LOSS RESERVE TESTING IN A CHANGING ENVIRONMENT

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Determining accurate loss reserves is one of the most challenging tasks facing the actuary, and through the years numerous approaches have been devised to assist in developing reasonable estimates. Many of these are outlined in Skurnick's "A Survey of Loss Reserving Methods."[1]

An actuary, in testing reserve adequacy, frequently employs several different methodologies before determining a final estimate. The approach which produced the most accurate result in previous evaluations might again be heavily relied upon. In a stable environment, an approach which has given reasonable results over time may be expected to do so again. However, in a rapidly changing environment, a previously accurate approach may no longer be appropriate; in fact, the estimate produced might be extremely inaccurate since different methodologies react in varying degrees to changes in underlying experience.[2]

The purpose of this paper is to demonstrate the importance of determining any underlying changes in the claim environment in selecting a reserve test. Basically, this paper examines and compares how several different reserve methodologies react to changes in two "variables": the calendar/accident year loss ratio and the adequacy of the reserves for reported claims. All other factors which normally may change over time are assumed to remain constant.

Other factors, of course, do change and influence reserve tests. The introduction of no-fault insurance, for example, certainly precludes the rate application of a previously acceptable model. In this paper, however, we have chosen to concentrate on the impact of the two items mentioned above as typical of the problems that can develop. It should be recognized that any other factor which causes patterns in the underlying data to be unrepresentative of the current situation can produce a somewhat similar distortion.

[1] D. Skurnick, "A Survey of Loss Reserving Methods," PCAS, LX, 1973.

[2] This situation has been noted previously. For example, see Skurnick, *Ibid.*, p. 37.

[3] R. L. Bornhuetter and R. E. Ferguson, "The Actuary and IBNR," PCAS, LIX, 1972, p. 182.

The paper examines the overall adequacy of the reserves; hence, IBNR is defined as the difference between the ultimate liability and the reported loss reserves (i.e., IBNR includes both development on reported claims and the emergence of unreported claims). This IBNR definition was used by Bornhuetter-Ferguson[3], although, as they note, a more restricted definition is sometimes more appropriate.

Three methodoligies are analyzed, all of which are based on incurred losses and could be said to belong to the "development" family. They are as follows:

(i) *Loss Development* — This is essentially the standard loss development approach used in manual ratemaking. Ultimate loss development factors are determined for each accident year based on recent emergence patterns of incurred losses. (In this paper, for all three methodologies, development factors are based on the latest three points, where available.) These factors are used to estimate the ultimate loss liability for each accident year. The required IBNR is then the sum over the individual accident years of the differences between the estimated ultimate loss liability and the corresponding emerged losses.

(ii) *Expected Loss Approach* — As described in Bornhuetter-Ferguson[4], this approach is based on the ultimate loss development factors determined as in (i). The IBNR need for each accident year is estimated as the product of the accident year expected losses (based on the expected loss ratio) and $1 - \left[\frac{1}{\text{U.L.D.}}\right]$, where U.L.D. is the appropriate ultimate loss development factor. The total IBNR need is the sum over the accident years of these products.

(iii) *Percentage of Premium Method* — For each accident year, IBNR factors are computed from historical emerged losses as a percentage of premium. The IBNR estimate is the sum over the accident years of the product of the appropriate IBNR factor and the corresponding earned premium.

For the purpose of this analysis, the three development methodologies are applied to several different situations and the resulting IBNR estimates are compared. It is assumed that the real underlying situation is known, including both the ultimate loss ratio for each accident year and the ade-

[4] *Ibid.*, p. 186.

quacy of the reserves for reported claims. Clearly, the actuary trying to estimate the IBNR need would not be aware of this information. However, by assuming these items known, one is able to compare the answers produced by the different methodologies, both with each other and with the actual need in the various situations. In a real-life reserve test, part of the task is to make an informed judgment as to the underlying situation so as to choose the most appropriate technique.

