

# Actuarial Adventure

## A Peek Behind the Curtain: How Actuaries Develop Their Estimates

Presented by

Joel S. Chansky FCAS, MAAA

Principal and Consulting Actuary

Milliman, Inc.

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# Agenda

- Objectives
- Data and Definitions
- Principles
- Methodology
- Discussions With Your Carrier
- Summary
- Questions

# Objectives

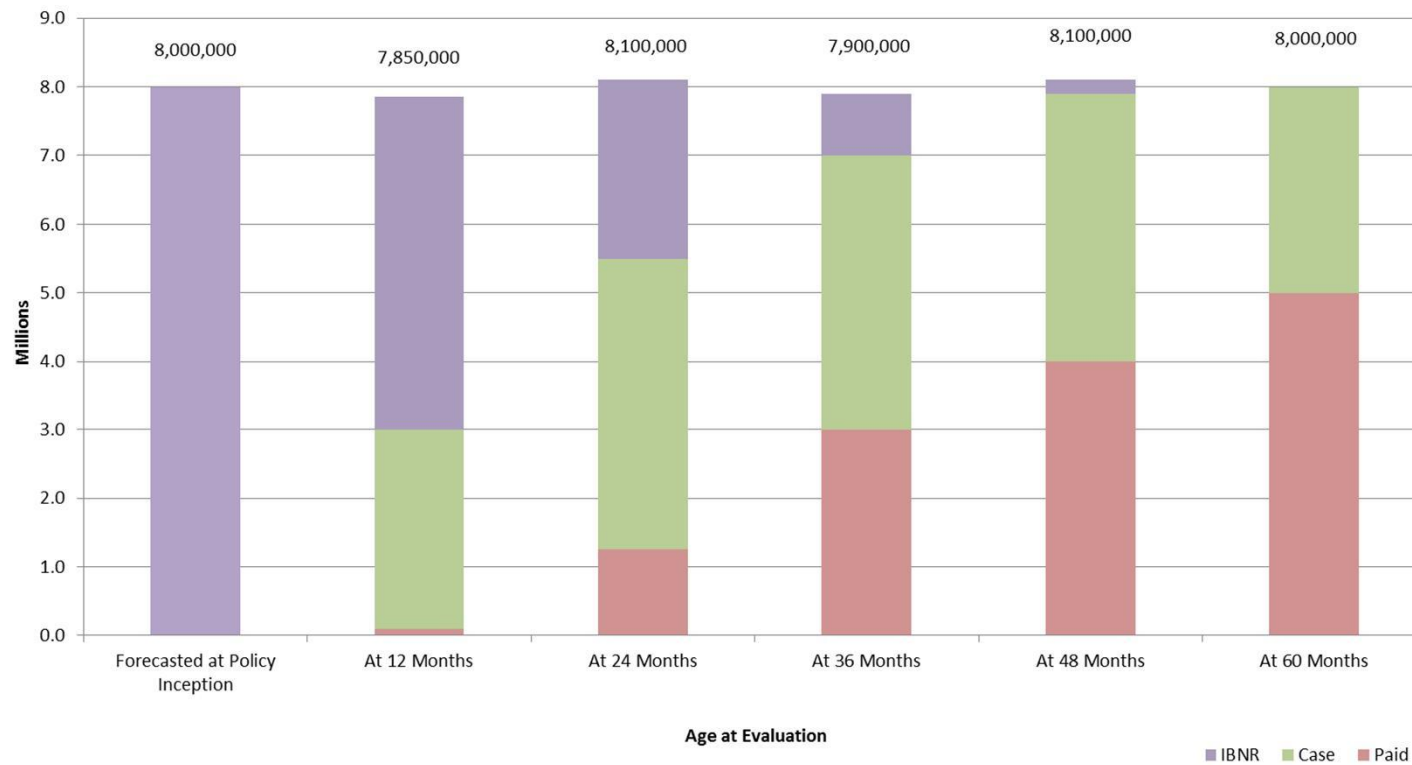
- Forecast future loss ratio/profitability
- Tool to use in negotiations with carriers
- Use prior history as guide
- Use current/future underwriting and external variables

# Data and Definitions

- Forecasting ultimate loss – prior years
  - Components of ultimate loss
    - Paid losses
    - Case reserves
    - Incurred but not reported (“IBNR”) reserves
  - Values change over time

# Data and Definitions

## ■ Ultimate loss over time



# Data and Definitions

- Unpaid losses (reserves)
  - Case reserves
    - Individual open claim reserves
    - Established by claims adjuster
  - IBNR reserves
    - Provision for unreported claims
    - Provision for re-opened claims
    - Provision for development on open claims
    - Established through actuarial/statistical models

