Creating Loss Development Triangles

When a company's unique loss experience becomes credible enough, loss development triangles can be created to enhance the accuracy of the loss development factors.
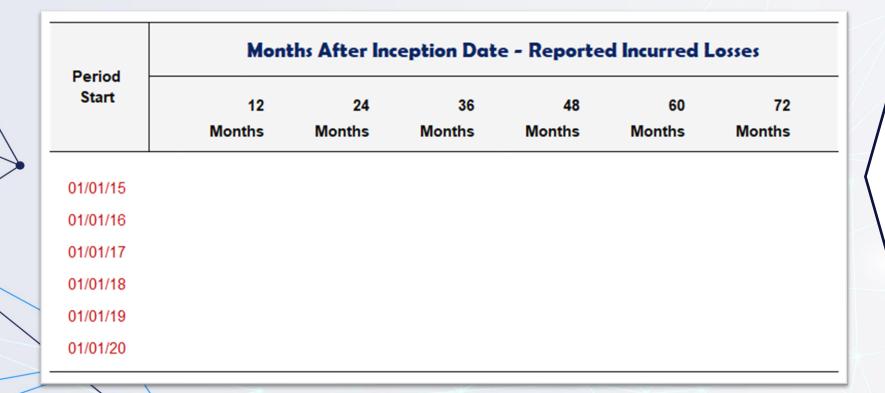
Credibility typically refers to both the extent of historical periods available and the volume of loss data in each period.

NOTE:
Without credible data, loss development triangles may be too volatile or brief to extract any reasonable analysis.

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Creating Loss Development Triangles

Period Start	Months After Inception Date – Reported Incurred Losses					
	12 Months	24 Months	36 Months	48 Months	60 Months	72 Months
01/01/15						
01/01/16						
01/01/17						
01/01/18						
01/01/19						
01/01/20						

Generally, loss development triangles use 12-month intervals as a basis of measurement.

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Creating Loss Development Triangles

Period Start	Months After Inception Date - Reported Incurred Losses					
	12 Months	24 Months	36 Months	48 Months	60 Months	72 Months
01/01/15						$582,000
01/01/16					$588,000	
01/01/17				$623,000		
01/01/18			$684,000			
01/01/19		$431,000				
01/01/20	$385,000					

Here, we've entered ABC Corp's loss data evaluated as of 12/31/20.

Note how the data points form a "diagonal" corresponding to each period's age in months at the point of evaluation.

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Creating Loss Development Triangles

The data being entered here is the total **unlimited** loss amount in each period.

While loss development triangles using **limited** loss data can be useful in certain situations, **unlimited** triangles are often recommended, as they provide the most flexibility in their usage.

Recommended

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Creating Loss Development Triangles

Period Start	Months After Inception Date - Reported Incurred Losses					
	12 Months	24 Months	36 Months	48 Months	60 Months	72 Months
01/01/15	$330,000	$415,000	$481,000	$513,000	$549,000	$582,000
01/01/16	296,000	382,000	497,000	557,000	588,000	
01/01/17	411,000	482,000	568,000	623,000		
01/01/18	423,000	576,000	684,000			
01/01/19	363,000	431,000				
01/01/20	385,000					

To construct the rest of the triangle, we fill in prior diagonals.

In most cases, you'll want at least **three years of historical data** before you start giving weight to a client's unique loss development.

Age-to-Age Factors

Once the data has been entered, age-to-age factors can be calculated.

These factors represent the growth shown in each period's losses as it matures over time.

Age-to-Age Factors

Period Start	Months After Inception Date – Reported Incurred Losses					
	12 Months	24 Months	36 Months	48 Months	60 Months	72 Months
01/01/15	$330,000	$415,000	$481,000	$513,000	$549,000	$582,000
01/01/16	296,000	382,000	497,000	557,000	588,000	
01/01/17	411,000	482,000	568,000	623,000		
01/01/18	423,000	576,000	684,000			
01/01/19	363,000	431,000				
01/01/20	385,000					
01/01/15	1.258	1.159	1.067	1.070	1.060	
01/01/16	1.291	1.301	1.121	1.056		
01/01/17	1.173	1.178	1.097			
01/01/18	1.362	1.188				
01/01/19	1.187					

As we get more data, we can start to identify ranges in each column's factors.

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Age-to-Age Factors

Period Start	Months After Inception Date - Reported Incurred Losses					
	12 Months	24 Months	36 Months	48 Months	60 Months	72 Months
01/01/15	$330,000	$415,000	$481,000	$513,000	$549,000	$582,000
01/01/16	296,000	382,000	497,000	557,000	588,000	
01/01/17	411,000	482,000	568,000	623,000		
01/01/18	423,000	576,000	684,000			
01/01/19	363,000	431,000				
01/01/20	385,000					
01/01/15	1.258	1.159	1.067	1.070	1.060	
01/01/16	1.291	1.301	1.121	1.056		
01/01/17	1.173	1.178	1.097			
01/01/18	1.362	1.188				
01/01/19	1.187					

As shown here, some points in time will be more volatile than others, making it more difficult to find a reasonable measurement.