THE STATIC SITUATION

When using a development approach to determine the IBNR need, the best results are obtained in a static environment. In such a static situation, one can expect that all three development methodologies would produce the same IBNR estimates. For example, consider the situation depicted in Exhibit I. The ultimate loss ratio for each accident year is constant; in addition, the loss emergence patterns do not change, i.e., the percentage development in incurred losses is the same for each accident year at common valuation dates. As seen below, all three methods yield the same (and the correct) IBNR need in this situation:[5]

Loss Development Method

Accident Year	(1) Ultimate Loss Development Factor[6]	(2) Acc. Year Losses at Current Valuation	(3) Estimated IBNR Required (Col. (1)—1) x Col. (2)
8	2.000	720,000	720,000
7	1.333	990,000	329,670
6	1.159	1,035,000	164,565
5	1.054	1,024,650	55,331
4	1.023	938,124	21,577
3	1.009	832,351	7,491
2	1.003	717,724	2,153
1	1.000	600,000	0
			1,300,787

[5] The minor differences in the Estimated IBNR Required result from rounding the various factors.

[6] Details of the underlying calculations are shown in Exhibit V.

Expected Loss Method

Accident Year	(1) IBNR Factor[7]: 1 − 1 / Ult. Loss Dev. Factor	(2) Expected Losses	(3) Estimated IBNR Required Col. (1) x Col. (2)
8	.500	1,440,000	720,000
7	.250	1,320,000	330,000
6	.137	1,200,000	164,400
5	.051	1,080,000	55,080
4	.022	960,000	21,120
3	.009	840,000	7,560
2	.003	720,000	2,160
1	.000	600,000	0
			1,300,320

Percentage of Premium Method

Accident Year	(1) IBNR Factor[8]	(2) Earned Premium	(3) Estimated IBNR Required Col. (1) x Col. (2)
8	.301	2,400,000	722,400
7	.151	2,200,000	332,200
6	.083	2,000,000	166,000
5	.031	1,800,000	55,800
4	.014	1,600,000	22,400
3	.006	1,400,000	8,400
2	.002	1,200,000	2,400
1	.000	1,000,000	0
			1,309,600

Note that the actual IBNR need, as can be determined from Exhibit I, is $1,302,000 which agrees with the estimates produced by all three of the development methodologies. If the results for a particular line of insurance are static over a period of several accident years, both as to ultimate loss ratio and loss emergence patterns, the choice of a particular methodology from the development family is not an issue as all three will yield the same result.

[7] See Exhibit V.

[8] See Exhibit V.

DETERIORATING LOSS RATIO WITH NO RESERVE STRENGTHENING

Unfortunately for actuaries, the static situation described in the last paragraph is rarely observed in real life. The large underwriting losses experienced by the industry in 1974 and (most likely) in 1975 after profitable years in 1972 and 1973 exhibit a changing environment that is more the rule than the exception. Exhibit II, whch shows a deteriorating loss ratio, while retaining a constant loss emergence pattern as in Exhibit I, would be more typical of the situation one might encounter. The rote application of the three methods produces strikingly different IBNR estimates, in light of the fact that the loss ratio deterioration on Exhibit II is not unusual. (Note that a $361,000 difference in IBNR need produces a loss ratio distortion for the year of 15 points.)

Loss Development Method

Accident Year	(1) Ultimate Loss Development Factor	(2) Acc. Year Losses at Current Valuation	(3) Estimated IBNR Required (Col. (1)—1) x Col. (2)
8	2.000	960,000	960,000
7	1.333	1,237,500	412,088
6	1.159	1,207,500	191,993
5	1.054	1,195,425	64,553
4	1.023	1,016,301	23,375
3	1.009	832,351	7,491
2	1.003	717,724	2,153
1	1.000	600,000	0
			1,661,653

