A Quick Introduction to the Runoff Ratio Method

by Richard E. Sherman, FCAS, MAAA

Often an entire triangle of loss development history is not available and there is a need to make projections for a group of older accident years (AYs) for which information is only available for the most recent yearends.

In this brief paper we will deal with such a situation by applying the simplest and easiest approach to deriving reasonable estimates of future development: the runoff ratio method.

Suppose all that is available are the following two arrays of historical loss data:

Incremental Paid ($000's)

AY	1	2	3	4	5	6	7	8
1998					440	310	240	175
1999				650	480	340	260	
2000			980	700	520	370		
2001		1,500	1,060	750	560			
2002	550	1,600	1,140	800				
2003	600	1,700	1,220					
2004	650	1,800						
2005	700							

Case Reserves ($000's)

AY	1	2	3	4	5	6	7	8
1998					750	547	396	281
1999				1,138	821	598	433	
2000			1,726	1,236	891	650		
2001		2,700	1,867	1,334	961			
2002	1,650	2,903	2,007	1,432				
2003	1,800	3,105	2,147					
2004	1,950	3,308						
2005	2,100							

In the above two arrays, loss data is available for the latest four calendar years, but not for earlier calendar years. Consequently, in this example, the standard paid loss development method can only be applied to AYs 2002-2005, even though there are still a large number of claims open for AYs 1998-2001. Since the outstanding liability for those earlier AYs is significant, there is a need for a method to utilize all of the above information in deriving estimates of the total unpaid losses.

The runoff ratio method is based on the idea that for the older AYs there may be a fairly stable relationship between incremental payments during each CY and how much the case reserves decline over that same CY. In other words, how much had to be paid out to

get case reserves to drop by $100,000? Was $125,000 needed? Or was only $75,000 needed? If the former, then the runoff ratio is 1.25. If the latter, 0.75.
In the next table we display comparisons of incremental paid and the drop in total case derived from the above data.

Calculation of Runoff Ratios

AY	2	3	4	5	6	7	8
1998	Paid				310	240	175
	Drop in Case				203	151	115
	Runoff Ratio				152%	159%	152%
1999	Paid			480	340	260	
	Drop in Case			317	222	165	
	Runoff Ratio			151%	153%	157%	
2000	Paid		700	520	370		
	Drop in Case		491	345	241		
	Runoff Ratio		143%	151%	153%		
2001	Paid	1,060	750	560			
	Drop in Case	833	533	372			
	Runoff Ratio	127%	141%	150%			
2002	1600	1,140	800				
	-1253	896	575				
	-128%	127%	139%				

For AY 1998 claims, during 2003 $310,000 was paid but case only dropped by $203,000. So $1.52 of payments were needed to produce a drop of $1 in total case. The runoff ratios for all AYs were between 150% and 159% during development years 5 through 8.

The next table displays all runoff ratios derivable from the original data.

Runoff Ratios

AY	2	3	4	5	6	7	8
1998					152%	159%	152%
1999				151%	153%	157%	
2000			143%	151%	153%		
2001		127%	141%	150%			
2002	-128%	127%	139%				
2003	-130%	127%					
2004	-133%						

Note that the runoff ratios for development year 2 were negative for all three AYs. This seeming anomaly is due to case reserves continuing to increase because of newly reported claims and upward reserve adjustments as the facts for more serious cases

became evident. Because of this, runoff ratios for the earliest years of development are not indicative of runoff ratios for the later years of development.

In the above example, a runoff ratio of 150% was selected as being representative of the relationship of incremental payments and declines in case reserves for development years 5 and higher. Using this assumption, total unpaid losses and the indicated IBNR reserve are derived in the next table.

Estimation of Total Unpaid Losses Using the Runoff Ratio Method

AY	Case Reserves @ 12/05	Selected Runoff Ratio	Total Unpaid Losses	Indicated IBNR Reserve
1998	281	150%	422	141
1999	433	150%	650	217
2000	650	150%	975	325
2001	961	150%	1442	481
2002	1,432	150%	2147	716
2003	2,147	150%	3221	1074

The projection of unpaid losses for AY 2002 is used in the next table to derive an indicated paid tail factor at 4 years of development.

Estimation of Paid Tail Factor for AYs 2002-2005

AY	(A) Cumulative Paid	(B) Total Unpaid Losses	(C) Total Ultimate Losses [(A)+(B)]	(D) Indicated Paid Tail Factor [(C)/(A)]
2002	4,090	2,147	6,237	1.525

The paid tail factor of 1.501 from the above table can be directly utilized in making standard paid loss development projections of ultimate losses for the most recent four AYs (2002-2005).

The projection of total IBNR reserves for AY 2002 is used in the next table to derive an indicated paid tail factor at 4 years of development.

Estimation of Incurred Tail Factor for AYs 2002-2005

AY	(A) Incurred Losses	(B) Indicated IBNR Reserve	(C) Total Ultimate Losses [(A)+(B)]	(D) Indicated Incurred Tail Factor [(C)/(A)]
2002	5,522	716	6,238	1.130

The incurred tail factor of 1.130 at 4 years of development from the above table can be directly utilized in making standard incurred loss development projections of ultimate losses for the most recent four AYs (2002-2005).

It is important to note that a transition needs to be made from using the runoff ratio for the oldest AYs to using paid and incurred development methods for the most recent AYs. The runoff ratio does not yield meaningful ratios for the most recent AYs, and it shouldn't be used for them. The merits of the runoff ratio method lie in making projections for older AYs, and in aiding the reserve analysis for AYs prior to the standard development triangles.

In the next table we see an example of usage of the runoff ratio method for the earliest AYs and the paid loss development method for the more recent AYs.

Combined Usage of Runoff Ratio and Paid Development Methods

AY	(A) Cumulative Paid	(B) Paid Factor to Ult.	(C) Ultimate Paid [(A)x(B)]	(D) Case Reserve	(E) Selected Runoff Ratio	(F) Total Unpaid [(D)x(E)]
1998	N/A	N/A	- -	281	155%	436
1999	N/A	N/A	- -	433	155%	671
2000	N/A	N/A	- -	650	155%	1,007
2001	N/A	N/A	- -	961	155%	1,490
2002	4,090	1.525	6,237			2,147
2003	3,520	1.899	6,684			3,164
2004	2,450	2.905	7,118			4,668
2005	700	11.039	7,728			7,028

Numerous other methods are described in a survey paper by Joseph Boor. It is posted at www.casact.org/pubs/forum/06wforum/06w348.pdf. These include: benchmarking, the modified Bondy method, curve fitting techniques (e.g., McClenahan's exponential decay of incremental paid, exponential decay of paid development factors and an inverse power curve fit to paid development factors) and the incremental paid to prior open method.

There are numerous precautions to consider in applying any or all of these methods. Here are a few:

- The historical data can be quite volatile, making selections of key assumptions difficult.
- Actuarial methods assume that the future will replicate the past. Often there are major discontinuities between the past and the future.
- It is advisable to apply more than one method, and to try to reconcile the reasons for differences in the projections produced by each method based on an understanding of the underlying assumptions of each method.
- More recent AYs may be quite different than older AYs in terms of the types of risks insured/self-insured.

- Legislation and judicial decisions can significantly alter the nature of claims experience, and cause future loss development to be decidedly different than past patterns.
- There is no warranty express or implied that future loss payments will conform to indications based on any actuarial method(s). It is nearly certain that future payments will differ from such projections, and quite possibly, by material amounts.
- In applying any actuarial method(s) it is recommended that these be performed by a loss reserve specialist with adequate past experience in conducting such analyses. Alternatively, such projections should at least be reviewed by a specialist.