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Structured Tools

to Help Organize One's Thinking When Performing or Reviewing a Reserve Analysis

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Agenda

Learning Objectives

Methodology Overview

Actual vs. Expected

Analysis of LDF Picks

Source of Change

Methodology Overview

Methodology was developed to stimulate critical thinking about the data and analysis and lead the actuary to identify potential data issues, pattern changes, or other things that would warrant deeper investigation.

Methodology consists of three parts:

Actual vs. Expected Analyses	Analysis of LDF Picks	Source of change Analysis
• Test the reasonableness of the assumptions and conclusions reached in the prior reserve analyses. • Compare incurred and paid claims activities, assumptions, and ultimate losses between the prior and current studies.	• Evaluates how selected loss development factors (LDFs) compare to the patterns being indicated by the data or industry. • For example, the selected LDFs might be compared to: o Industry LDFs o “5 year weighted” LDF averages from client triangles o "5 year excluding high/low" LDF averages from client triangles	• Quantifies the sources of change between current and prior ultimate loss selections. • The premise of this test is that ultimate losses change for a combination of three reasons: o Loss emergence o LDF and Initial Expected Loss assumptions o Selection of ultimates

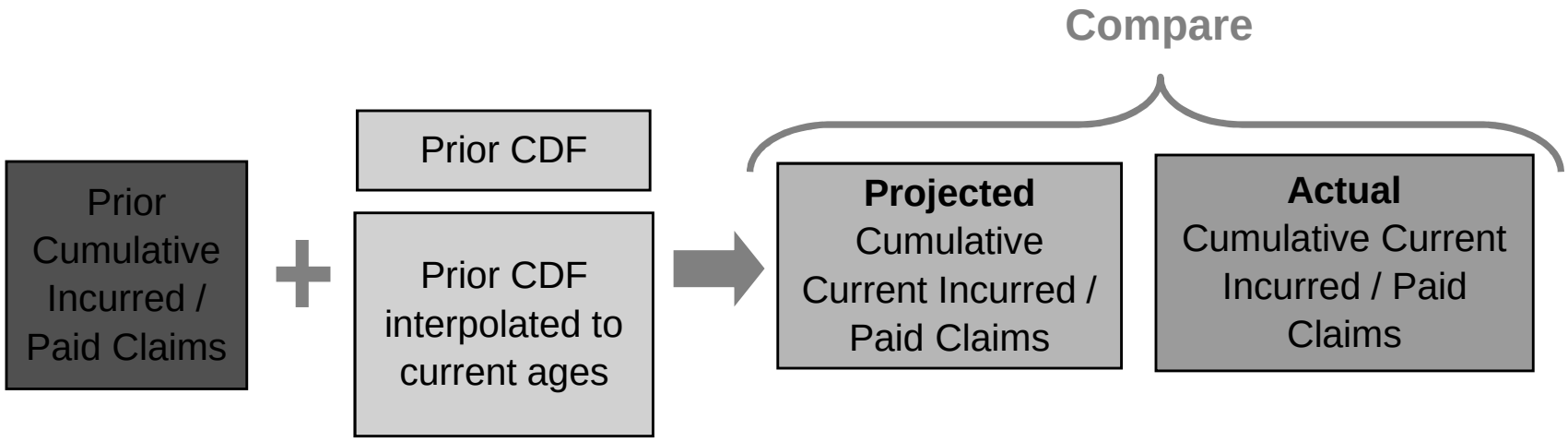
Actual vs. Expected Analysis

We employ both a direct and indirect method of measuring expected emergence. The analysis of actual loss emergence as compared to expected loss emergence allows us to comment on the following questions:

- How have the assumptions and conclusions reached in the prior reserve analyses held up when compared to the most recent claims emergence?
- Are there any significant differences between the actual versus expected results for incurred versus paid claims emergence?
- Are there any significant differences between the actual versus expected results for direct versus indirect expected claims projections?
- If the current claims activity is in line with the prior projection, we might reasonably expect current assumptions and ultimate losses to be close to prior assumptions and ultimate losses. Are they?

Actual vs. Expected Analysis - Direct

We want to compare the projected incurred and paid loss with the actual incurred and paid loss where projected losses are calculated by applying prior age to age LDFs to the prior incurred and paid losses



If the actual activity is lower (higher) than the expected activity, the expectation is that the current study's loss development assumptions should be selected to produce lower (higher) ultimate loss projections than those in the prior study.

