

# Simple Reserve Report Example

*Andy Merlino*

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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<sup>A</sup>T<sub>E</sub>X 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:

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

Notes:

- 1: See Exhibit II, Sheet 1.
- 2: See Exhibit III, Sheet 1.
- 3: See Exhibit I.

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.

## Exhibits

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

Table 2: Selection of Estimated Ultimate Loss & ALAE

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

Table 3: Paid Projection

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

Table 4: Paid Triangle

	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-Ult.
<b>1988</b>	2.742	1.399	1.177	1.086	1.057	1.033	1.023	1.016	1.013	
<b>1989</b>	2.931	1.368	1.151	1.089	1.039	1.032	1.019	1.011		
<b>1990</b>	3.047	1.342	1.170	1.071	1.054	1.027	1.027			
<b>1991</b>	2.964	1.373	1.154	1.089	1.058	1.022				
<b>1992</b>	2.963	1.310	1.147	1.081	1.047					
<b>1993</b>	2.514	1.327	1.158	1.079						
<b>1994</b>	2.426	1.316	1.144							
<b>1995</b>	2.330	1.337								
<b>1996</b>	2.297									
<b>Simple</b>	2.690	1.346	1.157	1.083	1.051	1.028	1.023	1.014	1.013	
<b>Weighted</b>	2.684	1.342	1.156	1.082	1.051	1.027	1.023	1.013	1.013	
<b>Selected</b>	2.700	1.350	1.550	1.080	1.050	1.030	1.025	1.015	1.013	1.150

Table 5: Paid Development Factor Triangle

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

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

Table 7: Incurred Triangle

	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-Ult.
<b>1988</b>	1.311	1.077	1.036	0.997	1.002	0.999	0.992	1.005	0.998	
<b>1989</b>	1.365	1.021	0.994	1.011	0.992	0.987	1.004	0.999		
<b>1990</b>	1.353	0.989	1.016	0.991	0.994	1.000	1.007			
<b>1991</b>	1.329	1.008	0.978	0.988	1.003	0.996				
<b>1992</b>	1.263	0.926	0.953	0.990	1.004					
<b>1993</b>	1.032	0.945	1.023	1.000						
<b>1994</b>	0.998	0.975	0.981							
<b>1995</b>	1.015	0.963								
<b>1996</b>	0.945									
<b>Simple</b>	1.179	0.988	0.997	0.996	0.999	0.996	1.001	1.002	0.998	
<b>Weighted</b>	1.159	0.979	0.994	0.995	0.999	0.996	1.002	1.002	0.998	
<b>Selected</b>	1.160	1.050	1.010	1.005	1.001	1.000	1.000	1.000	1.000	1.005

Table 8: Incurred Development Factor Triangle