LOSS RESERVE TESTING: A REPORT YEAR APPROACH

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DISCUSSION BY DAVID SKURNICK

GENERAL DISCUSSION

Fisher and Lange offer a new method of testing the reserve for known claims. Like all reserve tests, the evaluation of the reserve for known claims is important for the purposes of maintaining solvency and correctly stating earnings. Furthermore, it also provides a tool for the management and control of the Claims Department. In fact, for large enough companies, this type of analysis can be applied to individual claims offices. I am particularly happy to see the report year approach used, because I agree with the authors that the report year is the best time grouping for the purpose of testing the reserve for known claims.

One stated goal of this article is to instruct actuarial students who are unfamiliar with loss reserving techniques. This goal has been successfully achieved. In a clear step-by-step fashion, by the use of discussion, example and algebra, Fisher and Lange show how to go from tables of loss statistics to estimated average claim sizes, to reserve estimates, to equity calculations, to the effect on earnings. The discussion of various methods of selecting trend factors and disposal rates includes a broad collection of ideas on projecting time series, a problem faced by actuaries in ratemaking as well as reserving. Students should be well pleased with this paper.

Here is a typical instance of good technique. A claim closed without payment is not counted if closed within the initial year, but it is counted if closed in a subsequent year. The initial year's CWP's are useless for the analysis; eliminating them eliminates inaccuracy caused by fluctuation in their number. CWP's from subsequent years are required in order to maintain a fixed number of claims in the report year.

THE FISHER-LANGE METHOD

The new reserving method recommended in this article is certainly correct in that, all other things being equal, it will produce the proper reserve estimate. In order to test the reserve, the method requires the tabulation of a

great deal of data, which may have a variety of uses. However, it is my opinion that the Fisher-Lange method may be no more accurate a reserve test than a simpler method, the Payment Development Method of R. T. Sampson. [1] Later in this review, I will propose a modification that I believe will lead to greater accuracy.

Exhibit I is taken from the Fisher-Lange article. It shows the average cost of closed claims by report year and by settlement year. For example, the second figure in the first column indicates that the average claim reported in 1964 and closed in 1965 cost $790. The figures in parentheses are projections. The final column shows the projected rate of increase in average claim cost for each age group. For example, the second figure in the column indicates that age group 13-24 has a 7.0% annual increase projected.

Exhibit II, also taken from the Fisher-Lange article, shows the disposal rates. For example, the second figure in the first column indicates that .333 of the claims reported in 1964 were settled during 1965. Again the figures in parentheses are projections.

The lower right-hand figure in the main body of Exhibit I, 9.1%, is the weighted average of the projected rates of increase in claim cost, the weights being the product of the average claim cost and the disposal rate for each age group for the 1973 report year. The 9.1% is intended to represent the projected percentage increase in claim cost for the entire 1973 report year.

At the bottom of Exhibit I, a section called "Report Year Totals" has been added. The average claim cost for an entire report year is simply the weighted average of a column in Exhibit I using the weights in the corresponding column of Exhibit II. The percentage shown in the increase in average claim cost over the prior report year.

The figures shown in the exhibits raise certain questions that bear deeper examination.

1. In Exhibit II, why is there a tendency over time to settle claims more quickly?

2. In Exhibit I, why does the assumption of a constant percentage increase in annual claim cost for each age group lead to a varying

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Richard T. Sampson, "Establishing Adequacy of Reserves on Slow Closing Lines Use of Paid Formulae," *Insurance Accounting and Statistical Association Proceedings*, 1959.

increase in average claim for the report year totals?

3. In Exhibit I, why is the 9.1% average increase in claim cost higher than most of the annual increases in the report total claim cost? In particular, why is the 9.1%, which represents 1973, so much higher than the projected 3.8% increase of report year 1973 over 1972?

4. In Exhibit I, why is the average percentage increase in claim cost so high for claims settled at later ages? Would it not seem reasonable to assume that if the average claim settled at ages 0-12 is increasing at 6% per year, then the average claim in each age group is also increasing at 6% per year? Incidentally, this assumption is the foundation of the Payment Development Method.