Actual vs. Expected Analysis - Direct

The expected incurred (paid) is calculated by applying interpolated LDFs to the prior incurred (paid) loss amounts.

Data from prior analysis

Interpolated prior CDF

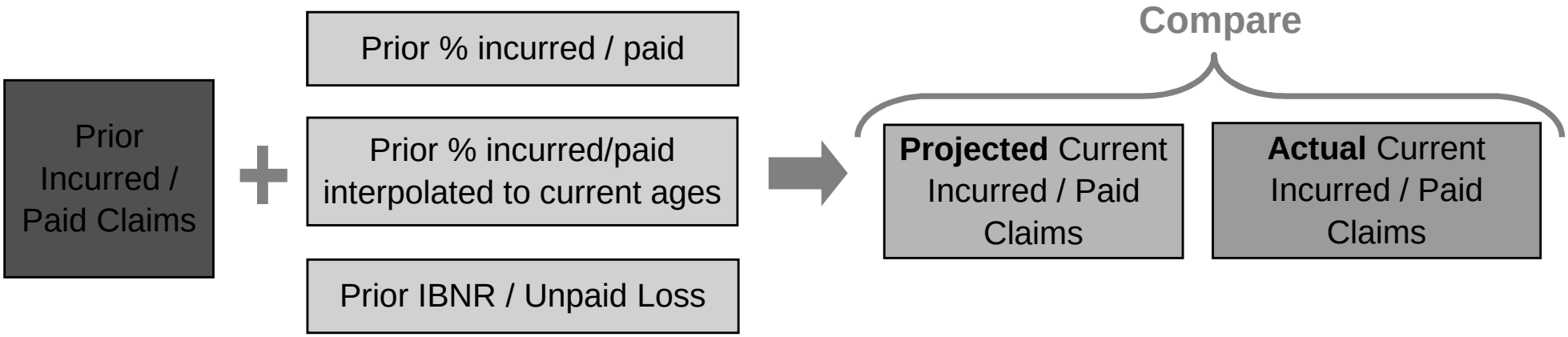
Expected Cumulative Current Incurred = (1) * (2) / (3)

Accident Year	Current Age	Prior Age	Cumulative Incurred Losses at 12/31/2011	CDF from Prior Actuarial Study	CDF Interpolated to Current Claim Age	Expected Cumulative Incurred Losses at 12/31/2012
			(1)	(2)	(3)	(4)
2004	108	96	621	1.025	1.012	629
2005	96	84	1,468	1.046	1.025	1,498
2006	84	72	1,283	1.072	1.046	1,315
2007	72	60	1,064	1.104	1.072	1,096
2008	60	48	1,510	1.181	1.104	1,615
2009	48	36	857	1.264	1.181	917
2010	36	24	847	1.706	1.264	1,143
2011	24	12	108	22.182	1.706	1,404
TOTAL			**7,758**			**9,618**

Note: The CDF for the oldest loss year cannot be interpolated from the CDFs calculated in the prior study. Instead, the CDF must be extrapolated from the decay pattern in the CDFs in the prior study. The methodology used to derive the 1.012 value was to (a) calculate the rate of change in the three oldest CDFs in Column (2); (b) fit an exponential curve to the resulting rates of change using Excel's "Growth" function; (c) extrapolate the fitted exponential curve one time period into the future; and (d) apply the extrapolated value to the 1.025 value from column (2).

Actual vs. Expected Analysis - Indirect

We want to compare the projected incurred and paid loss with the actual incurred and paid loss where projected losses are calculated as the percent of the prior IBNR or unpaid losses expected to emerge between the two ages implied by the prior CDFs.



If the actual activity is lower (higher) than the expected activity, the expectation is that the current study's loss development assumptions might need to be decreased (increased) to produce lower (higher) ultimate loss projections than those in the prior study. Alternatively, it could mean that the prior study's ultimate losses were too high (low).

Actual vs. Expected Analysis - Indirect

First, we must calculate the percent incurred (paid) implied by the prior LDFs at the prior and current ages. The expected incurred (paid) is the amount of the IBNR (unpaid losses) that emerges into incurred (paid) losses between the two ages.