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Age-to-Age Factors

Period Start	Months After Inception Date - Reported Incurred Losses					
	12 Months	24 Months	36 Months	48 Months	60 Months	72 Months
01/01/15	$330,000	$415,000	$481,000	$513,000	$549,000	$582,000
01/01/16	296,000	382,000	497,000	557,000	588,000	
01/01/17	411,000	482,000	568,000	623,000		
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01/01/19	363,000	431,000				
01/01/20	385,000					
01/01/15	1.258	1.159	1.067	1.070	1.060	
01/01/16	1.291	1.301	1.121	1.056		
01/01/17	1.173	1.178	1.097			
01/01/18	1.362	1.188				
01/01/19	1.187					
Wtd Avg	1.254	1.202	1.095	1.063	1.060	
3 Year Avg	1.241	1.222	1.095			
Median	1.258	1.183	1.097	1.063	1.060	

To help alleviate this issue, we make a few calculations to help identify commonalities.

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Selecting Age-to-Age Factors

Period Start	Months After Inception Date - Reported Incurred Losses					
	12 Months	24 Months	36 Months	48 Months	60 Months	72 Months
01/01/15	$330,000	$415,000	$481,000	$513,000	$549,000	$582,000
01/01/16	296,000	382,000	497,000	557,000	588,000	
01/01/17	411,000	482,000	568,000	623,000		
01/01/18	423,000	576,000	684,000			
01/01/19	363,000	431,000				
01/01/20	385,000					
01/01/15	1.258	1.159	1.067	1.070	1.060	
01/01/16	1.291	1.301	1.121	1.056		
01/01/17	1.173	1.178	1.097			
01/01/18	1.362	1.188				
01/01/19	1.187					
Wtd Avg	1.254	1.202	1.095	1.063	1.060	
3 Year Avg	1.241	1.222	1.095			
Median	1.258	1.183	1.097	1.063	1.060	
Selected						

Once we have a better grasp on the movement in each column, we can make selections.

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Selecting Age-to-Age Factors

Period Start	Months After Inception Date – Reported Incurred Losses					
	12 Months	24 Months	36 Months	48 Months	60 Months	72 Months
01/01/15	$330,000	$415,000	$481,000	$513,000	$549,000	$582,000
01/01/16	296,000	382,000	497,000	557,000	588,000	
01/01/17	411,000	482,000	568,000	623,000		
01/01/18	423,000	576,000	684,000			
01/01/19	363,000	431,000				
01/01/20	385,000					
01/01/15	1.258	1.159	1.067	1.070	1.060	
01/01/16	1.291	1.301	1.121	1.056		
01/01/17	1.173	1.178	1.097			
01/01/18	1.362	1.188				
01/01/19	1.187					
Wtd Avg	1.254	1.202	1.095	1.063	1.060	
3 Year Avg	1.241	1.222	1.095			
Median	1.258	1.183	1.097	1.063	1.060	
Selected	1.254	1.202	1.095	1.063	1.060	1.200

How selections are made will differ from person to person, and selections on actuarial reports are only made by licensed actuaries.

In the event you are helping a client construct these triangles for internal purposes, sticking with a specific calculation, such as the weighted average, will help make the resulting LDFs as objective as possible.

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Selecting Age-to-Age Factors

Period Start	Months After Inception Date - Reported Incurred Losses					
	12 Months	24 Months	36 Months	48 Months	60 Months	72 Months
01/01/15	$330,000	$415,000	$481,000	$513,000	$549,000	$582,000
01/01/16	296,000	382,000	497,000	557,000	588,000	
01/01/17	411,000	482,000	568,000	623,000		
01/01/18	423,000	576,000	684,000			
01/01/19	363,000	431,000				
01/01/20	385,000					
01/01/15	1.258	1.159	1.067	1.070	1.060	
01/01/16	1.291	1.301	1.121	1.056		
01/01/17	1.173	1.178	1.097			
01/01/18	1.362	1.188				
01/01/19	1.187					
Wtd Avg	1.254	1.202	1.095	1.063	1.060	
3 Year Avg	1.241	1.222	1.095			
Median	1.258	1.183	1.097	1.063	1.060	
Selected	1.254	1.202	1.095	1.063	1.060	

If you're helping a client go through an external report, reviewing the age-to-age factor selections ensures the subsequent LDFs used in the report are also reasonable.

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Calculating Loss Development Factors

Months After Inception Date - Reported Incurred Losses

Period Start	12 Months	24 Months	36 Months	48 Months	60 Months	72 Months
Selected	1.254	1.202	1.095	1.063	1.060	1.200
Cumulative	2.232	1.780	1.481	1.352	1.272	1.200

Months After Inception Date - Reported Incurred Losses

Period Start	12 Months	24 Months	36 Months	48 Months	60 Months	72 Months
Selected	1.240	1.190	1.100	1.060	1.060	1.200
Cumulative	2.189	1.765	1.483	1.348	1.272	1.200

However the selections are made, the final step in the process is relatively simple.

