5.5   Chain ladder method

◆ *Method*

We use the development factor method detailed at the end of Section 5.4 to project the *cumulative* claim payments. If we are not given cumulative payments we will have to sum the incremental claim amounts before we start, as cumulative figures are needed to calculate the development factors. Example 5.6 shows the steps involved in the chain ladder method.

Example 5.6

Consider the run-off triangle from Example 5.5:

Cumulative claim payments		Development Year			
		0	1	2	3
Accident Year	2011	600	680	720	740
	2012	620	695	730	
	2013	680	760		
	2014	720			

Use the chain ladder method to estimate the cumulative claim payment in Development Year 3 for Accident Years 2012 to 2014.

Solution

The developments factors we calculated in Example 5.5 are:

Development Year 2 to Development Year 3: $\dfrac{740}{720} = 1.027778$

Development Year 1 to Development Year 2: $\dfrac{720+730}{680+695} = 1.054545$

Development Year 0 to Development Year 1: $\dfrac{680+695+760}{600+620+680} = 1.123684$

These development factors are shown in the table below:

Cumulative claim payments		Development Year			
		→ 1.123684	→ 1.054545	→ 1.027778	
		0	1	2	3
Accident Year	2011	600	680	720	740
	2012	620	695	730	
	2013	680	760		
	2014	720			

We can estimate the cumulative claim payment in Accident Year 2012, Development Year 3 by multiplying the value for Accident Year 2012, Development Year 2 (730) by the development factor from year 2 to year 3:

$$730 \times 1.027778 = 750.2778$$

Similarly, we can estimate the cumulative claim payment in Accident Year 2013, Development Year 3 by multiplying the value for Accident Year 2013, Development Year 1 (760) by the development factors from year 1 to year 2 *and* from year 2 to year 3:

$$760 \times 1.054545 \times 1.027778 = 823.7172$$

Finally, we can estimate the cumulative claim payment in Accident Year 2014, Development Year 3 by multiplying the value for Accident Year 2014, Development Year 0 (720) by the development factors from year 0 to year 1 *and* from year 1 to year 2 *and* from year 2 to year 3:

$$720 \times 1.123684 \times 1.054545 \times 1.027778 = 876.8823 \qquad \blacklozenge\blacklozenge$$

Calculating the reserve

Once we have calculated the estimates of the future cumulative claim payments, we can estimate the reserve required to meet those payments.

Example 5.7

Estimate the reserve required for the run-off triangle shown in Example 5.6.

Solution

If we enter the estimates of the claim payments calculated in Example 5.6 into the run-off triangle, we obtain:

Cumulative claim payments		Development Year			
		0	1	2	3
Accident Year	2011	600	680	720	740
	2012	620	695	730	750.2778
	2013	680	760		823.7172
	2014	720			876.8823

Since the run-off triangle shows us the cumulative claim *payments* (*ie* the claims that have been paid to date) we calculate the reserve by subtracting the claims paid by the end of 2014 from the total estimated claim payment.

The reserve is:

$$740 + 750.2778 + 823.7172 + 876.8823 - (740 + 730 + 760 + 720) = 240.88$$

Because the 740 cancels, this can be simplified to:

$$750.2778 + 823.7172 + 876.8823 - (730 + 760 + 720) = 240.88 \qquad \blacklozenge\blacklozenge$$

We could, however, be given the claims *incurred* (*ie* all claims that have been reported to the insurer, whether or not they have been paid). In the following example the only thing that has changed from Example 5.7 is that we are told that we have cumulative *incurred* claims and not cumulative claim *payments.*