feet in the matter of distributing surplus or should the business of the company be treated as a whole? The question is somewhat analogous to the one preceding but has some distinguishing features, particularly so far as compensation insurance is concerned. In other lines, there being no regulation of rates, it may or may not be just to policyholders to treat the business of the company as a whole in the distribution of surplus, depending upon how nearly rates are kept to their proper level in different states or sections of the country. If a competitive situation forces rates in a particular section below their level in other parts of the country (such is the situation in certain lines of automobile insurance in California at the present time), then it would seem that recognition of that fact should be taken in the distribution of surplus. In compensation insurance we have almost universal rate regulation, but the regulation is in many instances by state authority and in every case the rates are promulgated to fit the compensation acts of the individual states. Carriers doing a countrywide business and distributing their surplus without regard to their experience by individual states may create havoc among the domestic carriers confined within the borders of a single state, not to mention an equal opportunity for injustices to policyholders in different states.

For compensation rate making has not yet reached a point where the same relative rate levels actually exist in all states, and if a low rate level required in one state precludes the earning of a dividend in excess of a certain amount on the business written in that state, the payment of a larger dividend by a carrier operating on a countrywide basis would result in driving the local participating carriers out of business. There are three ways in which different states attempt to prohibit this sort of unfair competition with local carriers:

(1) Where a foreign company has established a "fixed dividend policy" and where the rate of dividend paid in the past exceeds the rate which is presumably earnable under the level of rates that has been approved for the state, such company is required to charge higher rates, the increase being such as would make the net cost of the insurance after payment of the dividend substantially what the probable net cost would be for an equally well conducted local carrier.

(2) If a foreign company charges the approved rates without any increase, then the rate of dividend it may pay is limited to what a properly conducted local carrier could probably earn and pay.

(3) Surplus distributed to policyholders within the state must have been earned on policies covering risks in the state, irrespective of the surplus the carrier may have earned on its countrywide business or the dividends it may be allowing in other states.

While the discussion would be interesting, there is no intention of digressing so far from the main purpose of the paper as to get into the mazes of the advantages and disadvantages of such "protective tariff" measures. Suffice it to say that decidedly contrary views exist, particularly with regard to the last mentioned method of controlling surplus distribution.

PART II

The State Compensation Insurance Fund of California distributes its surplus among policyholders upon the individual risk experience method. Its present dividend system is the result of seven years' experience with this general method of apportioning surplus. It is needless to point out that so far as the Fund is

concerned, the process by which the present system in all its details has been reached is one of evolution. The theory which underlies the system is built upon the following premises:

(1) The surplus to be returned to a group of policyholders should be that contributed by their policies.

(2) The grouping of policyholders should be upon broad lines to bring fully into play the principles of insurance.

(3) The net cost of insurance (premiums less dividends) should so far as possible represent the true relative measure of the risk which has been assumed.

(4) Overhead expenses included in the net cost should be assessed so far as possible in relation to their incidence.

Starting with these as fundamentals, it is easy to see that one might come out with a great variety of formulae for surplus distribution, and it would seem that each would be a proper formula if it would stand two tests; one, is it equitable and, two, is it practicable.

The primary consideration in the apportionment of dividends under any form of insurance should be the equitable treatment of all policyholders. Equity does not prohibit discrimination between risks but it requires the basis of such discrimination to be fair. Fair discrimination in workmen's compensation insurance is a particularly difficult thing to attain because of the complicated nature of the benefits, the insufficiency of the statistics upon which rates are based, the impropriety of the average rate for a class as the measure of the hazard of individual risks within the class, the variability in the hazard of individual risks from year to year resulting from a multiplicity of interrelated causes and, finally, the limitations of human ingenuity in the practical solution of theoretical problems.