The authors of the article have answered the first question. They have assumed in this case that the speed-up in claims settlement was the result of a deliberate plan by the claims department. There are two other possible explanations. The speed-up may have been the result of unintentional changes in claims settlement policy, or there may be no real speed-up. We may be seeing a shift in the distribution of type of claims. The company may be experiencing relatively more claims that can be settled quickly, although the company continues to settle each type of claim at the same speed. It seems to me that, in general, a shift in disposal rates is due much more often to a change in claims department policy, either intentional or unintentional, than to a change in distribution of type of claim. This distinction is important because it implies that a change in disposal rate will not affect the total report year average claim cost. A speed-up in claims settlement means that the same claims are settled more quickly than under the prior claims department policy, but for the same amounts.

In response to the second question, the projected increase in report year total average claim varies from year to year for two reasons. First of all, it is based only partly on a projection. Some of the averages in each column are actual figures. These actual figures do not increase consistently. Secondly, the disposal rates change from one report year to another. Mathematically, the report year total average claim depends on the disposal rates.

Continuing to Question Number 3, it should be clear that the 9.1% weighted average figure is higher than the increase in the report year average claim cost due to the increasing percentage of quicker settling claims, which the formulas show are the smaller ones.

The answer to the last question is similar. The high rates of increase in

the higher age groups may be due to the shift in disposal rate. For example, consider claims settled in 37-48 months. As claims begin to be settled more quickly, some of the claims that formerly would have been settled in 49-60 months will enter the 37-48 group. This will raise its average claim cost. Also, some of the claims that would have been in the bottom of the 37-48 group will be settled more quickly and leave the group. This will also raise its average claim cost, since the most quickly settled claims in a group tend to be the smallest.

In the light of the observations above, a critical appraisal seems in order. It has been assumed that any change in the speed with which claims are settled will not change the size of these claims. Since the authors have assumed a constant rate of increase from year to year and since the disposal rate does not affect the size of the claims, I believe the assumed rate of increase in total report year average claim cost ought to be more consistent. As was noted earlier, the report year average claim cost depends mathematically upon the disposal rate and the average cost within each age group. But this is the reverse of our causation assumption, that the report year total average claim cost is independent of the disposal rate, but the average claim cost within each age group depends upon both of these factors.

The 9.1% weighted average of the average percentage increases in claim cost appears to be an artificial figure. Fisher and Lange suggest that management may modify this figure to reflect an anticipated rate of increase based upon external information. I believe that a management that agreed to a 9.1% rate for 1973 would be most surprised to learn that it had actually agreed that the average claim for report year 1973 was only 3.8% higher than the previous year.

The average percentage increase in claim cost for the individual age groups also seems artificial, since the difference in this figure from one age group to another is essentially a reflection of the changes in the disposal rate.

If, as has been assumed, the disposal rate has no effect on the report year total average claim, why bother to measure it? The answer is that it does have an effect on the average claim within an age group and this is our basic data. As long as the average claim within an age group is used to estimate the report year total average claim, some adjustment must be made to account for the possibility that the proportion of claims closed during the period differs from the average. That is, under the assumption that all differences in average percentage increase in claim cost from one age group to another reflect changes in the disposal rates, the Fisher-Lange method of separately

measuring disposal rate and average claim size is a means of correcting a report year average claim development for changes in the disposal rate.

We may liken this method to the farmer who counts sheep by adding the legs and dividing by four. In this analogy, the report year total average claim costs are the sheep, the average claim costs by age group are the legs and the disposal rates are the number of legs per sheep. It is important to recognize that once the farmer begins to count sheep by counting legs he must follow through by determining the average number of legs per sheep, even though the number of sheep does not actually depend upon the number of legs per sheep.

SAMPSON'S ADJUSTMENT FOR A CHANGING DISPOSAL RATE

The effect of the disposal rate on the average claim size was noted by Sampson in 1959[2]. He wrote:

"Even like payment periods are not wholly comparable, however. Numerous factors can lead to changes in settlement rate, the proportion of claims settled within a given time. This involves chance variations in settlements at the end of the payment period; sometimes a few more than normal will be worked off, sometimes a few less.