Expected Loss Method

Accident Year	(1) IBNR Factor $1 - \frac{1}{\text{Ult. Loss Dev. Factor}}$	(2) Expected Losses	(3) Estimated IBNR Required Col. (1) x Col. (2)
8	.500	1,440,000	720,000
7	.250	1,320,000	330,000
6	.137	1,200,000	164,400
5	.051	1,080,000	55,080
4	.022	960,000	21,120
3	.009	840,000	7,560
2	.003	720,000	2,160
1	.000	600,000	0
			1,300,320

Percentage of Premium Method

Accident Year	(1) IBNR Factor	(2) Earned Premium	(3) Estimated IBNR Required Col. (1) x Col. (2)
8	.344	2,400,000	825,600
7	.165	2,200,000	363,000
6	.088	2,000,000	176,000
5	.032	1,800,000	57,600
4	.014	1,600,000	22,400
3	.006	1,400,000	8,400
2	.002	1,200,000	2,400
1	.000	1,000,000	0
			1,455,400

The actual IBNR need determined from Exhibit II is $1,663,000; since the loss emergence patterns are consistent, it is clear that the loss development methodology produces the correct need.

The Expected Loss Method yields exactly the same IBNR estimate as in the static situation in the prior section. This is not surprising since the Expected Loss Method depends only on the loss development factors and the expected loss rato, neither of which has changed. Clearly, this is a serious weakness in this approach. If the actuary does not change the expected loss ratio, the method will underestimate the required reserve in such a situation.

Given the situation displayed in Exhibit II, one would probably be motivated to modify the expected loss ratio for the more recent accident years. However, although a few of the accident years already are showing a loss ratio a little above 60 based on the losses already emerged, for the two most recent accident years (which produce the bulk of the IBNR need), the emerged loss ratios are below 60. Consequently, the higher-than-expected emergence could be deemed to be attributable to reserve strengthening. In addition, one purpose of the paper is to examine the sensitivity of the method to varying situations and this example stresses the fact that without a further judgmental descision, the Expected Loss Method will in this case produce too low an IBNR estimate.

For the situation shown in Exhibit II, the Percentage of Premium Method produces an IBNR need between the estimates produced by the Loss Development and Expected Loss Methods. The loss development patterns are consistent; hence, as the loss ratio deteriorates, an increasing percentage of the premium will emerge as IBNR. However, this approach fails to determine the true need, since the IBNR factors are directly related to the loss ratios in the prior accident years, which are below the current ultimate loss ratio. (Of course, if one can adjust current premiums to offset any rate inadequacy, this problem is eliminated.)

Two further points should be mentioned. First, the Percentage of Premium Method tends to be "self-correcting" in this situation since a deteriorating loss ratio will create increased IBNR factors (percentage of premium emerged) which produces an increased IBNR estimate. In fact, if the loss ratio then stabilizes for several years, the Percentage of Premium Method will eventually produce the correct IBNR need. This is in contrast to the Expected Loss Method where the IBNR estimate will not change unless there is a judgmental decision made to revise the expected loss ratio. In addition, it should be noted that, as with the Expected Loss Method, the emerged losses of the most recent accident year are not used at all in the computation, and in certain situations, this is a weakness of the method.

Given the changing situation depicted in Exhibit II, the actuary must make a choice among the three methodologies since each yields a different answer. In this particular case, only the choice of the Loss Development

Method would yield the correct IBNR need although the Percentage of Premium Method produces a more accurate answer than the Expected Loss Method. Similar comments would apply when the ultimate loss ratio is improving and the loss emergence patterns remain consistent.

CONSISTENT LOSS RATIO WITH RESERVE STRENGTHENING

The static situation set forth in Exhibit I consists of a long-term stable loss ratio along with an equally stable incurred loss development pattern. The development pattern is dependent on both the adequacy of the reported claim reserves at various stages of maturity and the actual rate of emergence of late-reported claims. In this section, the data underlying the stable situation of Exhibit I is modified to reflect a changing level of reserve adequacy for reported claims.