In determining what is equitable, our treatment of the subject must conform to practical requirements of the business, for we are not dealing with an abstract proposition in philosophy or mathematics, but with a concrete phase of a large and important business. A business, which, in its contact with the public and particularly the insuring public, must be able to explain its workings in homely terms and to carry conviction to the minds of all that those workings are entirely fair and proper. But, in deciding the practical limitations, we must not fall into the habit

of thinking of the insurance carrier in terms of its corporate manifestations only. We must remember that the carrier, whether it be a stock or mutual company, a state fund or an interinsurer, is really a group of policyholders, whose interests are paramount in the determination of ways and means of conducting the business. In developing its dividend formula, the Fund has attempted to keep this viewpoint ever present and to weld theory and practice into an equitable and workable dividend scheme.

The basis of grouping employed by the Fund is the policy year. The surplus earned on policies of a given year of issue is distributed among the holders of those policies. Because of the desirability, from a practical point of view, of allowing dividends at the time of final adjustment on pay-roll audit, it is necessary to determine before all policies have expired the rate at which surplus is being earned on the business of a given year of issue. This is quite readily done by determining the projected loss ratio on December 31 of each year for policies of the current year of issue. Such determination, when made upon the past experience of the individual carrier and based upon a separation of the benefits into "medical" and "all other losses," is quite accurate and serves the purpose very nicely. It enables the Fund to decide in advance its dividend schedule for expirations of the ensuing year, very much as life insurance companies do. There must, of course, be a free surplus on December 31 of sufficient size to cover the prospective dividends, even though the amount of the dividends to be allowed is based upon prospective earnings.

The projected loss ratio and the actual expense ratio give the starting points of the distribution. They, together with investment profits, determine the amount available for distribution, expressed as a percentage of premiums. But the principal problem yet remains, *viz.*, that of distributing this amount among individual policyholders. This brings us to a consideration of the third and fourth premises previously mentioned. The Fund has approached the solution of the problem from its analogy to that of experience rating and of a graduated expense loading. Experience rating utilizes individual risk experience to adjust the measure of the risk and a graduated expense loading formula attempts to assess expenses in relation to their incidence. The

problems differ mainly in the fact that dividend distribution is of necessity retrospective in its application.

If we grant that the rates charged a particular risk are based upon the best possible advance measure of the risk hazard, it still follows that they may not be correct. If in the distribution of surplus it is possible to effect a further refinement of risk measurements, more complete justice will be done policyholders and the fundamental principles of insurance will be better carried out. To the extent, therefore, that individual risk experience is significant in the modification of rates through experience rating, it is utilized in determining the participation of an individual risk in the surplus available for distribution. The fact that prospective experience rating may have been employed in determining the advance rates, is only a further argument for a similar procedure applied retrospectively through the agency of the dividend. For the experience used in determining the rate of dividend is new experience, not hitherto used in the rating of the risk, and when given its proper credibility produces a further refinement of the rate for the individual risk. It checks up on prospective experience rating and reflects, with more expedition, changes in individual risk hazard produced by safety work, new processes, etc.

The loading in compensation rates at the present time is a flat percentage addition. In the case of a carrier operating as does the Fund, this method of loading is far from representing the facts concerning the incidence of expenses. The Fund from its own experience has determined a graduated expense formula, which when applied to the business of the Fund reproduces the actual total expenses. It was evolved by a two factor process, *viz.*, that of dividing expenses according to whether they varied by size of premium or were constant for each policy. Such a process does not introduce all the refinements, which in theory ought to be taken into account, but it does practically accomplish the thing. When it is considered that the average total expense ratio of the Fund is in the neighborhood of 12% and that this includes at the present time taxes of 2.6% and claim expenses of about 4.5%, it will be seen that substantially no change would be made in the results through the use of additional factors.

The actual distribution of expenses for policy year 1917 is shown in the following table:

CALIFORNIA STATE COMPENSATION INSURANCE FUND. EXPERIENCE OF POLICY YEAR 1917 BY SIZE OF RISK.

TABLE I.

