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A METHOD OF CALCULATING GROUP TERM DIVIDENDS

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THE purpose of this paper is to present a method for calculating dividends for group life insurance policies issued on the one-year renewable term basis and deemed large enough to qualify for experience rating. The paper is written from the point of view of retrospective dividends rather than prospective dividends (rate reductions). Although the paper is confined to the problem of group life, the method can be adapted to group casualty.

It is hoped that the paper will be useful to actuaries faced with the problem of developing a group term dividend formula for companies new to the group-writing field.

Establishing a group dividend formula is a practical matter. This point was brought out very well by Mr. Robert Henderson[1] some 23 years ago in discussing Mr. Ralph Keffer's paper, "An Experience Rating Formula." Mr. Henderson said, in part:

> I have to admit that in the short time that I have had Mr. Keffer's paper I haven't been able to follow through the mathematical analysis. So I speak as a non-mathematical layman, and therefore I will speak freely what is the impression that a good many in a similar position who are Fellows of the Society may have gotten from that paper. That is, that the distribution of dividends and the experience rating formula is to a large extent a practical matter. The important thing is the ultimate object to be attained and I cannot see that any definite conclusions regarding that ultimate object can be based on a hypothesis which may or may not be true. There are two important considerations in connection with the distribution of dividends in group insurance. One is that naturally a small group is more liable to fluctuation than a large group, and, therefore, there needs to be some smoothing formula of some kind which will operate more intensely on small groups than on the large. There are various formulas which will do this and so long as one is devised which will accomplish the ultimate object of working in gradually and forcibly each group's own experience, and will accomplish what I consider the second important object, all good purposes are served.
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> The second important object, of course, is that the actual claims and actual expenses shall be taken care of, including the initial expenses and that a surplus shall be built up and maintained to cover contingencies.

[1] *TASA* XXX, 604.

Although it is difficult to quarrel with Mr. Henderson's two objectives, an actuary will find it desirable to have a more extensive list of objectives before attempting to work out the details of a formula. The formula presented in this paper is based on ten rather broad objectives, listed and discussed below.

1. The company's group term business should not only stand on its own feet but also make a contribution to the surplus funds of the company.

2. Dividends should be as large as possible without being inconsistent with objective 1.

3. If the formula be applied to a constant case (a group for which there is no change from year to year in lives, premiums, claims, or other pertinent factors), then the dividend for any given year should never be less than the dividend for the preceding year.

Although a constant case is rarely, if ever, met in the real world, this assumption is important because dividend illustrations are almost always based on the assumption of a constant case with claims being taken as some arbitrarily assumed percentage of the premium. If an illustration shows year-by-year results, it is desirable that objective 3 be met. In the ordinary branch of the life insurance business the practice of using an increasing scale of dividends has been common for many years and has been generally accepted by the insurance-buying public. Employers and union representatives tend to expect similar results in the group field.

4. Year to year fluctuations in dividends as a percentage of current year premium should be minimized.

Some policyholders may feel that the return (combined total of claims and dividend), rather than the dividend alone, should be relatively stable. In the writer's judgment, however, most policyholders are more interested in having a stable net cost (premium less dividend) than in seeing that the insurance company's retention (premium less return) is stable; the typical policyholder is concerned with retention only in that he wants it to be reasonably low on the average.

5. The company should hold a reasonable reserve for unreported claims in order to guard against a net loss on termination of group contracts.

This problem can be minimized by delaying the calculation of the dividend for a terminating case for possibly 60 days. This procedure will greatly reduce the significance of unreported claims and will also allow the company to take into account the cost of conversions for policies that allow individual conversions when the policy itself is lapsed.

6. In order to discourage switching to another company after a high claim year and in order to have a real insurance element, especially for the

smaller groups, the formula should be so devised that excess claims will be distributed among all cases rather than charged to the particular group. Excess claims are defined as the excess, if any, of the actual claims for the year over a stated maximum.

The point here is that it is unrealistic to try to make every group stand on its own feet. If a formula withholds dividends whenever the total premiums paid are less than actual claims and expenses, it denies dividends for a long time to small cases that happen to have several claims in a relatively short period of time. A policyholder having a very high loss ratio (say 300%) in some year might be well advised to change carriers and pay acquisition costs again rather than submit to a formula that forced him to make up the excess claims before receiving a dividend.

The maximum claim charge is necessarily a matter of judgment. For the purposes of this paper, 150% of the basic premium for the year has been taken as the maximum amount chargeable to an individual group in any one year.

7. The return produced for large cases should be competitive without violating objective 1.

8. A dividend smaller than 2% of the current year premium should not be paid, on the theory that a very small dividend would be received with less favor than no dividend at all.

9. The formula should not break down for extreme cases.

10. The dividend calculation worksheet should be consistent with company accounting procedures and should be simple enough so that the calculations can be performed by well-trained, intelligent girls with no technical background.

