Claim Reserve, IBNR, and the Chain Ladder Method[1]

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Claim Reserves[3] are composed of Reported but Not Settled (RBNS) Claim Reserve and Incurred but Not Reported (IBNR[4]) Claim Reserve. Here we focus on using Chain Ladder Method (CLM) to estimate the IBNR claim reserve.

Chain ladder method[5] is a widely used ultimate claim estimation method. The chain ladder method is based on the assumption that the past development pattern can represent the future development pattern. We use this pattern to project the future ultimate claim amount. IBNR is the difference between this future cumulative amount and the already reported claim amount. This method often appears in the property and casualty insurance filed. Non-life insurance policies typically have shorter policy term.

First, the chain ladder method requires the use of cumulative data. If you are given incremental data, please accumulate first. Let's see the example below, we need to convert the incremental data in Table 1 to the accumulate data in Table 2.

Table 1: Reported Incremental Data

	Reported Incremental Data						
	Development Year (DY) - interval in year						
	0	1	2	3	4	5	6
2013	226	185	165	52	18	3	0
2014	241	201	138	65	21	6	
2015	212	183	78	7	3		
2016	232	193	85	5			
2017	217	176	72				
2018	209	179					
2019	210						

*AY: Accident Year
* In pratice, some companies use monthly interval
* AY here is from 2013-2019, since 2013 Claims do not accumulate anymore after 6 year, in real life, data won't last 6 years, more like 2 years

Table 2: Reported Cumulative Data

	Reported Cumulative Data						
	Development Year (DY)						
AY	0	1	2	3	4	5	6
2013	226	411	576	628	646	649	649
2014	241	442	580	645	666	672	
2015	212	395	473	480	483		
2016	232	425	510	515			
2017	217	393	465				
2018	209	388					
2019	210						

2013 AY Claims: $266 claim amt in 2013. In 2014, amount developed/accumulated to $411

Second, calculate the Loss Development Factors (LDF) and Cumulative Development Factors (CDF).

Table 3: Loss Development Factors(LDF)/Age-to-Age factors (based on Table 2 accumulative data)

	Loss Development Factors					
	Development Year (DY)					
AY	0-1	1-2	2-3	3-4	4-5	5-6
2013	1.819	1.401	1.090	1.029	1.005	1.000
2014	1.834	1.312	1.112	1.033	1.009	
2015	1.863	1.197	1.015	1.006		
2016	1.832	1.200	1.010			
2017	1.811	1.183				
2018	1.856					
2019						

Table 4: Factor Analysis

	0-1	1-2	2-3	3-4	4-5	5-6
(nearest) 3-Yr Simple Average	1.833	1.194	1.046	1.022	1.007	1.000
(nearest) 3-Yr Weighted Average	1.833	1.194	1.049	1.024	1.007	1.000
Selected Loss Development Factors(LDF)	1.833	1.194	1.046	1.022	1.007	1.000
	0-6(Ultimate)	*1-6(Ultimate)*	*2-6(Ultimate)*	*3-6(Ultimate)*	*4-6(Ultimate)*	*5-6(Ultimate)*
Cumulative Development Factors (CDF)	2.355	1.285	1.076	1.029	1.007	1.000

* one can also use: (nearest) 5-Yr Average or 5-Yr Average (exclusing highest and lowest)

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[3]There are long-term reserve and claim reserve. Long-term reserve (direct) can be made of long-term life reserve and long-term medical reserve. Claim reserve (direct) is composed of RBNS claim reserve and IBNR claim reserve. Audit team responsible for the RBNS. Actuaries are responsible for estimating IBNR claims reserves.

[4]IBNR is a reserve account used for the claims that have happened but not yet reported due to processing lag.

[5]Bornhuetter Ferguson method is an alternative to calculating claim reserve.

One can use the simple average LDF or weighted average LDF as the final selected CDF. The CDF is calculated based on the selected CDF (multiplication).

Finally, we can get the projected ultimate cumulative claim amount and IBNR claim reserve.

Table 5: Projected Cumulative Data

	Projected Ultimate Cumulative Data (Using CDF)							
	Development Year (DY)							
AY	0	1	2	3	4	5	6	IBNR
2013	226	411	576	628	646	649	649	
2014	241	442	580	645	666	672	672	0
2015	212	395	473	480	483		486.297	3.29719270353945
2016	232	425	510	515			530.177	15.1771537778011
2017	217	393	465				500.512	35.5121117755995
2018	209	388					498.468	110.467615231636
2019	210						494.561	284.560946314921
								IBNR=sum(J53:J59)

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