Item	SIZE OF RISK MEASURED BY PREMIUM GROUPS.									
	Minimum Premium Policies	$0 to $200	$201 to $500	$501 to $1000	$1001 to $2000	$2001 to $4000	$4001 to $6000	$6001 to $10,000	$10,000 & over	Total
Number of Policies	3020	5026	657	268	139	86	33	20	18	9267
Premiums	$56241	$272128	$205889	$183935	$190236	$232944	$160502	$152388	$362407	$1816670
Losses	$52239	$180534	$143055	$79673	$97584	$132819	$73783	$59839	$200335	$1020131
Unallocated Claim Expenses	$2434	$11366	$8606	$7688	$7946	$9736	$6708	$6367	$15132	75888
Taxes	1123	5429	4120	3681	3804	4662	3212	3047	7245	36333
General Expenses (Flat charge per policy)	25236	52625	8970	5020	2510	1425	863	194	184	97054
General Expenses (% of premium)	809	3921	2970	2653	2742	3360	2315	2197	5222	26189
Total Expenses	$29513	$73372	$24666	$19042	$17002	$19183	$13098	$11805	$27783	$235464
Ratio of Total Expenses to Premiums	52.4%	26.9%	12.3%	10.3%	9.2%	8.2%	8.1%	7.7%	7.5%	12.9%
Average Charge per Policy for General Expenses	$8.60	$11.20	$18.10	$28.60	$37.70	$55.60	$96.30	$119.00	$300.30	$13.30

The items listed show the number of policies, the premiums and the losses, and in addition the expenses divided into four groups, as follows:

1. Unallocated Claim Expenses.
2. Taxes.
3. General Expenses Chargeable According to the Number of Policies.
4. General Expenses Chargeable on the Basis of Premiums.

From these actual figures for the premium groups shown, the following table was made up. It shows the graduated expense ratios applied to various premium groups as well as the average loss ratio and the ratio of profit.

TABLE II.

CALIFORNIA STATE COMPENSATION INSURANCE FUND.

Showing graduated charges for expenses, average loss ratio and indicated average dividends by size of risk. (Policy year 1917).

Premium Groups	(1) Graduated Expense Ratio	(2) Average Loss Ratio	(3) Average Dividend
$201- $300	17.5	53	29.5
301- 400	17.0	53	30.0
401- 500	16.5	53	30.5
501- 600	16.0	53	31.0
601- 700	15.5	53	31.5
701- 900	15.0	53	32.0
901- 1100	14.5	53	32.5
1101- 1300	14.0	53	33.0
1301- 2100	13.5	53	33.5
2101- 2500	13.0	53	34.0
2501- 3000	12.5	53	34.5
3001- 4000	12.0	53	35.0
4001- 5000	11.5	53	35.5
5001- 7000	11.0	53	36.0
7001- 9000	10.5	53	36.5
9001-14000	10.0	53	37.0
14001-20000	9.5	53	37.5
20001-30000	9.0	53	38.0
30001-40000	8.5	53	38.5

In apportioning surplus on current years of issue as policies expire, investment profit is withheld for the upbuilding of a surplus to be available for contingencies. Consequently no account of investment profit will be found in the preceding or following tables.

Table II shows the average ratio of profit in various premium groups. The Fund plan contemplates that a risk with the average loss ratio will receive the average dividend, but a variation from the average loss ratio will cause a variation in the rate

of dividend, the extent being dependent upon the size of the risk. Because of the slight value of individual risk experience in risks with $500 or less premium, the average dividend for the premium group is paid, irrespective of individual loss ratio, to all risks with premiums under $500. Above that the following formula is employed:

$$\text{Percentage of Dividend} = \frac{P - (e + l)\left[P + z\left(\frac{L}{l} - P\right)\right]}{P}$$

where

P = Individual risk premium.

e = Expense ratio for the premium group in which the risk falls.

l = Loss ratio for all policies participating in the distribution.