# Principles

- Loss reserve
  - Unpaid amount required to settle all claims
  - Includes unreported claims
- Actuarially sound reserves
  - Based on estimates
  - Derived from reasonable assumptions
  - Using appropriate methods
- Match revenue with expenses
  - Ultimate loss / earned premium
  - Other measures will understate loss ratio
- Requires forecasting unpaid losses

# Principles

- Example of not matching revenue with expenses

	at 12 Months	at 24 Months	at 36 Months	at 48 Months	at 60 Months
Incurred Loss (\$000's)	20,000	60,000	70,000	75,000	75,000
IBNR Reserve (\$000's)	17,500	15,000	5,000	0	0
Ultimate Loss (\$000's)	37,500	75,000	75,000	75,000	75,000
Written Premium (\$000's)	100,000	100,000	100,000	100,000	100,000
Earned Premium (\$000's)	50,000	100,000	100,000	100,000	100,000
<u>Ratios</u>					
Incurred Loss/Written Premium	0.200	0.600	0.700	0.750	0.750
Ultimate Loss/Earned Premium	0.750	0.750	0.750	0.750	0.750



# Principles

- Inherent uncertainty
  - A range can be actuarially sound
  - True value known only after all claims settled
- Most appropriate reserve depends on
  - Relative likelihood of estimates in range
  - Intended use

# Methodology

- Loss triangles

**Cumulative Incurred Loss Triangle**

Accident Year	12 Months	24 Months	36 Months	48 Months	60 Months
2009	100,000	120,000	130,000	135,000	140,000
2010	110,000	130,000	145,000	140,000	
2011	105,000	125,000	140,000		
2012	125,000	135,000			
2013	130,000				

**Incurred Loss Development Factors**

Accident Year	12-24	24-36	36-48	48-60	60-Ult.
2009	1.200	1.083	1.038	1.037	
2010	1.182	1.115	0.966		
2011	1.190	1.120			
2012	1.080				
2013					

# Methodology

- Selecting loss development factors (“LDFs”)

Development:	<u>12-24</u>	<u>24-36</u>	<u>36-48</u>	<u>48-60</u>
<u>Averages</u>				
Mean	1.163	1.106	1.002	1.037
Weighted	1.159	1.107	1.000	1.037
Latest 2	1.135	1.118	1.002	
<u>Selected</u>				
Age-Age	1.163	1.106	1.002	1.037
<u>Cumulative</u>				
Age-Ultimate	1.336	1.149	1.039	1.037

# Methodology

- Developing ultimate loss estimates for prior years

Incurred Loss Development Method			
(1)	(2)	(3)	(4)
Accident Year	Incurred Loss as of 12/31/2013	Cumulative Development Factors	Expected Ultimate Loss (2) x (3)
2010	140,000	1.037	145,180
2011	140,000	1.039	145,460
2012	135,000	1.149	155,115
2013	130,000	1.336	173,680

# Methodology

- Incurred loss ratio triangle
  - Incurred losses / earned premium

Cumulative Incurred Loss Ratio Triangle						
Accident Year	12 Months	24 Months	36 Months	48 Months	60 Months	Earned Premium
2009	0.500	0.600	0.650	0.675	0.700	200,000
2010	0.550	0.650	0.725	0.700		200,000
2011	0.525	0.625	0.700			200,000
2012	0.625	0.675				200,000
2013	0.650					200,000
Straight Avg	0.570	0.638	0.692	0.688	0.700	
Avg Latest 2	0.638	0.650	0.713	0.688		

# Methodology

- Deriving an expected loss ratio for future years

Expected Loss Ratio Method									
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Accident Year	Earned Premium	Selected Ultimate Loss	Un-trended Loss Ratio (3) / (2)	Premium On-Level Factor	Loss Trend Factor	Coverage & Premium Trend Factor	On-Level Earned Premium (2) x (5)	Trended On-Level Ultimate Loss (3) x (6) x (7)	Trended On-Level Ultimate Loss Ratio (9) / (8)
2010	200,000	145,180	0.726	1.000	1.216	1.000	200,000	176,467	0.882
2011	200,000	145,460	0.727	1.000	1.158	1.000	200,000	168,388	0.842
2012	200,000	155,115	0.776	1.000	1.103	1.000	200,000	171,014	0.855
2013	200,000	173,680	0.868	1.000	1.050	1.000	200,000	182,364	0.912
<b>Total</b>	<b>800,000</b>	<b>619,435</b>	<b>0.774</b>				<b>800,000</b>	<b>698,234</b>	

Notes:

(6): Assumes a 5% trend

(11) Weighted Average 0.873

(12) Wtd Avg Excl. Hi/Lo 0.869

(13) Average Latest 2 0.883

(14) Selected for 2014 0.875

# Methodology

- Rate level indications

- Carrier is charging a rate they feel is appropriate to cover losses and expenses while achieving a target profit
- Different techniques are used to determine whether rates the carrier charges are appropriate (in the aggregate)
  - Loss Ratio Method
    - › Determines an indicated change in rates
    - › Uses loss and expense ratio, fixed expense ratio, variable expense % and target profit %
  - Pure Premium Method
    - › Determines an indicated average rate
    - › Uses pure premium (ultimate loss / exposures), fixed expense per exposure, variable expense % and target Profit %
  - Loss Ratio Method more commonly used

# Methodology

- An example of the Loss Ratio Method

- Projected Ultimate Loss Ratio = .875 (Based on history and future assumptions)
- Projected Fixed Expense Ratio = .05
- Variable Expense Percentage = 20%
- Target U/W Profit Percentage = 5%

$$\text{Indicated Rate Change} = \frac{[0.875 + 0.05]}{1.0 - 0.20 - 0.05} - 1.0 = 0.233$$

- This result means the overall rate level is inadequate and should be increased by 23.3%



# Methodology

- Considerations for rate level indications
  - Coverage changes
  - Premium trending
  - Loss trending

# Methodology

- Considerations for rate level indications
  - Coverage changes
    - Law changes or court rulings that affect the amount of damages able to be awarded, or statutory benefit level changes for workers compensation
    - Changes in policy terms and conditions (exclusions, etc.)
    - Change in policy limits

# Methodology

- Considerations for rate level indications
  - Premium trending
    - Inflation
    - Change in rating characteristics (debits/credits)
    - Change in deductible
    - Change in portfolio
      - › Re-underwriting to account for changes in business
      - › Acquisition or divestiture of blocks of business

# Methodology

- Considerations for rate level indications
  - Loss Trending
    - Inflation
    - Technological advancements
    - Improved safety
    - Social influences

# Discussions With Your Carrier

- Information exchange is key!
- Operational changes influence your rates
  - New/Discontinued operations
  - New risk management initiatives
  - Personnel changes
- Underwriting changes
  - Removal of consistently poor performing policyholders
    - Are large losses random?
    - Is a risk's experience unlucky?
  - Decisions based on “experience” or predictive modeling
  - How will removing the worse than average risks affect your rates?
  - Example: Cease writing property policies in Florida due to repetitive large losses/catastrophe losses resulting from hurricanes

# Discussions With Your Carrier

- Other
  - How is your carrier determining the change in rate level?
  - Is your book of business credible enough to be rated on its own?
  - If not, is the industry source the carrier is using to supplement book of business appropriate?
    - Similar exposures, limits, and/or geographical location?
- Predictive analytics
  - Superior underwriting tool if enough data is available
  - Leads to better loss ratios
  - First year requires forecasting the impact of this “re-underwriting”

# Discussions With Your Carrier

- Results reflecting underwriting changes

(1) Accident Year	(2) Earned Premium	Expected Loss Ratio Method					(7) Coverage & Premium Trend Factor	(8) On-Level Earned Premium (2) x (5)	(9) Trended Ultimate Loss (3) x (6) x (7)	(10) Trended On-Level Ultimate Loss Ratio (9) / (8)
		(3) Selected Ultimate Loss	(4) Un-trended Loss Ratio (3) / (2)	(5) Premium On-Level Factor	(6) Loss Trend Factor	(8) On-Level Earned Premium (2) x (5)				
2010	160,000	87,108	0.544	1.000	1.216	0.900	160,000	95,292	0.596	
2011	160,000	87,276	0.545	1.000	1.158	0.900	160,000	90,930	0.568	
2012	160,000	93,069	0.582	1.000	1.103	0.900	160,000	92,348	0.577	
2013	160,000	104,208	0.651	1.000	1.050	0.900	160,000	98,477	0.615	
<b>Total</b>	<b>640,000</b>	<b>371,661</b>	<b>0.581</b>				<b>640,000</b>	<b>377,046</b>		

Notes:

(2): Assumes a 20% decrease in earned premium

(3): Assumes a 40% decrease in ultimate losses

(6): Assumes a 5% trend

(7): Estimated impact of use of advanced predictive analytics

(18): = [(14) + (15)] / [1.0 - (16) - (17)] - 1.0

(11) Weighted Average 0.589

(12) Wtd Avg Excl. Hi/Lo 0.586

(13) Average Latest 2 0.596

(14) Selected for 2014 0.590

(15) Fixed Expense Ratio 5%

(16) Variable Expense Ratio 20%

(17) Profit and Contingencies 5%

(18) Indicated Rate Change **-14.7%**

# Summary

- True ultimate loss cannot be determined until all claims have been closed
- Gap between the carrier and the Program Manager is often a result of the assumptions underlying the forecasted loss ratio
- Key to impacting assumptions is information sharing
- Not all changes dictate a change in assumptions



# Questions?