EXCESS CLAIMS

If the claim charge for any one year is to be limited to a maximum of 150% of the basic premium for the year, it will of course be necessary to spread the cost of this limitation among all the groups. The question naturally arises as to the size of the excess claim charge. The following charges are recommended:

Number of Lives	Excess Claim Charge Expressed as a Percentage of the Average Dollar Amount of Insurance per Life
Less than 101	14.0%
101–200	11.5
201–300	9.0
More than 300	5.0

The recommendations above were arrived at by assuming that the probabilities of the occurrence of 0, 1, 2, . . . deaths in a year in a group may be computed by the Poisson distribution. An empirical analysis based on this assumption resulted in the recommendations. The details of this analysis have been omitted (with mild regrets) for two reasons. First, it was felt desirable to keep the paper reasonably short. Second, since the recommendations are based on various assumptions which may not be true, they are arbitrary anyway—regardless of any beauty that might exist in the reasoning.

At this point a logical question is, "Why base a dividend formula on a set of factors developed from various assumptions which may or may not fit the facts?" The answer is two-fold. First, it was necessary to use an armchair method since no data were available. Second, the recommended charges are intended merely as a starting point. They can easily be checked against the actual results on an annual basis.

The history sheet, presented later in the paper, will show the excess claims and the excess claim charge by policy year for every policy on the company's books. This record will make it very easy for a company to compare its total excess claims with the charges therefor—such totals to be split by size of group. Adjustments in the formula may be made from time to time on the basis of these figures. It is perhaps unnecessary to say that a certain amount of judgment is required in making these adjustments. Fluctuations from year to year must be expected, especially for a comparatively small group department. In addition, claims resulting from a catastrophe such as the Texas City disaster should be charged against the general surplus funds of the group department rather than be included in the excess claims charges.

DIVIDEND WORKSHEET

After a great deal of experimenting it was decided that the formula embodied in the worksheet shown on the next two pages best met the ten objectives mentioned earlier in the paper. The method used is essentially the fund method and may be outlined as follows.

Mortality charge = actual claims (but not more than the stated maximum of 150% of basic premium) plus excess claim charge plus cost of conversions.

Excess for the year = premium less mortality charge less expenses less contribution to contingency reserve.

Total excess = algebraic sum of the excesses for every year from the date of issue of the policy up to and including the current year.

Theoretical reserve = product of the total excess and a reserve factor

DIVIDEND WORKSHEET (GROUP TERM)

POLICY NO...NAME..

RENEWAL DATE................................POLICY YEAR..

1) Lives exposed prior years = last year's (3)	....
2) Lives exposed current year	....
3) Total lives exposed = (1) + (2)	....
4) Premium (P)	$..........................
5) Basic premium × 1.5	$..........................
6) Claims	$..........................
7) Average coverage per life in thousands	....
8) Excess claim charge [based on (2) and (7)]	$..........................
9) Number of thousands of coverage converted	....
10) Cost of conversions	$..........................
11) Total mortality charge = (10) + (8) + [lesser of (5) and (6)]	$..........................
12) Premium tax = rate (................) × (4)	$..........................
13) Commissions	$..........................
14) Overrider	$..........................
15) Contingency reserve contribution	$..........................
16) Administrative expense	$..........................
17) Total expense = (12) + (13) + (14) + (15) + (16)	$..........................
18) Excess = (4) − (11) − (17)	$..........................
19) Excess prior years = last year's (20)	$..........................
20) Total excess = (18) + (19)	$..........................
21) Reserve factor $= \dfrac{1000}{1000 + (3)}$	....
22) Factor × excess = (20) × (21)	$..........................*
23) Theoretical reserve = greater of (22) and 10% of (4)	$..........................
24) Total theoretical dividend = (20) − (23)	$..........................*
25) Total actual dividends prior years = last year's (40)	$..........................
26) Theoretical dividend = (24) − (25)	$..........................*

* Use 0 if negative.

FORMULA ADJUSTMENTS

27) Last year's dividend rate (d) = last year's (39)	....
28) dP = (27) × (4)	$....................
29) Last year's actual reserve = last year's (41)	$....................
Fill in items (30) – (32) if and only if (18) ≥ (28).	
30) (d + .1)P [Use P for first three policy years]	$....................
31) Lesser of (18) and (30)	$....................
32) Formula dividend = (26) but not more than (31) nor less than (28)	$....................
Fill in items (33)–(36) if and only if (18) < (28).	
33) (d – .05)P but not more than .3P	$....................*
34) $\frac{1}{2}$[(18) + (26) + (29)]	$....................*
35) Lesser of (33) and (34)	$....................
36) Formula dividend = greater of (26) and (35) but not more than (28)	$....................
37) Formula dividend rate $= \dfrac{(32) \text{ or } (36)}{(4)}$	....
38) Actual dividend	$....................
If (37) is greater than 0 but less than 2%, pay .02P. *If (37) is greater than 50%, pay .5P.* *Otherwise, pay (32) or (36).*	
39) Actual dividend rate $= \dfrac{(38)}{(4)}$	....
40) Total dividends paid = (25) + (38)	$....................
41) Actual reserve = (18) + (29) – (38)	$....................

which decreases as the number of life years exposed increases (but not less than 10% of the current year's premium).