$z = \frac{P}{P + K}$ where K has any assigned value.

L = Actual losses of the individual risk.

This formula is developed upon the following basis: Since l is the average loss ratio, then the average loading, viewed retrospectively, may be considered as $1 - l$. To convert the actual losses into premiums for comparison with the actual premium, it is necessary to divide the losses by l. The difference so indicated cannot be taken at its face value but must be modified in accordance with its credibility, which is measured by the factor z. The result is the addition to or deduction from the actual premium, to give the premium which the risk should have paid to obtain the average dividend. But the amount which the risk would have then been charged for losses and expenses would be the average loss ratio and the expense ratio for that premium group, multiplied into the adjusted premium. The remainder of the adjusted premium would have been the dividend. Having actually paid some other premium, P, the insured must first be charged or credited with the adjustment in his premium and after crediting the dividend which he would have received had he paid upon the adjusted basis, the net balance, if any, is allowed the insured as his share of the divisible surplus.

Obviously, this formula will produce situations where the insured not only has no dividend coming to him, but where he actually owes his insurance carrier money. It is necessary in

practice, therefore, to introduce arbitrary stop limits because, however logical it might be to call upon him for the payment of negative dividends, it would be impossible to collect them and suicidal from a competitive point of view to make the attempt. In fixing these limits, the Fund also recognized the vital weakness of ignoring the causes and severity of injuries, when modifying the measure of risk hazard upon the basis of individual risk experience. In its desire to place the importance of individual risk experience at its lowest defensible measure and to minimize the effect of including in the actual losses, the costs of accidents which are not indicative of risk hazard it decided that every policyholder, irrespective of loss ratio, should get some dividend and that the cost of allowing minimum dividends, where they were in excess of those indicated by the formula, would be met by fixing a maximum dividend as well. Thus in practice the formula is applicable only to those risks whose loss ratios lie within the minimum and maximum values corresponding respectively to the maximum and minimum rates of dividends. Because the credibility of the risk experience, as an indicator of risk hazard, increases with the size of the risk, it was decided that the minimum dividend should decrease with an increase in the size of risk, thus bringing the individual risk experience more and more into play as the risk increases in size. Finally it was decided that even for the largest risks a dividend of no less than ten per cent should be allowed, which, therefore, became the terminal value for these decreasing minimum dividends.

In order to fix proper maximum and minimum values for the dividends, according to size of risk, it was necessary to make actual tests. Obviously, the values should be so placed that they would compensate for each other and at the same time there should be a consistent relation between the values assigned to different sized premium groups. To make the test a tabulation of the year of issue premiums was made by size of risk and by loss ratio. Tables V and VI at the end of this paper show such tabulations for policy years 1917 and 1918. A study of them shows that for the smaller risks the loss ratios are either very small or very large and that this tendency diminishes as the risks increase in size. This is a further justification for the imposition of arbitrary limits, as otherwise it would have been necessary to split the premium into its several component ele-

ments (Death, Permanent Total, Major Permanent, etc.) and adopt different values of K for each in order not to give improper weight to the serious cases. Under the circumstances the same result is attained by the limits in a very simple and thoroughly satisfactory way.

As a result of the tests, the maximum for all groups was placed at the point of a 20% loss ratio. The value of the dividend indicated by the formula for a 20% loss ratio became the value for any loss ratio less than that. The minimum dividends which were adopted were, therefore, placed at the points where they would just take up the excess obtained by placing the maximum as above and where there would be a consistent downward trend to the terminal value of 10%. This may be illustrated best by showing the 1917 year of issue values:

TABLE III.

CALIFORNIA STATE COMPENSATION INSURANCE FUND

Showing average, maximum and minimum dividends for various sized risks (Policy Year 1917).