Age-to-age factors are multiplied together, starting with the most mature column and working all the way back to the least mature column.

Now, we have unique loss development factors that can be used in our own analysis!

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Additional Triangles

While they're not crucial, other useful types of triangles can be constructed as well to help improve an analysis.

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Additional Triangles

Period Start	Months After Inception Date - Incurred-to-Paid Ratio					
	12 Months	24 Months	36 Months	48 Months	60 Months	72 Months
01/01/15	42%	70%	82%	88%	92%	96%
01/01/16	25%	43%	64%	79%	84%	
01/01/17	33%	56%	70%	76%		
01/01/18	40%	67%	71%			
01/01/19	43%	50%				
01/01/20	28%					

One such exhibit is the incurred-to-paid ratio triangle, or payout triangle, which measures the amount of losses that have actually been paid at each interval of time.

This can give you a better idea of the rate at which a company pays out their losses and may help identify certain "problem" periods.

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Additional Triangles

Period Start	Months After Inception Date – Claim Counts					
	12 Months	24 Months	36 Months	48 Months	60 Months	72 Months
01/01/15	115	124	125	126	127	127
01/01/16	147	159	162	162	163	
01/01/17	124	128	129	131		
01/01/18	136	139	142			
01/01/19	109	118				
01/01/20	105					

The claim count triangle, another commonly created exhibit, measures the claim frequency over time.

This may help provide context into certain issues, such as whether or not higher losses in a period are due to claim frequency or severity.

Additional Triangles

Period Start	Months After Inception Date – Average Claim Severity					
	12 Months	24 Months	36 Months	48 Months	60 Months	72 Months
01/01/15	$2,870	$3,347	$3,848	$4,071	$4,323	$4,583
01/01/16	2,014	2,403	3,068	3,438	3,607	
01/01/17	3,315	3,766	4,403	4,756		
01/01/18	3,110	4,144	4,817			
01/01/19	3,330	3,653				
01/01/20	3,667					

Another helpful exhibit requires loss development triangles and claim count triangles to have already been development. By dividing the losses by claim counts, we can measure the average claim severity over time.

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Other Ways of Estimating Ultimate Loss

Case Development

B-F Methods

Frequency-Severity

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Becoming Analytically Based and Data Driven
Dealing with Uncertainty

Reserving/Payment Changes

How would you deal with changes in a company's reserving or payment philosophies?

Acquisitions

How would you handle integrating an acquisition into a client's ongoing analytics?

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Becoming Analytically Based and Data Driven
Dealing with Uncertainty

Risk Profile

How would you handle significant changes or additions to a company's risk profile (exposure, locations, type of business, etc)?

TPA Changes

How would you handle dealing with a client or company changing TPAs?

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Becoming Analytically Based and Data Driven
Dealing with Uncertainty

COVID-19

How can you use analytics to mitigate issues surrounding uncertain external forces, such as the COVID-19 pandemic?

What lessons can be learned from this and used going forward?

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Becoming Analytically Based and Data Driven
Maximizing the Benefit of Analytics

Becoming Consistent

How do you become a consistent user and provider of analytics?

Convincing decision makers

How can you convince decision makers that analytics will improve their ability to make crucial risk-related decisions?

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Becoming Analytically Based and Data Driven
Maximizing the Benefit of Analytics

Dialogue/Communication

How can you use analytics to improve dialogue and communication between yourself, your client, and external parties?

How can you use dialogue and communication to improve your analytics?

Staying Curious

How can you stay curious and keep out of analytic "ruts" that have ceased providing useful information?

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Conclusion
Providing Knowledge and Relaying Insights

You don't need to be an actuary to use analytics.

The majority of small to mid-size companies and firms have a very limited understanding of analytics, so they leave it to the "experts."

This provides you with a prime opportunity to stand out.

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Conclusion
Providing Knowledge and Relaying Insights

By using analytics in a consistent, credible manner, you're ensuring your current clients are making the most cost-efficient decisions possible.

On top of that, you're making yourself and your firm a more attractive prospect as potential clients recognize that you're basing your guidance on actual, tangible evidence – not back of the napkin calculations.

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Conclusion

As analytical tools become more widespread and commonly available, the insurance landscape is demanding more sophisticated knowledge. Without a solid understanding of analytics, you risk being left behind.

Conclusion

Our hope is that, using this knowledge, you can help your colleagues and clients better understand all the ways actuarial analytics can be useful.

While we might not know what the future holds, we can use our analytic tools to make ourselves better prepared for all possible outcomes.

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Next Session: The Presentation Meeting

Questions: support@SIGMAactuary.com