"This is significant because these 'variance claims,' the ones which may or may not be settled at the end of the period, are not representative of the whole period. Coming late in the period, they are typically the larger claims. Therefore, faster settlement in a given period will throw in more higher cost claims and artificially increase the average payment as compared with a previous slower settling period."

Sampson then goes on to develop a factor to correct for the variance in the disposal rate. Generally speaking, his method is this: In determining the percentage increase in claim cost, the earlier of two adjacent report years is adjusted by adding or subtracting a sufficient number of claims to equalize disposal rates, and adding these claims at an average dollar amount that is higher than the cumulative average in recognition of the fact that these variance claims are the larger, later claims.

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[2] Ibid., P.2

Incidentally, Sampson mentions that this adjustment is generally small and does not warrant extreme precision. It may be noted that the difference in average percentage increase in claim cost by age group is not as important as Exhibit I might suggest, at first glance, since most claims are settled at early ages. For example, the 1973 disposal rates indicate that 94% of the claims will be settled within ages 0 to 36 months, wherein the projected average percentage increase in claim cost only varies from 6.6% to 7.4%.

BEYOND THE DISPOSAL RATE

I would like to suggest a third method of correction for the variance in disposal rate and show why it should be more accurate than the others. This method is feasible, given today's computer capabilities. The two basic assumptions are that a change in the disposal rate will not affect the report year total average claim cost nor will it affect the order of closings within a report year. It follows that the average of the claims settled within a given time period for two different report years will not be directly comparable if the two years had different disposal rates, but the averages over a certain percentage of all claims to be settled will always be directly comparable. For example, the average of the first 50% of the claims closed within a report year should be directly comparable to the average of the first 50% of the claims closed within another report year. Note that the number of claims in a report year is fixed twelve months after the beginning of the report year, so at any later state of development it is possible to determine the percentage of the report year's claims that have closed.

The foregoing analysis suggests that the comparison of claims be based on the order closed and the percentage of total closed, regardless of the speed of closing. Assume that the claims within a report year are listed in order of the date settled and a cumulative average claim cost is computed as each additional 1% of claims closes. Exhibit III shows a portion of such a table. The underlined figures, which come from Exhibit I, show the average claim costs after twelve months of settlements. The remaining data was constructed for the sake of the example. It is my assumption that the $698 average claim cost of 1973 after one year of closings and after 50% of the claims are closed is more directly comparable to the $620 average after 50% of the 1972 claims are closed than to the $612 average after one year of 1972 settlements. If it had already been decided to estimate the average claim for 1972 at $1,618, it would be reasonable to estimate the average claim for 1973 at this figure, increased by the ratio of 698 to 620. This is the analogue of the Payment Development Method. Note that the need to adjust for variance claims, as

well as any error in that adjustment has been eliminated. Under the same assumptions, an alternative approach would be to relate 1973 to 1972 based on a longer term average rate of increase along the fiftieth percentile cumulative averages.

If it is believed that the difference in average percentage increase in claim cost by age group noted in Exhibit I has causes other than variation in the disposal rate, then it will be desirable to group claims in the order closed and compute the separate rates of increase in claim cost. Here it is again desirable to group the claims by the fraction of those closed in order of date of closing, rather than by settlement age, in order to prevent changes in disposal rate from distorting the projections. Exhibit IV, which does not contain actual data, was designed to serve as an example. By way of explanation of this exhibit, the upper left-hand figure of $400 indicates that the average value of the first 40% of claims closed for report year 1966 was $400. The figure just below indicates that the average of the next 10% closed was $420.

An exhibit like this can be projected by any of the methods suggested by Fisher and Lange for projecting Exhibit I. I expect that the projection of Exhibit IV will be smoother than the projection of Exhibit I, since the distortion from changing disposal rates has been eliminated. It would be desirable to perform tests with actual data to determine whether or not the projected average percentage increases in claim cost were the same for each percentile group. These tests could determine whether the simpler method illustrated in Exhibit III would suffice, or whether the more complicated method of Exhibit IV is necessary.

