Group Claim Incurral and Reserve Analysis

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Starting Situation:

1. Claim reserves for group medical and dental had previously been set by using quarterly claim runoff data as in Exhibit A. The results occasionally raised questions and problems in making decisions, and didn't lend much to understanding the most probable liability situations.

2. Monthly claim runoff data had been used (as in the "Claim Runoff" portion of Exhibit B) to develop a monthly claim runoff pattern. That pattern was combined with a trend increase model to calculate factors that could be multiplied by paid claims for the last 12 months (or since issue if shorter) to get incurred claims for each case. These factors were used for (a) individual case experience rating and (b) to develop incurred claims and actual to expected claim ratios for extensive experience monitoring. If a particular coverage had a claim payment tail up to 48 months then the full 48 month claim payment triangle was used in order to keep the tail.

New Contributions:

1. I recognized that (a) using the entire runoff triangle to keep a "tail" on the runoff curve was not necessary and that (b) doing so was a disadvantage if claim payment patterns changed over the period being used. I adjusted the method in Exhibit B to use only the cumulative claim runoff data falling in the previous N months, where N was variable. In essence, once the cumulative claim triangle is created any similar subset triangle in the upper left corner can be excluded from the calculations. This allows the elimination of early payment months for claims incurred long ago under possibly different payment patterns without losing the data for later payments made in more recent months.

2. I established a reserve analysis system that used the monthly claim payment data to calculate a runoff pattern. The pattern was used to calculate incurred claims by month of incurral. This allowed reserve calculations based on 'incurred less paid to date' times an appropriate claim payment expense factor as illustrated in Exhibits B and D.

3. The calculations resulting from 1 and 2 needed interpretation. I then talked to the claim payment people and found out that for Medical and Dental our claims payment patterns were already excellent and therefore may have only slightly improved over the 1/88 to 12/91 period studied. I had previously known that the Short Term Disability patterns changed when we centralized all payments in the home office. I also gained more insight into the normal versus abnormal claim payment patterns, such as year end pushes to reduce inventory. (We have routinely adjusted Medical and Dental reserves for abnormal inventory levels.) In particular there was an especially spectacular decrease in 12/31/91 inventory due to an extra special effort to "show the boss what we can do" by pushing out all of the small and easy claims. This had a big impact on claims incurred and paid in the last quarter. It would have raised questions and the year end reserve as computed under prior method if the new analysis was not in place.

Results:

1. I applied this technique to various subgroupings of our medical and dental business. This resulted in a conclusion, after discussions with the claims people, that claims are definitely coming in faster after incurral. This is the main reason that cumulative claim payment ratios in Exhibit C are larger in the earlier months after incurral when the claim payment period under study is shortened. This happened for all subdivions of medical and dental and for those of another company I was able to study as well.

2. As implied above, a clearer understanding of the issues involved gave a better understanding of the reserve data at year end, allowing a much quicker and more confident setting of reserves.

3. This understanding allows us to better chose 12 month incurral factors for case level and experience monitoring as mentioned in Starting Situation #2.

4. The same technique has proven useful in examining incurred claims and reserves for individual cases that are large enough and have been in force lon enough to develop some credibility.

5. Subsequent analysis of the adequacy of prior year end reserves can now be done with a good degree of confidence months sooner than we previously were able to do.

SAMPLE DENTAL CLAIMS

(IN THOUSANDS)

PAYMENT DATE

INCURRAL	88-Q1	88-Q2	88-Q3	88-Q4	89-Q1	89-Q2	89-Q3	89-Q4	90-Q1	90-Q2	90-Q3	90-Q4	91-Q1	91-Q2	91-Q3	91-Q4	TOTAL
PRE-89													3	1			4
88-Q1	5,805	3,641	545	208	116	36	19	11	5	4	6	5	2	1			10,404
88-Q2		5,520	3,411	547	183	63	26	12	4	3	3	1	3	10	2	2	9,790
88-Q3			4,925	3,273	505	133	41	19	11	8	1	2	2	7	5	1	8,933
88-Q4				4,990	3,111	358	83	41	15	6	1	2		2	3	6	8,616
89-Q1					5,541	3,495	553	183	106	43	15	13	9	5	1	9	9,973
89-Q2						5,404	3,051	479	175	61	24	14	3	2	2	1	9,216
89-Q3							4,852	2,699	490	128	44	20	10	7	3	2	8,255
89-Q4								4,388	3,244	383	109	45	22	8	3	3	8,205
90-Q1									5,264	3,429	552	250	133	49	19	16	9,712
90-Q2										5,222	3,219	557	170	62	27	12	9,269
90-Q3											5,092	3,469	470	122	55	16	9,224
90-Q4												5,970	3,216	403	107	45	9,741
91-Q1													6,215	4,146	627	227	11,215
91-Q2														6,497	3,708	552	10,757
91-Q3															6,602	3,398	10,000
91-Q4																7,346	7,346
TOTAL	5,805	9,161	8,881	9,018	9,456	9,489	8,625	7,832	9,314	9,287	9,066	10,348	10,258	11,322	11,164	11,636	150,662