Expected Cumulative Current Incurred

$$= (2) * \frac{(4) - (3)}{1 - (3)} + (1)$$

Interpolated prior % incurred

Data from prior analysis

Accident Year	Current Age	Prior Age	Cumulative Incurred Losses at 12/31/11	Selected IBNR at 12/31/11	Percent Incurred at Prior Age	Percent Incurred at Current Age	Expected Cumulative Incurred Losses at Current Valuation
			(1)	(2)	(3)	(4)	(5)
2004	108	96	621	0	97.6%	98.8%	621
2005	96	84	1,468	50	95.6%	97.6%	1,490
2006	84	72	1,283	67	93.3%	95.6%	1,306
2007	72	60	1,064	86	90.6%	93.3%	1,089
2008	60	48	1,510	240	84.7%	90.6%	1,602
2009	48	36	857	443	79.1%	84.7%	975
2010	36	24	847	703	58.6%	79.1%	1,195
2011	24	12	108	1,417	4.5%	58.6%	911
TOTAL			**7,758**	**3,006**			**9,190**

Comparison of Direct and Indirect Methods

If ultimate losses are selected exactly equal to the direct loss development ultimate loss indication, there will be no difference in actual vs. expected results under the direct and indirect methods.

This is demonstrated with the following simplified example:

Assume the cumulative incurred losses at time 1 are 1,000 and the prior development pattern is as given in the following table:

Development Age	0 – 1	1 – 2	2 – 3
Incremental LDF	n/a	1.500	1.167
Cumulative LDF	n/a	1.750	1.167
Percent Incurred	57.1%	85.7%	100.0%

- Ultimate losses at time 1 are selected equal to the LDF method = 1,000 * 1.750 = 1,750
- Expected cumulative incurred losses at time 2 are:
  - Direct Method = 1,000 * 1.750 / 1.167 = **1,500**
  - Indirect Method = 1,000 + 750 * (0.857 - 0.571) / (1 – 0.571) = **1,500**

Comparison of Direct and Indirect Methods

We extend this example to show that if ultimate losses are not selected equal to the loss development method, the direct and indirect actual vs. expected methods will yield different results.

Now assume the cumulative incurred losses at time 1 are 1,400 and the prior development pattern remains as given in the prior example:

Development Age	0 – 1	1 – 2	2 – 3
Incremental LDF	n/a	1.500	1.167
Cumulative LDF	n/a	1.750	1.167
Percent Incurred	57.1%	85.7%	100.0%

- Incurred LDF method indication at time 1 = 1,400 * 1.750 = 2,450
- However, the actuary selected ultimate losses at time 1 as 2,000
- Expected cumulative incurred losses at time 2 are:
  - Direct Method = 1,400 * 1.750 / 1.167 = **2,100**
  - Indirect Method = 1,400 + 600 * (0.857 - 0.571) / (1 – 0.571) = **1,800**

Actual vs. Expected Considerations

We have shown that the direct and indirect actual vs. expected methods will only give different results if ultimate losses are not selected equal to the loss development method.

- Direct method produces a quantitative assessment of how the most recent loss emergence lines up with the emergence pattern the actuary expects. It allows the actuary to pass judgment on or ask questions about the development patterns selected in the prior analysis.
- Indirect method incorporates a judgmental element in the ultimate loss selections from the prior analysis. This method provides the actuary with a quantitative way of assessing the consistency of the selected ultimate losses from the prior analysis with the most recent loss emergence.

Neither method is inherently “better” than the other. Maximum value is achieved when both are used and differences are identified, analyzed, and understood.

Actual vs. Expected Considerations

Large differences or inconsistencies between the two methods can lead to additional questions.

- Could there be something wrong with the data?
- Has there been a change in claims handling practice or the way case reserves are set up?

For volatile books of business, there is more randomness in the results, and the actuary may want to look at additional diagnostics.

- Claim count totals
- Data stratifications by claim size
- Capped versus excess losses
- Historical levels of volatility in less versus more mature accident periods
- Adjusting the data to remove calendar year inflationary trends

Interpretation of Results – Simple Example

We now compare the expected cumulative incurred losses at time 2 to the actual cumulative incurred losses at time 2.

Development Age	Expected Cumulative Incurred Losses @ Time 2	Actual Cumulative Incurred Losses @ Time 2	Actual minus Expected Losses
Direct Expected Loss Emergence	1400 * (1.750 / 1.167) = 2,100	2,000	(100)
Indirect Expected Loss Emergence	$600 * \frac{(0.857 - 0.571)}{1 - 0.571} + 1400 = 1,800$	2,000	200

- Direct development results indicate that losses have not emerged as quickly as expected
- Indirect development results indicate that losses have emerged more quickly than the prior selected ultimate loss selection would have led us to expect
- The actuary might consider selecting a new ultimate loss estimate that is higher than the prior selected 2,000 but lower than the current LDF indication of 2,333

Interpretation of Results – Original Example

Returning to our original example, we compare losses expected to emerge by time t to actual cumulative incurred losses as of time t.