Size of Risk	Expense Ratio	Average dividend (Allowed for loss ratio of 53%)	Maximum Dividend	Minimum Dividend	
			Allowed for loss ratios of 0 to 20%	Loss ratio for which allowed	Amount in %
$201– $300	17.5	29.5	30.0	149% & over	27.5
301– 400	17.0	30.0	30.5	148% " "	27.5
401– 500	16.5	30.5	31.0	136% " "	27.5
501– 600	16.0	31.0	32.0	128% " "	27.5
601– 700	15.5	31.5	32.5	128% " "	27.5
701– 900	15.0	32.0	33.5	128% " "	27.5
901– 1100	14.5	32.5	34.5	127% " "	27.0
1101– 1300	14.0	33.0	35.5	123% " "	27.0
1301– 1700	13.5	33.5	36.5	122% " "	26.5
1701– 2100	13.5	33.5	37.0	120% " "	26.5
2101– 2500	13.0	34.0	38.0	114% " "	26.0
2501– 3000	12.5	34.5	39.0	113% " "	26.0
3001– 3500	12.0	35.0	40.5	109% " "	25.5
3501– 4000	12.0	35.0	41.5	107% " "	25.0
4001– 4500	11.5	35.5	42.5	106% " "	24.5
4501– 5000	11.5	35.5	43.0	106% " "	24.0
5001– 6000	11.0	36.0	44.5	105% " "	23.0
6001– 7000	11.0	36.0	45.5	100% " "	21.5
7001– 8000	10.5	36.5	47.0	99% " "	21.0
8001– 9000	10.5	36.5	48.0	98% " "	20.5
9001–10000	10.0	37.0	49.5	98% " "	19.0
10001–12000	10.0	37.0	50.5	97% " "	18.0
12001–14000	10.0	37.0	52.0	96% " "	17.0
14001–16000	9.5	37.5	53.5	95% " "	16.0
16001–18000	9.5	37.5	55.0	93% " "	15.0
18001–20000	9.5	37.5	56.5	93% " "	14.0

Upon the basis of a projected loss ratio of 63% for policy year 1920 and an average expense ratio of 12%, the following table of values was developed for application to policies of that year upon their expiration:

TABLE IV.

CALIFORNIA STATE COMPENSATION INSURANCE FUND

Showing average, maximum and minimum dividend for various sized risks. (Applicable to policy year 1920.)

Size of Risk	Expense Ratio	Average dividend (Allowed for loss ratio of 63%	Maximum Dividend	Minimum Dividend	
			Allowed for loss ratios of 0 to 20%	Loss ratio for which allowed	Amount in %
0– 100	27.0	10.0	10.0		10.0
101– 150	23.0	14.0	14.0	Loss Ratios	14.0
151– 200	21.0	16.0	16.0	not con-	16.0
201– 250	19.0	18.0	18.0	sidered for	18.0
251– 300	17.5	19.5	19.5	risks of	19.5
301– 400	16.5	20.5	20.5	$500.00 or	20.5
401– 500	16.0	21.0	21.0	less.	21.0
501– 600	15.5	21.5	23.0	138% & over	18.5
601– 700	15.0	22.0	24.0	131% " "	18.5
701– 900	14.5	22.5	25.0	128% " "	18.5
901– 1100	14.0	23.0	25.5	125% " "	18.5
1101– 1300	13.5	23.5	26.5	123% " "	18.5
1301– 1700	13.0	24.0	28.0	119% " "	18.5
1701– 2100	12.5	24.5	29.0	116% " "	18.0
2101– 2500	12.0	25.0	31.5	112% " "	17.5
2501– 3000	11.5	25.5	33.0	110% " "	17.0
3001– 4000	11.0	26.0	34.5	108% " "	16.5
4001– 5000	10.0	26.5	36.5	107% " "	16.0
5001– 6000	10.0	27.0	38.0	104% " "	16.0
6001– 7000	10.0	27.0	39.5	101% " "	15.5
7001– 8000	9.5	27.5	41.0	100% " "	14.5
8001– 9000	9.5	27.5	42.5	98% " "	14.5
9001–10000	9.0	28.0	44.0	97% " "	14.0
10000–12000	9.0	28.0	45.5	96% " "	13.5
12000–14000	9.0	28.0	47.5	94% " "	13.0
14000–16000	8.5	28.5	49.5	93% " "	13.0
16000–18000	8.5	28.5	50.5	92% " "	12.0
18000–20000	8.5	28.5	51.5	91% " "	11.5
25000	8.5	28.5	53.5	90% " "	11.0
30000	8.5	28.5	55.5	89% " "	10.0
35000	8.5	28.5	57.5	88% " "	10.0
40000	8.5	28.5	59.5	87% " "	10.0
45000	8.5	28.5	61.5	86% " "	10.0
50000	8.5	28.5	63.5	85% " "	10.0
60000	8.5	28.5	64.5	84.5% " "	10.0
70000	8.5	28.5	65.5	84% " "	10.0
80000	8.5	28.5	67.0	83.5% " "	10.0
90000	8.5	28.5	68.0	83% " "	10.0
100000	8.5	28.5	69.0	83% " "	10.0
200000	8.5	28.5	73.0	82% " "	10.0

