



Actuarial 101

LA RIMS July Education Event

July 19, 2017



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Introductions

Who we are



Mary Daly, FCAS, MAAA
Oliver Wyman Actuarial Consulting
Principal



Scott Ritto
Kilroy Realty Corporation
Vice President Risk Management

Agenda

What will I learn over lunch today?

Why

Why “Actuarial 101”?

What

“Actuarial 101” - Some Terminology and Basics

How

Actuarial Methodology

When

Changes Impacting the Analysis

Why “Actuarial 101”

Actuarial Roles

Consulting Actuaries

- Auditor Required Reserve Analysis
- Requirements for Self-Insurance
- Captive Requirements
- M&A Due Diligence

Insurance Carrier Actuaries

- Collateral Review
- Policy Pricing

Ratemaking Actuaries

- Industry Rates

“Actuarial 101” Life of a Claim



Initial Data Entry

Paid Loss	\$0
+ Case Reserves	\$1,000
<hr/>	
Incurred Loss	\$1,000

During Claim Life

Paid Loss	\$500
+ Case Reserves	\$750
<hr/>	
Incurred Loss	\$1,250

Upon Closure

Paid Loss	\$5,000
+ Case Reserves	\$0
<hr/>	
Incurred Loss	\$5,000

From 1st entry to 2nd entry

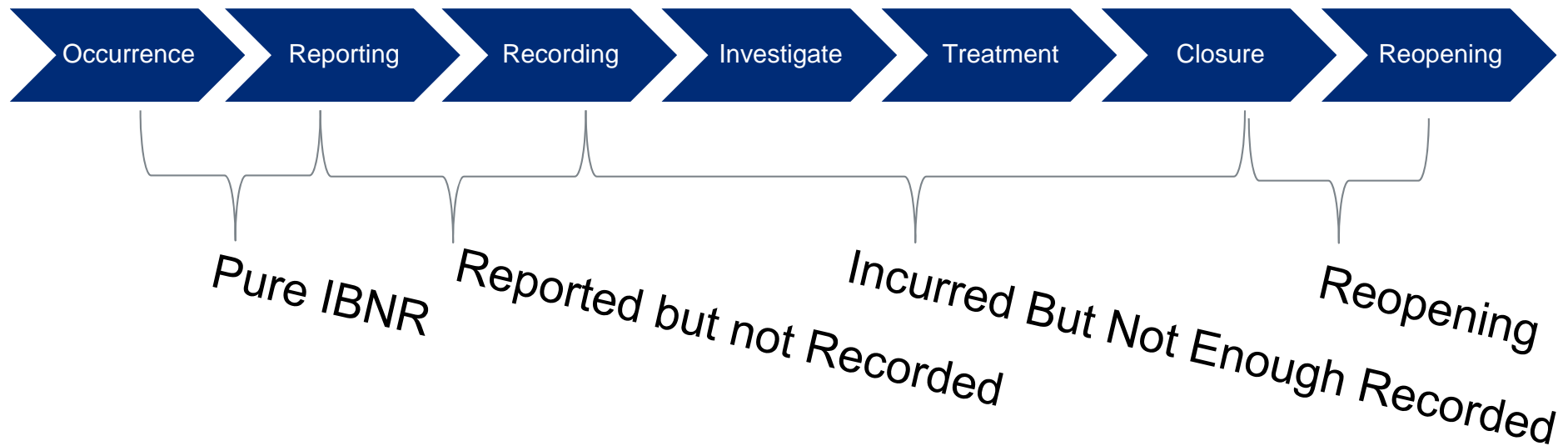
- Payments Increase by \$500 but Case Reserve only decreases by \$250
 - Claim initially expected to cost \$1,000 is now expected to cost \$1,250!

From 2nd entry to final entry

- Payments increased \$4,500 but Case Reserve only decreased \$750
 - Claim actually cost \$5,000, \$4,000 higher than claims examiner estimated!

“Actuarial 101”

What is IBNR?