	Expected Loss	Actual Loss	Actual - Expected
	(1)	(2)	(2) – (1)
Direct Method	9,618	9,458	(160)
Indirect Method	9,190	9,458	268

- Direct development results indicate that losses have not emerged as quickly as expected
- Indirect development results indicate that losses have emerged more quickly than the prior selected ultimate loss selection would have led us to expect
- The actuary might consider decreasing the loss development factors but increasing initial expected losses or selecting ultimate losses based on a higher method

Interpretation of Results – Original Example

We can further refine our analysis by looking at the actual vs. expected results by Accident Year. This may give us additional insight.

Our direct method shows lower than expected development across most years. LDFs should probably be lowered.

Accident Year	Expected Cumulative Incurred Loss (Direct)	Expected Cumulative Incurred Loss (Indirect)	Actual Cumulative Incurred Loss	Actual vs. Expected (Direct)	Actual vs. Expected (Indirect)
	(1)	(2)	(3)	(3) - (1)	(3) - (2)
2004	629	621	621	(8)	0
2005	1,498	1,490	1,452	(46)	(38)
2006	1,315	1,306	1,232	(83)	(74)
2007	1,096	1,089	1,131	35	42
2008	1,615	1,602	1,759	144	157
2009	917	975	850	(67)	(125)
2010	1,143	1,195	1,122	(21)	(73)
2011	1,404	911	1,291	(113)	380
TOTAL	**9,618**	**9,190**	**9,458**	**(160)**	**268**

Higher than expected indirect development is driven by the 2011 year. The prior ultimate for this year is likely too low.

Analysis of LDF Picks

We test the reasonableness of the selected LDF patterns by comparing the indicated test results to those indicated by corresponding industry patterns and mechanical averages taken directly from the company data.

- Various averages can be used
- Should include different time frames (3 yr vs. 5 yr) and different weighting schemes (weighted vs. straight average, highest vs. second highest, excluding high and low values)
- Some averages will be biased high (highest, second highest) and some will be biased low (five year excluding high and low values*) allowing selected LDFs to be compared to a wide range of alternatives.

*For discussion of the downward bias in the 5 ex hi/lo average, see "Downward Bias of Using High-Low Averages for Loss Development Factors" by Cheng-Sheng Peter Wu, Casualty Actuarial Society Summer 1997 Forum, Volume 1, pages 197-240 and 1999 Proceedings of the Casualty Actuarial Society, Volume LXXXVI, pages 699 – 735.

Analysis of LDF Picks - Data

We use the following data triangle for this testing:

Accident Year	Development Age								
	12	24	36	48	60	72	84	96	108
2004	49	402	504	570	569	624	652	621	621
2005	37	1,297	1,529	1,448	1,384	1,423	1,468	1,452	
2006	122	777	988	1,086	1,300	1,283	1,232		
2007	137	804	935	888	1,064	1,131			
2008	57	751	1,407	1,510	1,759				
2009	56	830	857	850					
2010	38	847	1,122						
2011	108	1,291							
2012	114								

Analysis of LDF Picks - Data

Which results in the following age to age LDFs and averages:

Accident Year	Development Period 12 - 24	24 - 36	36 - 48	48 - 60	60 - 72	72 - 84	84 - 96	96 - 108	108 - Ult
2004	8.204	1.254	1.131	0.998	1.097	1.045	0.952	1.000	
2005	35.054	1.179	0.947	0.956	1.028	1.032	0.989		
2006	6.369	1.272	1.099	1.197	0.987	0.960			
2007	5.869	1.163	0.950	1.198	1.063				
2008	13.175	1.874	1.073	1.165					
2009	14.821	1.033	0.992						
2010	22.289	1.325							
2011	11.954								
2012									
3 point average	16.355	1.410	1.005	1.187	1.026	1.012	0.971	1.000	
5 point average	13.622	1.333	1.012	1.103	1.044	1.012	0.971	1.000	
7 point average	15.647	1.300	1.032	1.103	1.044	1.012	0.971	1.000	
3 point wtd avg	14.693	1.395	1.015	1.183	1.024	1.007	0.978	1.000	
5 point wtd avg	11.422	1.324	1.012	1.104	1.033	1.007	0.978	1.000	
7 point wtd avg	11.886	1.286	1.021	1.104	1.033	1.007	0.978	1.000	
5 point ex hi/lo	13.317	1.253	1.005	1.120	1.044	1.012			
Largest LDF	35.296	1.873	1.132	1.198	1.096	1.045	0.989	1.000	
2nd largest LDF	22.131	1.324	1.099	1.197	1.063	1.032	0.953		
2nd smallest LDF	6.363	1.162	0.950	0.997	1.028	1.032	0.989		
Smallest LDF	5.876	1.032	0.947	0.955	0.987	0.960	0.953	1.000	
Selected LDF	13.000	1.400	1.070	1.070	1.030	1.020	1.015	1.007	1.005