In connection with this table it is of interest to point out that, under the method used to apportion dividends, an average loss ratio of 63% and an expense ratio of 12% would mean an average dividend of 25%, and the actual dividends allowed during the first nine months of 1921 on expirations of policy year 1920 averaged 25.5%. These dividends were distributed by the formula previously given, substituting therein the graduated expense ratios and the average loss ratio shown in the table for policy year 1920.

If an average loss ratio higher than the projected loss ratio were actually experienced, the dividends distributed would likewise be less because the risks participate upon the basis of their loss ratios. Likewise, if the projected loss ratio is found to be too high, the actual amount of dividends distributed will be found to be greater than the estimated amount. In short, there is a tendency within the formula itself to adjust the amount of surplus distributed to the actual amount available irrespective of the validity of the first assumption respecting such amount. The closer the first approximation, the more equitably will the formula operate, but unless there is a material change in the distribution of loss ratios from that upon which the limits are based, there is no chance of missing the mark to any appreciable extent. It is quite easy to watch the progress of the plan during the year it is being applied to expiring risks, and it could be subject to monthly, quarterly or semi-annual modification if such were found desirable.

In allowing the dividend upon an expired risk, it is not only necessary to have the pay-roll audit completed and the final adjustment of premium made, but also the losses must be sufficiently matured to determine true loss ratios. While this is a real problem in many risks where there are indeterminate cases, it is not a bit different from the problem as it exists in experience rating procedure. If it can be solved satisfactorily in the latter case, it can equally well be solved for purposes of dividend distribution.

The Fund has not only had no trouble in applying the plan in the determination of dividends on expiring business, but it has found that it appeals very strongly to the insuring public. It would seem that the best proof possible of its practicability would be the fact that it has stood up perfectly under the test

of actual use. Further, it seems to comply with the criterion that the formula of distribution be equitable, for only such weight is given to individual loss experience as the credibility of that experience warrants. It does not discriminate unfairly between risks, but carries the principles of fair discrimination to their logical conclusion in that unintentional errors in advance risk measurement are modified and their disturbing effect upon policyholders minimized.

TABLE V.

DISTRIBUTION OF PREMIUMS BY LOSS RATIO AND SIZE OF RISK.

CALIFORNIA STATE COMPENSATION INSURANCE FUND.