Note: IBNR is estimated in aggregate (i.e. not for each bucket defined above)

Actuarial Methodology

Basics

- Several methods are used in an attempt to analyze a company's data from a number of different perspectives.
- Methods can be performed using paid or incurred data
- The goal in each case is to estimate ultimate losses by policy period
- Loss Development (“Triangle”) Method is most well known

Actuarial Methodology

Loss Development Method

- Two Main Assumptions
 1. History Repeats Itself
 - Paid assumes consistent settlement and payment.
 - Incurred assumes above (although less dependent) and assumes consistent reserving.
 2. Law of Large Numbers
 - Data is stable; sufficient volume of claims
 - Best for higher frequency lines of business

Actuarial Methodology

Loss Development Method

Accident Year	<u>Months of Development</u>						
	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>	<u>60</u>	<u>72</u>	<u>84</u>
2010	5,100	7,400	8,200	8,600	8,860	8,950	8,950
2011	6,500	8,800	9,900	10,300	10,510	10,620	
2012	7,200	10,100	11,700	12,500	12,750		
2013	6,800	9,400	10,500	11,000			
2014	6,500	9,000	10,200				
2015	7,500	10,600					
2016	7,000						

Actuarial Methodology

Loss Development Method

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2012	7,200	10,100	11,700	12,500	12,750		
2013	6,800	9,400	10,500	11,000			
2014	6,500	9,000	10,200				
2015	7,500	10,600					
2016	7,000						

Notes:

- Each **column** of a loss triangle corresponds to the age of each set of claims. For example, **Column Age 12** displays the losses for each accident year when the accident year was 12 months old, i.e., at 12 months from the inception of the accident year.
- For example, for Accident Year 2010 beginning on 1/1/2010, 12/31/2010 would represent the point in time at which Accident Year 2010 is 12 months old.

Actuarial Methodology

Loss Development Method

<u>Accident Year</u>	<u>Months of Development</u>						
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2011	6,500	8,800	9,900	10,300	10,510	10,620	
2012	7,200	10,100	11,700	12,500	12,750		
2013	6,800	9,400	10,500	11,000			
2014	6,500	9,000	10,200				
2015	7,500	10,600					
2016	7,000						

Notes:

- Each row of loss triangle corresponds to a fixed set of claims. For example, the row corresponding to Accident Year **2010** corresponds to all claims occurring from **1/1/2010 to 12/31/2010.**
- As of 12/31/10, there are **\$5,100** of incurred losses associated with accidents occurring between 1/1/10 and 12/31/10.
- As of 12/31/11, there are **\$7,400** of incurred losses associated with accidents occurring between 1/1/10 and 12/31/10.

Actuarial Methodology

Loss Development Method

Accident Year	<u>Months of Development</u>						
	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>	<u>60</u>	<u>72</u>	<u>84</u>
2010	5,100	7,400	8,200	8,600	8,860	8,950	8,950
2011	6,500	8,800	9,900	10,300	10,510	10,620	
2012	7,200	10,100	11,700	12,500	12,750		
2013	6,800	9,400	10,500	11,000			
2014	6,500	9,000	10,200				
2015	7,500	10,600					
2016	7,000						

Notes:

- Each **diagonal** of a loss triangle corresponds to a valuation date, or snapshot in time.
- For example, the **orange diagonal** corresponds to a valuation date of **12/31/2012**. This is precisely when accident year 2010 is 36 months old, when accident year 2011 is 24 months old, and when accident year 2012 is 12 months old.

Actuarial Methodology

Loss Development Method

Accident Year	<u>Months of Development</u>						
	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>	<u>60</u>	<u>72</u>	<u>84</u>
2010	5,100	7,400	8,200	8,600	8,860	8,950	8,950
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2012	7,200	10,100	11,700	12,500	12,750		
2013	6,800	9,400	10,500	11,000			
2014	6,500	9,000	10,200				
2015	7,500	10,600					
2016	7,000						

Calculate Loss Development Factors

Accident Year	<u>24</u>	<u>12</u>	<u>12 to 24</u>
2010	7,400	5,100	1.451
2011	8,800	6,500	1.354
2012	10,100	7,200	1.403
2013	9,400	6,800	1.382
2014	9,000	6,500	1.385
2015	10,600	7,500	1.413