First, the paid losses underlying the experience were selected. A stable payment rate was assumed, viz., at the twelve-month valuation date 15% of the accident year ultimate incurred losses were paid, at 24 months 45%, at 36 months 65%, at 48 months 75%, at 60 months 85%, at 72 months 90%, at 84 months 95%, and 100% at 96 months.

Second, the outstanding losses were modified to reflect reserve adequacy levels different than the consistent, long-term levels underlying the static situation. The long-term levels are those shown below for accident years 1 and 2; the remaining ones are the result of an assumed slippage followed by an abrupt strengthening and return to the historical reserve adequacy levels.

Assumed Levels of Reserve Adequacy

Valuation	Accident Year							
Date	1	2	3	4	5	6	7	8
12 Months	85%	85%	85%	85%	80%	75%	70%	85%
24 Months	90	90	90	90	85	85	90	
36 Months	95	95	95	90	90	95		
48 Months	100	100	95	95	100			
60 Months to Ult.	100	100	100	100				

The resulting incurred losses, together with a sample calculation of the adjustment, are displayed in Exhibit III. As the calculations below show, all three methods overstate the required IBNR in this situation with the Loss

Development Method nearly 15% over the mark, which is \$1,302,000 as in the static situation. The Loss Development Method is the most susceptible to distortions from changes in the adequacy level of the reserves for reported claims. This is, of course, largely because the bulk of the IBNR required is attributable to the current accident year and by incorporating the actual emerged losses the relative adequacy of the current reserve exerts considerable leverage.

All three methods, however, contain the same type of distortion which stems from the relationship between the composition of the development factor and the current incurred losses. In a time of unexpected rapid inflation, the reserves carried one or more years ago are almost certain to have been somewhat inadequate at that time and raising them now to current values adds an additional increment to the development factor. The current reserves, however, are being set in the midst of an environment of higher inflation and assuming we do not experience another significant jump in the rate of inflation, these reserves should not develop as adversely as anticipated in the loss development factor. Used together without modification, the estimated reserve will be overstated. In this specific example, a rote application of the Loss Development Method would incorrectly add nearly 10 points to the current year's loss ratio.

The Expected Loss and Percentage of Premium Methods are distorted to a lesser extent because they are not subject to a leverage impact from the emerged incurred losses. However, in both cases, the factors utilized do assume a certain amount of future development which incorrectly includes a provision for the extra reserve strengthening.

Loss Development Method

Accident Year	(1) Ultimate Loss Development Factor	(2) Acc. Year Losses at Current Valuation	(3) Estimated IBNR Required (Col. (1)—1) x Col. (2)
8	2.182	720,000	851,040
7	1.353	990,000	349,470
6	1.169	1,035,000	174,915
5	1.061	1,024,650	62,504
4	1.023	938,124	21,577
3	1.009	832,351	7,491
2	1.003	717,724	2,153
1	1.000	600,000	0
			1,469,150

Expected Loss Method

Year Accident	(1) IBNR Factor 1 — 1 / Ult. Loss Dev. Factor	(2) Expected Losses	(3) Estimated IBNR Required Col. (1) x Col. (2)
8	.542	1,440,000	780,480
7	.261	1,320,000	344,520
6	.145	1,200,000	174,000
5	.057	1,080,000	61,560
4	.022	960,000	21,120
3	.009	840,000	7,560
2	.003	720,000	2,160
1	.000	600,000	0
			1,391,400

Percentage of Premium Method

Accident Year	(1) IBNR Factor	(2) Earned Premium	(3) Estimated IBNR Required Col. (1) x Col. (2)
8	.325	2,400,000	780,000
7	.157	2,200,000	345,400
6	.087	2,000,000	174,000
5	.035	1,800,000	63,000
4	.014	1,600,000	22,400
3	.006	1,400,000	8,400
2	.002	1,200,000	2,400
1	.000	1,000,000	0
			1,395,600

Numerous methods are available to test the reserves for reported cases ranging from relatively sophisticated procedures to simple run-off tests. These tests have the advantage of dealing with a group of claims about which some information is known. They do not directly test the adequacy of the overall reserves required. Tests of reported cases are beyond the scope of this paper; however, this example, which assumes a relatively modest shift in reserve adequacy, shows their importance in completing the overall tests.