Credibility at Later Triangle Points

At a certain point in the triangle, there are not enough actual data points to give full credibility to the averages. Various options are available to provide stability.

- Selected factors and tail from current or prior analysis
- Industry factors and tail
- Use of curve fitting

	Development Period								
	12 - 24	24 - 36	36 - 48	48 - 60	60 - 72	72 - 84	84 - 96	96 - 108	108 - Ult
3 point average	16.355	1.410	1.005	1.187	1.026	1.012	1.015	1.007	1.005
5 point average	13.622	1.333	1.012	1.103	1.044	1.012	1.015	1.007	1.005
7 point average	15.647	1.300	1.032	1.103	1.044	1.012	1.015	1.007	1.005
3 point wtd avg	14.693	1.395	1.015	1.183	1.024	1.007	1.015	1.007	1.005
5 point wtd avg	11.422	1.324	1.012	1.104	1.033	1.007	1.015	1.007	1.005
7 point wtd avg	11.886	1.286	1.021	1.104	1.033	1.007	1.015	1.007	1.005
5 point ex hi/lo	13.317	1.253	1.005	1.120	1.044	1.012	1.015	1.007	1.005
Largest LDF	35.296	1.873	1.132	1.198	1.096	1.045	1.015	1.007	1.005
2nd largest LDF	22.131	1.324	1.099	1.197	1.063	1.032	1.015	1.007	1.005
2nd smallest LDF	6.363	1.162	0.950	0.997	1.028	1.032	1.015	1.007	1.005
Smallest LDF	5.876	1.032	0.947	0.955	0.987	0.960	1.015	1.007	1.005
Selected LDF	13.000	1.400	1.070	1.070	1.030	1.020	1.015	1.007	1.005

We have chosen to replace all factors 84 months and beyond with the selected factors from the current analysis in this example

Loss Development Method Calculation

The next step is to accumulate the factors and calculate the loss development test for each average.

Accident Year	2012	2011	2010	2009	2008	2007	2006	2005	2004
Incurred Loss	114	1,291	1,122	850	1,759	1,131	1,232	1,452	621
3 point average	3,345	2,316	1,428	1,076	1,877	1,176	1,266	1,469	624
5 point average	2,508	2,085	1,359	1,017	1,909	1,176	1,266	1,469	624
7 point average	2,863	2,072	1,386	1,017	1,909	1,176	1,266	1,469	624
3 point wtd avg	2,971	2,290	1,427	1,065	1,862	1,169	1,266	1,469	624
5 point wtd avg	2,058	2,041	1,339	1,003	1,879	1,169	1,266	1,469	624
7 point wtd avg	2,100	2,001	1,352	1,003	1,879	1,169	1,266	1,469	624
5 point ex hi/lo	2,324	1,976	1,371	1,033	1,909	1,176	1,266	1,469	624
Largest LDF	12,024	3,858	1,790	1,198	2,069	1,214	1,266	1,469	624
2nd largest LDF	4,952	2,534	1,663	1,147	1,982	1,199	1,266	1,469	624
2nd smallest LDF	870	1,548	1,158	924	1,917	1,199	1,266	1,469	624
Smallest LDF	609	1,173	988	790	1,712	1,115	1,266	1,469	624
Selected LDF	2,564	2,233	1,386	982	1,898	1,185	1,266	1,469	624