Actuarial Methodology

Loss Development Method

<u>Accident</u>	<u>Age-to-age Factors</u>						
	<u>Year</u>	<u>12 to 24</u>	<u>24 to 36</u>	<u>36 to 48</u>	<u>48 to 60</u>	<u>60 to 72</u>	<u>72 to 84</u>
2010	1.451	1.108	1.049	1.030	1.010	1.000	1.001
2011	1.354	1.125	1.040	1.020	1.010	1.000	1.001
2012	1.403	1.158	1.068	1.020	1.010	1.000	1.001
2013	1.382	1.117	1.048	1.024	1.010	1.000	1.001
2014	1.385	1.133	1.051	1.024	1.010	1.000	1.001
2015	1.413	1.130	1.051	1.024	1.010	1.000	1.001
2016	1.398	1.130	1.051	1.024	1.010	1.000	1.001
Average	1.398	1.128	1.051	1.024	1.010	1.000	
3 year Avg	1.393	1.136	1.052	1.024			
Wtd. Avg	1.396	1.130	1.052	1.023	1.010	1.000	
Prior	1.395	1.127	1.053	1.025	1.010	1.000	1.001
Selected	1.398	1.130	1.051	1.024	1.010	1.000	1.001

Actuarial Methodology

Loss Development Method

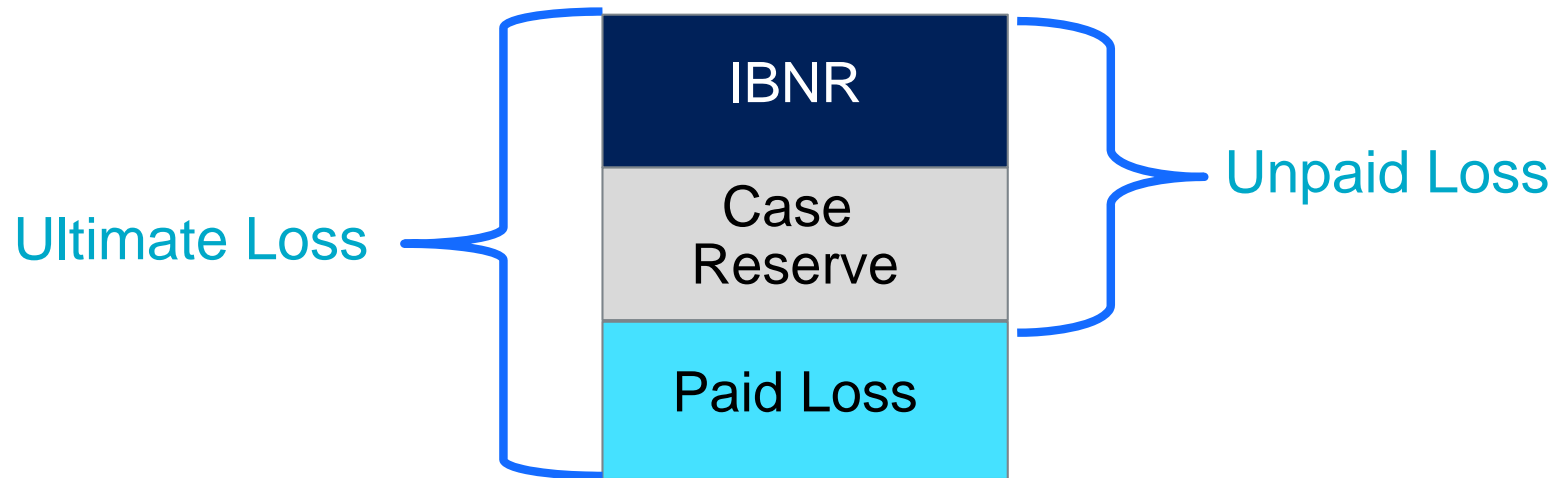
“Squaring” the Triangle

<u>Accident</u>	<u>Months of Development</u>							<u>Ultimate</u>
	<u>Year</u>	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>	<u>60</u>	<u>72</u>	
2010	5,100	7,400	8,200	8,600	8,860	8,950	8,950	$8,950 \times 1.001 = 8,959$
2011	6,500	8,800	9,900	10,300	10,510	10,620	$10,620 \times 1.000 \times 1.001 = 10,631$	
2012	7,200	10,100	11,700	12,500	12,750	$12,750 \times 1.010$	$12,750 \times 1.000 \times 1.001 = 12,890$	
2013	6,800	9,400	10,500	11,000	$11,000 \times 1.024$	$11,000 \times 1.010$	$11,000 \times 1.000 \times 1.001 = 11,388$	
2014	6,500	9,000	10,200	$10,200 \times 1.051$	$10,200 \times 1.024$	$10,200 \times 1.010$	$10,200 \times 1.000 \times 1.001 = 11,098$	
2015	7,500	10,600	$10,600 \times 1.130$	$10,600 \times 1.051$	$10,600 \times 1.024$	$10,600 \times 1.010$	$10,600 \times 1.000 \times 1.001 = 13,033$	
2016	7,000	$7,000 \times 1.398$	$7,000 \times 1.130$	$7,000 \times 1.051$	$7,000 \times 1.024$	$7,000 \times 1.010$	$7,000 \times 1.000 \times 1.001 = 12,032$	

Actuarial Methodology

What is Ultimate Loss?

The ultimate total cost of all claims occurring in a defined period (or reported in the period for claims made), usually by accident period and/or policy period