The impact on pricing can also be significant if one does not consider movement in the level of adequacy in the reported claim reserves. In this example, the use of the unadjusted loss development factors would overstate the ultimate incurred losses for the last two accident years by nearly 15%, thereby possibly causing one to raise rates excessively and be placed in an uncompetitive position.

It is interesting at this point to note the almost opposite reaction of the tests to the two basic situations described. The Loss Development Method yields the only correct answer in the deteriorating loss ratio situation (unless one can estimate fairly well the ultimate loss ratio) but is the most vulnerable to distortion from reserve strengthening. The tests emphasizing expected losses (or premiums) are less influenced by reserve shifts but react extremely slowly to a deteriorating loss ratio and can mask the underlying severity of the situation by artificially lowering the calendar year loss ratios.

LOSS RATIO DETERIORATION AND RESERVE STRENGTHING

This example is simply a composite of the two changing situations described previously. The incurred losses utilized in the deteriorating loss ratio example are adjusted to reflect the assumed reserve adequacy levels (and payment patterns) underlying the strengthening example. The resulting incurred losses are shown in Exhibit IV.

As might be expected, the three tests produce substantially different estimates of the required IBNR reserve. In fact, the variance in the range is roughly equal to 20 points of the current year's loss ratio. The individual estimates react as one might expect from the previous examples. The Loss Development Method overstates the required IBNR reserve by $219,000 as it correctly interprets the loss ratio deterioration but does not adjust the loss development factors so as not to double-up on the reserve strengthening. The Expected Loss Method produces an estimate $272,000 too low as it reacts the slowest to the deteriorating loss ratio situation and the overstatement from the reserve strengthening is fairly small. The Percentage of Premium Method is only $101,000 short in this example, as this estimate reacts faster than the Expected Loss Method to the loss ratio deterioration.

Clearly, selection and modification of the most appropriate test is vital, and would depend on the "mix" of loss ratio and reserve adequacy changes in the data being analyzed.

Loss Development Method

Accident Year	(1) Ultimate Loss Development Factor	(2) Acc. Year Losses at Current Valuation	(3) Estimated IBNR Required (Col. (1)—1) x Col. (2)
8	2.182	960,000	1,134,720
7	1.353	1,237,500	436,838
6	1.169	1,207,500	204,068
5	1.061	1,195,425	72,921
4	1.023	1,016,301	23,375
3	1.009	832,351	7,491
2	1.003	717,724	2,153
1	1.000	600,000	0
			1,881,566

Expected Loss Method

Accident Year	(1) IBNR Factor $1 - \frac{1}{\text{Ult. Loss Dev. Factor}}$	(2) Expected Losses	(3) Estimated IBNR Required Col. (1) x Col. (2)
8	.542	1,440,000	780,480
7	.261	1,320,000	344,520
6	.145	1,200,000	174,000
5	.057	1,080,000	61,560
4	.022	960,000	21,120
3	.009	840,000	7,560
2	.003	720,000	2,160
1	.000	600,000	0
			1,391,400

Percentage of Premium Method

Accident Year	(1) IBNR Factor	(2) Earned Premium	(3) Estimated IBNR Required Col. (1) x Col. (2)
8	.374	2,400,000	897,600
7	.173	2,200,000	380,600
6	.093	2,000,000	186,000
5	.036	1,800,000	64,800
4	.014	1,600,000	22,400
3	.006	1,400,000	8,400
2	.002	1,200,000	2,400
1	.000	1,000,000	0
			1,562,200

This paper has considered only reserve tests incorporating incurred losses. Such tests, whether they use incurred losses directly or employ claim counts and average incurred (or outstanding) claim costs, are impacted by changes in reserve adequacy. Methods projecting incurred losses from paid losses, for example R. E. Salzmann's "Extrapolation from Accumulated Paid Losses,"[9] would produce the correct result in each of the examples given. However, these methods are limited to "coverages where payment patterns and claim durations are relatively stable,"[10] and, although we assume these patterns to remain constant in the paper, in practice they may not do so for many slow-settling lines.