Exhibit 1

(Table 4 of LOSS RESERVE TESTING: A REPORT YEAR APPROACH, by Fisher and Lange)

Average Claim Cost for Claims Settled in Interval Indicated

Age of Claim	Report Year 1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	Average % increase in Claim Cost (exponential)
0 12	398	393	413	444	495	577	545	577	612	698	6.6
13 24	790	871	837	961	1084	988	1146	1181	1466	(1426)	7.0
25 36	2348	2128	2288	2471	2438	2865	3375	3598	(3639)	(3906)	7.4
37 48	2430	2500	2998	3146	4261	4344	4317	(5251)	(5883)	(6591)	12.0
49 60	3429	2630	3425	3173	4681	5285	(5368)	(5986)	(6676)	(7445)	11.5
61 72	2572	3629	2944	4034	5211	(5624)	(6546)	(7620)	(8869)	(10322)	16.4
73 Ult.*	1934	3114	5931	4228	4934	(7216)	(8973)	(11158)	(13874)	(17252)	24.3
											9.1%**

NOTE: Numbers in parentheses are projected values.

*These averages include the current Claim Department estimate for any claims still outstanding.

**Weighted average of percentage increases by age of claim, with weights proportional to the product of the appropriate claim costs (above) and disposal rates (from Table 6) for the latest report year (1973).

Report Year Totals

Report Year	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Average Claim Cost	860	892	959	1013	1155	(1253)	(1410)	(1493)	(1618)	(1679)
Increase Over Prior Year		3.7%	7.5%	5.6%	14.0%	(8.5%)	(12.5%)	(5.9%)	(8.4%)	(3.8%)

Exhibit II

(Table 6 of LOSS RESERVE TESTING: A REPORT YEAR APPROACH, by Fisher and Lange)

Percentage of Report Year Total Claims Incurred Settled in Interval Indicated

Age of Claim Measured in Number of Months from Beginning of Report Year to Settling of Claim	Report Year									
	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
0 12	.508	.503	.496	.505	.500	.497	.471	.477	.477	.502
13 24	.333	.333	.340	.334	.345	.344	.351	.350	.367	(.349)
25 36	.073	.081	.084	.087	.083	.079	.094	.101	(.091)	(.087)
37 48	.037	.036	.038	.035	.033	.040	.047	(.040)	(.036)	(.035)
49 60	.021	.022	.020	.019	.021	.024	(.022)	(.019)	(.017)	(.016)
61 72	.012	.012	.012	.010	.011	(.010)	(.009)	(.008)	(.007)	(.007)
73 Ultimate	.016	.013	.010	.010	.007	(.006)	(.006)	(.005)	(.005)	(.004)

Exhibit III

Cumulative Average Closed Claim in Order of Date of Closing

Percentage of Claims Closed In Order of Date of Closing	Report Year									
	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
46	384	382	400	428	482	561	542	561	596	680
47	387	385	404	430	488	566	545	571	603	685
48	390	388	407	434	490	570	549	577	612	690
49	392	390	410	437	493	572	555	581	614	694
50	395	393	413	440	495	577	559	586	620	698
51	398	396	416	444	500	581	563	589	625	
52	401	400	420	450	502	584	569	594	627	

Exhibit IV

Average Closed Claim Within Percentile Group in Order of Date of Closing

Percentile Group of Claims Closed in Order of Date of Closing	Report Year							
	1966	1967	1968	1969	1970	1971	1972	1973
0—40%	400	420	440	470	510	550	600	670
40—50	420	440	470	510	560	620	680	750
50—60	440	460	500	550	610	690	790	
60—70	470	500	540	590	660	760	900	
70—80	500	540	600	680	710	830	1010	
80—85	550	580	680	770	810	950	1400	
85—90	580	620	740	870	950	1000		
90—95	620	700	820	1000	1100	1200		
95—98	680	800	940	1100				
98—100	850	1000						