

Simple Reserve Report Example

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Abstract

I am going to display how a very simple reserve report could be created using R. This document is only for display purposes. It was created using data freely available on the CAS website. This could be greatly improved by having better notes and table identifiers. I am just getting started with Latex and will have cleaner reports in subsequent examples.

Purpose

Ractuary has been 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 reinsureense coverage...

Other Stuff

Blah blah...

Conclusions

A summary of our reserve analysis is as follows:

| | Paid | Incurred | Selected_Ultimate | 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 |

Table 1: Report Summary

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 predict 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 |
|----------------|-----------------|---------------------|-------------------|
| 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 |

Table 2: Selection of Ultimate Loss & ALAE Estimate

| | Paid | ldf | 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 |

Table 3: Paid Projection

| | 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 | | | | | | | | | |

Table 4: Paid Triangle

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

| AccidentYear | Incurred | ldf | 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 |

Table 6: Incurred Projection

| | 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 | | | | | | | | | |

Table 7: Incurred Triangle

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