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Exhibit A

Exhibit B

SIMPLIFIED EXAMPLE OF
CLAIM RUNOFF CURVE METHOD USING ALL AVAILABLE DATA &
POTENTIAL RESERVE METHOD FOR MEDICAL, DENTAL AND STD CLAIMS

CLAIM RUNOFFS:

PAID MONTH	PAID CLAIMS CELLS BY INCURRAL MONTH 1	2	3	4
1	5	4	6	1
2	25	20	30	
3	20	16		
4	0			

PAID MONTH	CUMULATIVE PAID CLAIMS BY INCURRAL MONTH 1	2	3	4
1	5	4	6	1
2	30	24	36	
3	50	40		
4	50			

$$R1 = \frac{\text{PAID IN MONTH 1}}{\text{PAID IN 2 MONTHS}} = \frac{5 + 4 + 6}{30 + 24 + 36} = \frac{15}{90} = \frac{1}{6}$$

$$R2 = \frac{\text{PAID IN 2 MONTHS}}{\text{PAID IN 3 MONTHS}} = \frac{30 + 24}{50 + 40} = \frac{54}{90} = .60$$

$$R3 = \frac{\text{PAID IN 3 MONTHS}}{\text{PAID IN 4 MONTHS}} = \frac{50}{50} = 1.00$$

CUMULATIVE PAID IN 3 MONTHS = R3 = 100%

CUMULATIVE PAID IN 2 MONTHS = R2 x R3 = 60%

CUMULATIVE PAID IN 1 MONTH = R1 x R2 x R3 = 10%

RESERVES:

	INCURRAL MONTH 1	2	3	4	TOTAL
1. TOTAL PAID	50	40	36	1?	127
2. - INC. FACTOR	1.00	1.00	.60	.10	
3. = TOTAL INCURRED	50	40	60	10?	160?
4. RESERVE (3) - (1)	0	0	24	9?	33?

? means that an adjustment may be in order based on additional analysis and judgement. Hence this technique is just a tool that should be used knowledgeably, not by wrote.

Exhibit C

SUBSET OF DENTAL CUMULATIVE RUNOFF CURVE VARYING BY NUMBER OF MONTHS OF PAID CLAIMS USED
THE LATEST DATA IN ALL INSTANCES IS FROM DEC. 1991 BACKWARD