Theoretical dividend = total excess less theoretical reserve less actual dividends paid in prior years.

Actual dividend = theoretical dividend adjusted in accordance with the following criteria (in which the word "dividend" is taken to mean the dividend expressed as a percentage of premium).

1. The dividend should never be reduced by more than 5% from last year's dividend, provided that the enforcement of this rule does not require the application of more than one-half of the actual reserve (total excess less actual dividends paid prior years), or involve paying a dividend greater than 30% in a poor year unless the actual reserve is very large.
2. Except in the first three years, when the group is finding its own level and is struggling out of the acquisition costs, the dividend should not exceed last year's dividend by more than 10%.
3. If the formula, with adjustments, produces a dividend between 0 and 2%, the dividend paid should be 2%.
4. Under no circumstances should the dividend be greater than 50%.

COMMENTS ON THE WORKSHEET

The comments below are numbered to correspond with the items on the worksheet. It does not appear necessary to comment on every item.

2. Lives exposed current year. Perhaps the most reasonable procedure is to use the arithmetic mean of the lives insured at the beginning and end of the policy year. If the policy year is not exactly one calendar year, this figure could be adjusted by prorating.

4. Premium. The actual premium for the year.

5. Basic premium. The ratio of basic to actual is easily obtained from the average premium calculations.

6. Claims. This item calls for actual claims including disability claims.

9. Number of thousands of coverage converted. This item is not necessary if the cost of conversions is taken as a percentage of premium.

32. Formula dividend. It should be noted that items (30)-(32) are used only if (18) $\geq$ (28). In such case, since (30) = $(d + .1)\mathrm{P} > d\mathrm{P}$ = (28), it follows that both (18) and (30)—and hence (31)— are at least equal to (28). Therefore, the directions "not more than (31) nor less than (28)" can never be inconsistent.

The formula has been tested against about 100 artificial cases, some of them very extreme. The results were very satisfactory in the light of the ten objectives mentioned earlier in the paper.

It should, of course, be borne in mind that any formula should be checked periodically to see that its performance measures up to expectations. It would be well to check this particular formula annually by figuring the total reserve on the group term business. If the total reserve is too low, a reduction factor in the dividend formula may be necessary. The history sheet, described below, affords a convenient way of checking total reserves as well as excess claims.

HISTORY SHEET

The history sheet can be filled out with very little additional work if it is done at the time the dividend calculation is made. The items on the sheet, which is shown on the next page, are either taken directly from the dividend worksheet for the current year or are easily calculated therefrom.

The history sheet has five major purposes, as follows:

1. It furnishes the group underwriter with all the experience information he is likely to need on one sheet. This makes his periodic reviews of the case much easier.
2. The necessary information for testing the formula with respect to the excess claim charge is available in convenient form.
3. The necessary information for checking the adequacy of total reserves is available in convenient form.
4. Inclusion of the administrative expense charge in the annual section of the sheet may prove useful in cost analysis work.
5. The history sheet contains enough information to calculate the next year's dividend without going back through the basic records. Thus, losing a dividend sheet would not be a calamity. The history sheet and the dividend worksheet should, of course, be filed in different places.

HISTORY SHEET (GROUP TERM)

POLICY NO.............................NAME...

POLICY YEAR	1	2	3	4	5
Annual					
Lives (3)............					
Premium (4)........	$	$	$	$	$
Claims (6)..........	$	$	$	$	$
Excess claim charge (8)	$	$	$	$	$
Excess claims (6)−(5)	$	$	$	$	$
Excess (18)..........	$	$	$	$	$
Dividend (38).......	$	$	$	$	$
Return (6)+(38)....	$	$	$	$	$
Loss ratio..........	%	%	%	%	%
Dividend ratio.......	%	%	%	%	%
Return ratio.........	%	%	%	%	%
Administrative expense (16).........	$	$	$	$	$
Cumulative					
Lives..............					
Premium...........	$	$	$	$	$
Claims.............	$	$	$	$	$
Excess claim charge..	$	$	$	$	$
Excess claims........	$	$	$	$	$
Excess.............	$	$	$	$	$
Dividends..........	$	$	$	$	$
Return.............	$	$	$	$	$
Actual reserve (41)...	$	$	$	$	$
Loss ratio..........	%	%	%	%	%
Dividend ratio.......	%	%	%	%	%
Return ratio.........	%	%	%	%	%