

Simple Reserve Report Example

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Abstract

This document demonstrates how a very simple actuarial reserve report could be created using R. This document is only for display purposes. It was created using insurance loss data freely available on the CAS website. This report could be greatly improved by having better documentation for the relationships among tables. I am just getting started with L^AT_EX and will have more clearly documented reports in subsequent examples.

Purpose

Ractuary was requested by Nsure Ance Company (NAC) to provide a reserve estimate for their workers' compensation loss and allocated loss adjustment expense (ALAE) reserves. Losses are evaluated as of December 31, 1997...

Background

NAC began offering workers' compensation coverage in 1988. Each policy is written on a calendar year basis (i.e. beginning January 1 and ending December 31). NAC has never purchased reinsure coverage...

Other Stuff

Blah blah...

Conclusions

A summary of our reserve analysis is as follows:

Exhibit I: Reserve Summary

	Paid ¹	Incurred ²	Ultimate ³	Case OS	IBNR	Total OS
1988	125,049	133,513	138,993	8,464	5,480	13,944
1989	147,358	161,673	167,073	14,315	5,400	19,715
1990	187,760	210,204	216,633	22,444	6,429	28,873
1991	213,396	244,669	252,263	31,273	7,594	38,867
1992	213,904	253,878	261,087	39,974	7,209	47,183
1993	193,676	251,129	253,250	57,453	2,121	59,574
1994	151,081	202,911	209,512	51,830	6,601	58,431
1995	111,268	174,496	211,166	63,228	36,670	99,898
1996	66,033	143,042	174,486	77,009	31,444	108,453
1997	25,265	125,429	179,035	100,164	53,606	153,770
Totals	1,434,790	1,900,944	2,063,498	466,154	162,554	628,708

From the table above, estimated ultimate loss & ALAE as of December 31, 1997 is 2,063,498 indicating a total outstanding loss & ALAE of 628,708.2.

Methodology

We used two actuarial projection techniques (paid projection and incurred projection) in creating the final estimated ultimate loss projection. The loss projections use loss experience for the more mature accident years to estimate the development of less mature accident years. See the following exhibits for detail regarding the projections and estimated ultimate loss and ALAE selection.

¹See [Exhibit III, Sheet 1](#)

²See [Exhibit IV, Sheet 1](#)

³See [Exhibit II](#)

Exhibits

Exhibit II: Selection of Estimated Ultimate Loss and ALAE

	Paid Projection ¹	Incurred Projection ²	Selected Ultimate ³
1988	143,806	134,181	138,993
1989	171,665	162,481	167,073
1990	222,012	211,255	216,633
1991	258,633	245,892	252,263
1992	267,026	255,147	261,087
1993	253,863	252,637	253,250
1994	213,874	205,150	209,512
1995	244,146	178,186	211,166
1996	195,602	153,370	174,486
1997	202,067	156,003	179,035
Totals	2,172,694	1,954,303	2,063,498

¹See [Exhibit III, Sheet 1](#)

²See [Exhibit IV, Sheet 1](#)

²The average of the paid and incurred projections

Exhibit III, Sheet 1: Paid Projection

	Paid ¹	LDF ²	Ultimate
1988	125,049	1.150	143,806
1989	147,358	1.165	171,665
1990	187,760	1.182	222,012
1991	213,396	1.212	258,633
1992	213,904	1.248	267,026
1993	193,676	1.311	253,863
1994	151,081	1.416	213,874
1995	111,268	2.194	244,146
1996	66,033	2.962	195,602
1997	25,265	7.998	202,067

¹See [Exhibit III, Sheet 2](#)

²See [Exhibit III, Sheet 3](#)