CONCLUSION

While the paper has concentrated on one family of reserve tests and on two elements which may vary from year to year, the main point is that every reserve test can be severely distorted by changing conditions and that different tests react in varying ways. In addition to changing loss ratios and reserve levels, the results can be influenced by changes in disposal rates of claims, claims handling practices, legal costs, general social conditions, etc. It is therefore important that the actuary carefully examine the reserve testing methodologies he utilizes and attempt to identify which of these factors may influence the various procedures.

"Man's yesterday may ne'er be like his morrow,
Nought may endure but Mutability."

Shelley
"Mutability"

[9] R. E. Salzmann, "Estimated Liabilities for Losses and Loss Adjustment Expenses," Chapter 3, *Property-Liability Insurance Accounting*, Robert W. Strain, Editor (California, The Merritt Company, 1974), p. 36.

[10] *Ibid.*, p. 36.

EXHIBIT I

THE STATIC SITUATION

ACCIDENT YEAR

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Earned Premium	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	2,000,000	2,200,000	2,400,000
Ult. Loss Ratio	.60	.60	.60	.60	.60	.60	.60	.60
Expected Loss Ratio	.60	.60	.60	.60	.60	.60	.60	.60
Incurred Losses Valued at:								
12 months	300,000	360,000	420,000	480,000	540,000	600,000	660,000	720,000
24 months	450,000	540,000	630,000	720,000	810,000	900,000	990,000	
36 months	517,500	621,000	724,500	828,000	931,500	1,035,000		
48 months	596,250	683,100	796,950	910,800	1,024,650			
60 months	586,328	703,593	820,859	938,124				
72 months	594,537	713,443	832,351					
84 months	598,104	717,724						
96 months	600,000							

EXHIBIT II

LOSS RATIO DETERIORATION WITH NO RESERVE STRENGTHENING

ACCIDENT YEAR

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Earned Premium	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	2,000,000	2,200,000	2,400,000
Ult. Loss Ratio	60	.60	.60	.65	.70	.70	.75	.80
Expected Loss Ratio	60	.60	.60	.60	.60	.60	.60	.60
Incurred Losses Valued at:								
12 months	300,000	360,000	420,000	520,000	630,000	700,000	825,000	960,000
24 months	450,000	540,000	630,000	780,000	945,000	1,050,000	1,237,500	
36 months	517,500	621,000	724,500	897,000	1,086,750	1,207,500		
48 months	569,520	683,100	796,500	986,700	1,195,425			
60 months	586,328	703,593	820,859	1,016,301				
72 months	594,537	713,443	832,351					
84 months	598,104	717,724						
96 months	600,000							

EXHIBIT III

CONSISTENT LOSS RATIO WITH RESERVE STRENGTHENING

ACCIDENT YEAR

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Earned Premium	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	2,000,000	2,200,000	2,400,000
Ult. Loss Ratio	.60	.60	.60	.60	.60	.60	.60	.60
Expected Loss Ratio	.60	.60	.60	.60	.60	.60	.60	.60
Incurred Losses Valued at:								
12 months	300,000	360,000	420,000	480,000	517,765*	550,588	578,471	720,000
24 months	450,000	540,000	630,000	720,000	792,000	880,000	990,000	
36 months	517,500	621,000	724,500	817,623	919,421	1,035,000		
48 months	569,250	683,100	788,603	901,260	1,024,650			
60 months	586,328	703,593	820,859	938,124				
72 months	594,537	713,443	832,351					
84 months	598,104	717,724						
96 months	600,000							