(*1917 Year of Issue*)

Loss ratios (in %)	$501 to $1000	$1001 to $2000	$2001 to $4000	$4001 to $6000	$6001 to $10,000	Over $10,000
0 to 4	$54239	$38663	$39492	$18266	$14389	..
5 to 9	23288	27642	25133	14235	14865	..
10–14	18986	24991	34018	15352	7160	$29249
15–19	17648	11038	9139	25017	33600	25071
20–24	7459	13921	6284	..	7722	22688
25- 29	8805	10495	13522	9844	8037	34767
30–34	5401	9234	13816	..	6930	..
35–39	3486	6792	7864	15625	..	..
40–44	1730	2871	6184	4570	7571	10196
45–49	2708	2209	5525	..	..	28917
50–54	5007	2726	3504	..	8514	19067
55–59	2697	4306	2447	..	17388	54760
60–64	3183	..	18267	5169	..	47497
65–69	2417	2429	2169	8846	..	..
70–74	953	7095	..	..	..	..
75-79	1459	1233	2411	..	..	17080
80–84	1916	..	5280	..	..	..
85–89	1243	..	..	5007	..	42114
90–98	643	..	2861	4291	..	..
99 over	20659	24584	35020	34274	23475	30724

TABLE VI.

CALIFORNIA STATE COMPENSATION INSURANCE FUND. DISTRIBUTION OF PREMIUMS BY LOSS RATIO AND SIZE OF RISK.
(1918 Year of Issue)

Loss ratios (in %)	Size of Risk								
	$0 to $200	$201 to $500	$501 to $1000	$1001 to $2000	$2001 to $3000	$3001 to $5000	$5001 to $9000	$9001 to $10,000	Over $10,000
0 to 10	$312962	$184609	$160542	$116555	$42028	$76625	$47788	$7228	$10166
11 " 20	20307	30594	37353	54926	33485	58245	48756	40524	62569
21 " 24	5337	6091	13196	15373	4863	7599	..	..	11604
25 " 28	2655	8069	11361	15136	9241	11892	6225	9928	..
29 " 32	3417	4366	10792	15142	7319	9530	5169	..	46189
33 " 36	2241	4668	6836	9608	4713	9401	6162	24277	65297
37 " 40	1845	4167	8641	5780	2452	..	..	18962	41003
41 " 43	2196	3428	1472	2914	4643	..	..	..	15145
44 " 47	2072	3206	5271	5619	..	7320	..	9907	36643
48 " 51	2923	3186	4982	8040	2120	22073	5891	..	178824
52 "	857	476	..	1845	2651	..	5496	..	..
53 " 56	1638	1722	1717	1102	..	12544	6361	..	37393
57 " 60	1561	1905	3347	1627	5059	9133	..	16702	22912
61 " 64	1297	1457	4892	3925	..	3191	..	..	194694
65 " 68	1157	1634	636	2708	..	3088	6821	..	..
69 " 72	1762	1292	2229	1632	4962	3437	6947	..	10164
73 " 76	1430	1444	2416	..	2648	..	5570	7779	20788
77 " 80	645	1304	667	..	..	3351	..	..	10973
81 " 84	545	1589	1377	..	2304	8205	..	..	..
85 " 88	1534	442	..	..	..	6556	..	..	12103
89 " 92	581	1415	616	..	2334	..	..	..	13919
93 " 96	1018	1536	1612	1314	2727	11750	..	..	..
97 100	866	969	1801	..	2625	..	..	..	..
101 " 104	273	1765	..	4564	2028	..	11537	..	17870
105 " 108	663	1327	947	..	5139	4369	..	9724	..
109 " 112	586	671	733	1154	2536	..	..	..	..
113 " 116	1183	355	1460	..	2327	4228	..	9219	..
117 " 119	282	337	..	..	..	..	..	..	..
120 " 123	440	..	575	..	..	..	..	..	21826
124 " 126	148	276	511	..	..	..	..	..	..
127 " 130	273	..	..	1662	2384	..	..	..	..
131 " 134	281	732	..	2848	..	..	..	..	..
135 " 138	715	243	547	2870	2946	3052	..	..	..
over " 138	24220	19991	29287	45267	12718	17647	18234	7383	830080