MONTH	48 MOS DATA	42 MOS DATA	36 MOS DATA	30 MOS DATA	24 MOS DATA	21 MOS DATA	18 MOS DATA	15 MOS DATA	12 MOS DATA	9 MOS DATA	6 MOS DATA
1	0.2190	0.2186	0.2221	0.2222	0.2233	0.2285	0.2302	0.2372	0.2386	0.2507	0.2540
2	0.6552	0.6574	0.6611	0.6616	0.6633	0.6702	0.6724	0.6767	0.6805	0.6887	0.6927
3	0.8070	0.8078	0.8098	0.8098	0.8101	0.8137	0.8150	0.8181	0.8215	0.8248	0.8268
4	0.8799	0.8803	0.8815	0.8813	0.8812	0.8829	0.8836	0.8855	0.8882	0.8891	0.8897
5	0.9193	0.9196	0.9206	0.9201	0.9199	0.9210	0.9206	0.9217	0.9239	0.9255	0.9234
6	0.9429	0.9430	0.9438	0.9431	0.9429	0.9435	0.9427	0.9434	0.9453	0.9467	0.9438
7	0.9583	0.9583	0.9589	0.9583	0.9578	0.9582	0.9574	0.9578	0.9594	0.9611	0.9582
8	0.9688	0.9688	0.9693	0.9691	0.9684	0.9687	0.9683	0.9681	0.9695	0.9714	0.9702
9	0.9760	0.9760	0.9764	0.9763	0.9757	0.9761	0.9757	0.9753	0.9764	0.9783	0.9782
10	0.9813	0.9813	0.9815	0.9816	0.9811	0.9814	0.9812	0.9806	0.9812	0.9830	0.9833
11	0.9853	0.9853	0.9855	0.9856	0.9851	0.9853	0.9852	0.9847	0.9848	0.9863	0.9869
12	0.9884	0.9884	0.9885	0.9887	0.9883	0.9884	0.9884	0.9881	0.9878	0.9889	0.9899
13	0.9907	0.9907	0.9907	0.9910	0.9906	0.9907	0.9907	0.9906	0.9900	0.9907	0.9915
14	0.9924	0.9924	0.9924	0.9926	0.9925	0.9924	0.9925	0.9925	0.9920	0.9921	0.9928
15	0.9938	0.9938	0.9938	0.9940	0.9939	0.9938	0.9939	0.9939	0.9935	0.9931	0.9937
16	0.9947	0.9947	0.9947	0.9947	0.9947	0.9946	0.9946	0.9946	0.9943	0.9938	0.9942
17	0.9955	0.9955	0.9955	0.9955	0.9955	0.9954	0.9954	0.9954	0.9950	0.9947	0.9948
18	0.9960	0.9960	0.9960	0.9960	0.9961	0.9961	0.9961	0.9961	0.9958	0.9955	0.9956
19	0.9965	0.9965	0.9965	0.9965	0.9965	0.9965	0.9965	0.9966	0.9962	0.9960	0.9960
20	0.9969	0.9969	0.9969	0.9969	0.9969	0.9969	0.9969	0.9970	0.9967	0.9965	0.9966
21	0.9972	0.9972	0.9972	0.9972	0.9972	0.9972	0.9972	0.9972	0.9970	0.9968	0.9969
22	0.9975	0.9975	0.9975	0.9975	0.9975	0.9975	0.9975	0.9975	0.9973	0.9971	0.9973
23	0.9976	0.9976	0.9976	0.9976	0.9977	0.9976	0.9977	0.9977	0.9975	0.9974	0.9976
24	0.9978	0.9978	0.9978	0.9978	0.9978	0.9979	0.9979	0.9980	0.9977	0.9976	0.9978
25	0.9980	0.9980	0.9980	0.9980	0.9980	0.9980	0.9980	0.9981	0.9979	0.9977	0.9979
26	0.9981	0.9981	0.9981	0.9981	0.9981	0.9981	0.9982	0.9982	0.9980	0.9979	0.9981
27	0.9982	0.9982	0.9982	0.9982	0.9982	0.9982	0.9983	0.9983	0.9982	0.9980	0.9981
28	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983	0.9984	0.9984	0.9982	0.9980	0.9982
29	0.9984	0.9984	0.9984	0.9984	0.9984	0.9984	0.9984	0.9985	0.9983	0.9981	0.9982
30	0.9984	0.9984	0.9984	0.9984	0.9984	0.9984	0.9985	0.9985	0.9983	0.9982	0.9983
31	0.9985	0.9985	0.9985	0.9985	0.9985	0.9985	0.9985	0.9986	0.9985	0.9983	0.9984
32	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9987	0.9985	0.9983	0.9984
33	0.9987	0.9987	0.9987	0.9987	0.9987	0.9987	0.9987	0.9987	0.9985	0.9983	0.9984
34	0.9988	0.9988	0.9988	0.9988	0.9988	0.9988	0.9988	0.9988	0.9987	0.9985	0.9986
35	0.9992	0.9992	0.9992	0.9992	0.9992	0.9992	0.9992	0.9992	0.9991	0.9989	0.9990
36	0.9995	0.9995	0.9995	0.9995	0.9995	0.9995	0.9995	0.9995	0.9995	0.9994	0.9995
37	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9996	0.9997
38	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
39	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
40	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
41	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999
42	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
43	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
44	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
45	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
46	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
47	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
48	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

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Exhibit D

SUBSET OF DENTAL RESERVE BOOK (DOTS VARYING BY THE NUMBER OF MONTHS OF PAID CLAIMS USED TO CALC RUNOFF CURVE
THIS EXAMPLE SETS RESERVES AT 1.05 TIMES THE DIFFERENCE BETWEEN INCURRED AND PAID CLAIMS