*The comparable incurred losses from Exhibit I are $540,000. Paid losses are assumed to be 15% of the ultimate incurred losses of $1,080,000 or $162,000. This results in a reserve of $378,000 which is at the historical adequacy level for reserves at a valuation date of 12 months. An 80% adequacy level is obtained by multiplying the reserve by 80/85 yielding $355,765. Adding to this amount the paid losses of $162,000, one obtains $517,765.

EXHIBIT IV

LOSS RATIO DETERIORATION AND RESERVE STRENGTHENING

ACCIDENT YEAR

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Earned Premium	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	2,000,000	2,200,000	2,400,000
Ult. Loss Ratio	.60	.60	.60	.65	.70	.70	.75	.80
Expected Loss Ratio	.60	.60	.60	.60	.60	.60	.60	.60
Incurred Losses Valued at:								
12 months	300,000	360,000	420,000	520,000	604,059	642,353	723,088	960,000
24 months	450,000	540,000	630,000	780,000	924,000	1,026,667	1,237,500	
36 months	517,500	621,000	724,500	885,368	1,072,658	1,207,500		
48 months	569,250	683,100	788,603	976,365	1,195,425			
60 months	586,328	703,593	820,859	1,016,301				
72 months	594,537	713,443	832,351					
84 months	598,104	717,724						
96 months	600,000							

EXHIBIT V

CALCULATION OF ULTIMATE LOSS DEVELOPMENT AND IBNR FACTORS (UTILIZING DATA FROM EXHIBIT I)

Loss Development Factors

Development Period	(1) Most Recent Observation	(2) First Prior Observation	(3) Second Prior Observation	(4) Three-Year Mean
12 to 24 Mos.	1.500[a]	1.500	1.500	1.500
24 to 36 Mos.	1.150	1.150	1.150	1.150
36 to 48 Mos.	1.100	1.100	1.100	1.100
48 to 60 Mos.	1.030	1.030	1.030	1.030
60 to 72 Mos.	1.014	1.014	1.014	1.014
72 to 84 Mos.	1.006	1.006	N/A	1.006
84 to 96 Mos.	1.003	N/A	N/A	1.003

Percentage of Premium Factors

Development Period	(5) Most Recent Observation	(6) First Prior Observation	(7) Second Prior Observation	(8) Three-Year Mean
12 to 24 Mos.	0.150[b]	0.150	0.150	0.150
24 to 36 Mos.	0.068	0.068	0.068	0.068
36 to 48 Mos.	0.052	0.052	0.052	0.052
48 to 60 Mos.	0.017	0.017	0.017	0.017
60 to 72 Mos.	0.008	0.008	0.008	0.008
72 to 84 Mos.	0.004	0.004	N/A	0.004
84 to 96 Mos.	0.002	N/A	N/A	0.002

Ultimate Loss Development and IBNR Factors

Development Period	(9) Loss Development Method Ultimate Loss Dev. Factor[c]	(10) Expected Loss Method IBNR Factor $(1 - \frac{1}{\text{Col. (9)}})$	(11) Percentage of Premium Method IBNR Factor[d]
12 to Ult.	2.000	0.500	0.301
24 to Ult.	1.333	0.250	0.151
36 to Ult.	1.159	0.137	0.083
48 to Ult.	1.054	0.051	0.031
60 to Ult.	1.023	0.022	0.014
72 to Ult.	1.009	0.009	0.006
84 to Ult.	1.003	0.003	0.002
96 to Ult.	1.000	0.000	0.000

(a) 990,000/660,000 = 1.500
(b) (990,000-660,000)/2,200,000 = 0.150
(c) Upward multiplicative accumulation of Column (4)
(d) Upward additive accumulation of Column (8)