Exhibit III, Sheet 2: Paid Triangle

	1	2	3	4	5	6	7	8	9	10
1988	22,190	60,834	85,104	100,151	108,812	114,967	118,790	121,558	123,492	125,049
1989	26,542	77,798	106,407	122,422	133,359	138,599	143,029	145,712	147,358	
1990	32,977	100,494	134,886	157,758	168,991	178,065	182,787	187,760		
1991	38,604	114,428	157,103	181,322	197,411	208,804	213,396			
1992	42,466	125,820	164,776	189,045	204,377	213,904				
1993	46,447	116,764	154,897	179,419	193,676					
1994	41,368	100,344	132,021	151,081						
1995	35,719	83,216	111,268							
1996	28,746	66,033								
1997	25,265									

Exhibit III, Sheet 3: Paid Development Factor Triangle

	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-Ult.
1988	2.7415	1.3990	1.1768	1.0865	1.0566	1.0333	1.0233	1.0159	1.0126	
1989	2.9311	1.3677	1.1505	1.0893	1.0393	1.0320	1.0188	1.0113		
1990	3.0474	1.3422	1.1696	1.0712	1.0537	1.0265	1.0272			
1991	2.9641	1.3729	1.1542	1.0887	1.0577	1.0220				
1992	2.9628	1.3096	1.1473	1.0811	1.0466					
1993	2.5139	1.3266	1.1583	1.0795						
1994	2.4256	1.3157	1.1444							
1995	2.3297	1.3371								
1996	2.2971									
Simple	2.6904	1.3464	1.1573	1.0827	1.0508	1.0284	1.0231	1.0136	1.0126	
Weighted	2.6844	1.3421	1.1561	1.0823	1.0509	1.0274	1.0234	1.0134	1.0126	
Selected	2.7000	1.3500	1.5500	1.0800	1.0500	1.0300	1.0250	1.0150	1.0130	1.1500

Incurred Projection

	Incurred ¹	LDF ²	Ultimate
1988	133,513	1.005	134,181
1989	161,673	1.005	162,481
1990	210,204	1.005	211,255
1991	244,669	1.005	245,892
1992	253,878	1.005	255,147
1993	251,129	1.006	252,637
1994	202,911	1.011	205,150
1995	174,496	1.021	178,186
1996	143,042	1.072	153,370
1997	125,429	1.244	156,003

¹See [Exhibit IV, Sheet 2](#)

²See [Exhibit IV, Sheet 3](#)

Exhibit IV, Sheet 2: Incurred Triangle

	1	2	3	4	5	6	7	8	9	10
1988	91,892	120,466	129,785	134,401	134,051	134,264	134,169	133,158	133,800	133,513
1989	117,540	160,490	163,802	162,824	164,650	163,326	161,246	161,836	161,673	
1990	155,671	210,607	208,274	211,660	209,823	208,629	208,662	210,204		
1991	189,021	251,182	253,292	247,771	244,882	245,666	244,669			
1992	229,435	289,785	268,235	255,528	252,878	253,878				
1993	251,804	259,975	245,594	251,196	251,129					
1994	212,555	212,160	206,811	202,911						
1995	178,437	181,175	174,496							
1996	151,415	143,042								
1997	125,429									

Exhibit IV, Sheet 3: Incurred Development Factor Triangle

	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-Ult.
1988	1.3110	1.0774	1.0356	0.9974	1.0016	0.9993	0.9925	1.0048	0.9979	
1989	1.3654	1.0206	0.9940	1.0112	0.9920	0.9873	1.0037	0.9990		
1990	1.3529	0.9889	1.0163	0.9913	0.9943	1.0002	1.0074			
1991	1.3289	1.0084	0.9782	0.9883	1.0032	0.9959				
1992	1.2630	0.9256	0.9526	0.9896	1.0040					
1993	1.0324	0.9447	1.0228	0.9997						
1994	0.9981	0.9748	0.9811							
1995	1.0153	0.9631								
1996	0.9447									
Simple	1.1791	0.9879	0.9972	0.9963	0.9990	0.9957	1.0012	1.0019	0.9979	
Weighted	1.1592	0.9789	0.9936	0.9953	0.9995	0.9958	1.0022	1.0016	0.9979	
Selected	1.1600	1.0500	1.0100	1.0050	1.0010	1.0000	1.0000	1.0000	1.0000	1.0050