- $\text{Paid Loss} + \text{Case Reserves} + \text{IBNR} = \text{Ultimate Loss}$

Actuarial Methodology

How is Ultimate Loss used in Pricing Analysis?

- Adjust to future policy year terms
 - Severity and Frequency Trends
 - Regulatory Changes
- Divide by exposure to eliminate exposure changes
- Select an average loss cost based on history
- Multiply selected loss cost by forecasted exposures

Accident Year	Ultimate	Trend Factor	Regulatory Factor	Adjusted Ultimate	Exposures	Loss Cost
2010	8,959	1.189	1.003	10,685	3,500	3.05
2011	10,631	X 1.160	X 0.996	12,282	3,900	3.15
2012	12,890	1.131	0.997	14,539	3,900	3.73
2013	11,388	1.104	0.998	12,540	4,000	3.13
2014	11,098	1.077	0.998	11,923	4,200	2.84
2015	13,033	1.051	0.999	13,674	4,600	2.97
2016	12,032	1.025	0.996	12,280	5,400	2.27

Selected Loss Cost 3.00
2017 Exposures 5,000
2017 Loss Pick 15,000

Changes Impacting Analysis

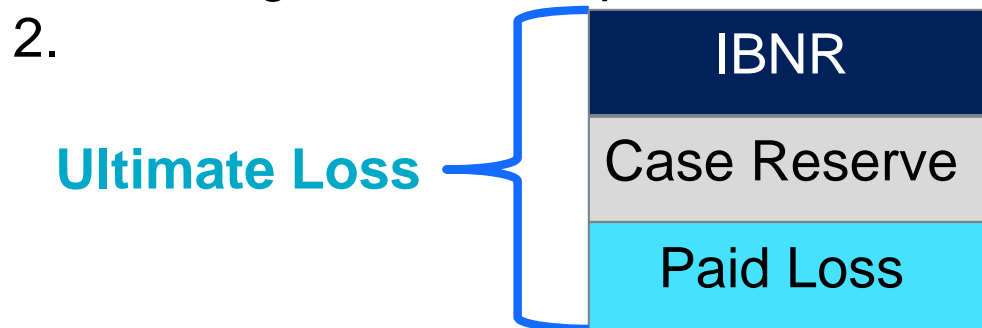
Internal or Operational Changes

- Case Reserving Changes
- Claim Settlement Philosophy Changes
- Claims Handling Practices
- Claims Audit
- Claim Inventory Workout
- Changes in Excess Insurance or Deductible Program
 - May need separate analysis by retention
- Loss Control Program Changes
- Return to Work Program Changes
 - May need claim counts separately for lost-time and med only
- Business Growth
- Change in Mix of Business
- Acquisitions, Divestitures or Mergers
- Changes in Risk Manager, CFO, or Treasurer
- Significant Operational Changes
 - May need payroll by state and job classification

Actuarial 101

Summary

1. Case Reserves are not adequate total reserves and Incurred Loss is not adequate ultimate loss for 2 main reasons:
 - Growth in costs on reported claims.
 - Emergence of unreported claims.



3. LDF Method assumes historical growth from one period to next will repeat
4. Trend and Regulatory changes are contemplated in forecasting
5. Company specific changes may not be automatically contemplated
 - Effective Communication = Higher Accuracy

Contact information

If you have any additional questions, please do not hesitate to contact us

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