			INCURRED CLAIMS										
YEAR	MONTH	PAID TO DATE	48 MOS DATA	42 MOS DATA	36 MOS DATA	30 MOS DATA	24 MOS DATA	21 MOS DATA	18 MOS DATA	15 MOS DATA	12 MOS DATA	9 MOS DATA	6 MOS DATA
1989	1	3,667	3,669	3,669	3,669	3,669	3,669	3,669	3,669	3,669	3,669	3,669	3,669
	2	2,954	2,956	2,956	2,956	2,956	2,956	2,956	2,956	2,956	2,957	2,957	2,957
	3	3,352	3,356	3,356	3,356	3,356	3,356	3,356	3,356	3,356	3,357	3,357	3,357
	4	3,014	3,018	3,018	3,018	3,018	3,018	3,018	3,018	3,018	3,018	3,019	3,019
	5	3,126	3,130	3,130	3,130	3,130	3,130	3,130	3,130	3,130	3,131	3,131	3,131
	6	3,076	3,080	3,080	3,080	3,080	3,080	3,080	3,080	3,080	3,081	3,081	3,081
	7	2,604	2,608	2,608	2,608	2,608	2,608	2,608	2,608	2,608	2,608	2,609	2,608
	8	3,046	3,051	3,051	3,051	3,051	3,051	3,051	3,051	3,051	3,051	3,052	3,051
	9	2,605	2,609	2,609	2,609	2,609	2,609	2,609	2,609	2,609	2,610	2,610	2,610
	10	2,911	2,916	2,916	2,916	2,916	2,916	2,916	2,916	2,916	2,916	2,917	2,917
	11	2,701	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,706	2,707	2,706
	12	2,593	2,598	2,598	2,598	2,598	2,598	2,598	2,598	2,598	2,599	2,599	2,598
1990	1	3,519	3,527	3,527	3,527	3,527	3,527	3,527	3,526	3,526	3,527	3,527	3,527
	2	2,918	2,925	2,925	2,925	2,925	2,925	2,925	2,925	2,925	2,925	2,926	2,925
	3	3,275	3,283	3,283	3,283	3,283	3,283	3,283	3,283	3,283	3,284	3,284	3,284
	4	3,040	3,049	3,049	3,049	3,049	3,049	3,049	3,048	3,048	3,049	3,050	3,049
	5	3,152	3,162	3,162	3,162	3,162	3,162	3,162	3,162	3,162	3,162	3,163	3,163
	6	3,077	3,088	3,088	3,088	3,088	3,088	3,088	3,088	3,088	3,089	3,089	3,089
	7	3,007	3,019	3,019	3,019	3,019	3,019	3,019	3,019	3,019	3,020	3,020	3,020
	8	3,343	3,358	3,358	3,358	3,358	3,358	3,358	3,359	3,358	3,360	3,361	3,360
	9	2,874	2,889	2,889	2,889	2,889	2,889	2,890	2,890	2,889	2,891	2,892	2,891
	10	3,504	3,526	3,526	3,526	3,525	3,526	3,526	3,525	3,526	3,527	3,528	3,526
	11	3,229	3,254	3,254	3,254	3,253	3,254	3,254	3,253	3,254	3,255	3,255	3,252
	12	3,008	3,036	3,036	3,036	3,035	3,036	3,036	3,036	3,037	3,038	3,036	3,034
1991	1	4,113	4,161	4,161	4,161	4,160	4,162	4,161	4,161	4,162	4,164	4,159	4,155
	2	3,462	3,514	3,514	3,513	3,513	3,514	3,513	3,514	3,516	3,515	3,510	3,508
	3	3,640	3,709	3,709	3,709	3,708	3,710	3,709	3,710	3,712	3,710	3,703	3,702
	4	3,762	3,855	3,855	3,853	3,853	3,856	3,854	3,856	3,857	3,853	3,845	3,846
	5	3,634	3,751	3,751	3,749	3,750	3,753	3,751	3,753	3,754	3,748	3,741	3,746
	6	3,361	3,507	3,507	3,505	3,507	3,509	3,507	3,511	3,509	3,503	3,497	3,508
	7	3,440	3,648	3,648	3,645	3,648	3,648	3,646	3,649	3,646	3,639	3,634	3,645
	8	3,496	3,803	3,802	3,797	3,800	3,800	3,796	3,797	3,793	3,784	3,778	3,786
	9	3,064	3,482	3,481	3,476	3,476	3,477	3,470	3,468	3,460	3,450	3,446	3,444
	10	3,446	4,270	4,266	4,255	4,255	4,254	4,235	4,228	4,212	4,195	4,178	4,168
	11	2,611	3,985	3,972	3,949	3,947	3,936	3,896	3,883	3,859	3,837	3,791	3,769
	12	1,289	5,886	5,897	5,803	5,802	5,773	5,641	5,600	5,435	5,403	5,141	5,076

RESERVES BY YEAR OF INCURRAL FOR ABOVE INCURRED CLAIMS:

1988	2	2	2	2	2	2	2	2	2	2	2
1989	53	53	53	53	53	53	52	50	56	62	58
1990	178	178	178	175	177	177	176	176	190	196	183
1991	8,666	8,657	8,502	8,505	8,479	8,256	8,202	7,977	7,856	7,460	7,385
TOTAL UNADJUSTED RES:	8,899	8,890	8,735	8,735	8,711	8,488	8,432	8,205	8,104	7,720	7,628
TOTAL ADJUSTED RES:	6,349	6,339	6,299	6,307	6,326	6,275	6,277	6,241	6,178	6,107	6,116

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