Comparison of Results

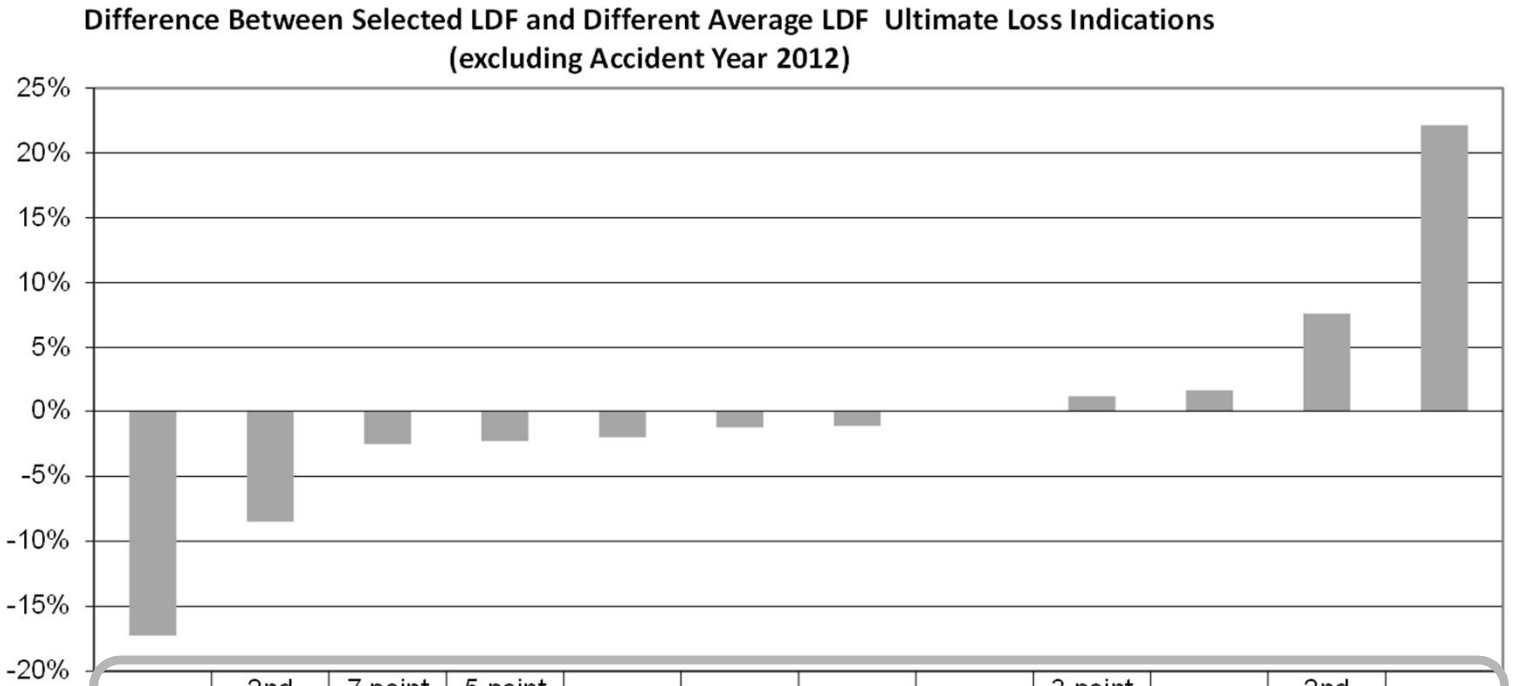
We total the incurred loss development method results across all accident years for each average and compare this total to the results using the selected LDFs. We have performed the comparison both including and excluding the latest year.

	Total Ultimate Losses	Dollar Variance with Selected Total	Percentage Variance with Selected Total	Total Ultimate Losses ex. AY 2012	Dollar Variance with Selected Total ex. AY 2012	Percentage Variance with Selected Total ex. AY 2012
Incurred Loss	9,572			9,458		
3 point average	14,577	970	7%	11,232	188	2%
5 point average	13,413	-194	-1%	10,905	-138	-1%
7 point average	13,783	176	1%	10,919	-124	-1%
3 point weighted average	14,143	536	4%	11,172	129	1%
5 point weighted average	12,849	-758	-6%	10,791	-253	-2%
7 point weighted average	12,864	-743	-5%	10,764	-279	-3%
5 point ex hi/lo	13,147	-460	-3%	10,824	-220	-2%
Largest LDF	25,513	11,906	87%	13,489	2,445	22%
2nd largest LDF	16,836	3,229	24%	11,884	840	8%
2nd smallest LDF	10,975	-2,632	-19%	10,105	-938	-8%
Smallest LDF	9,745	-3,862	-28%	9,137	-1,906	-17%
Selected LDF	13,607			11,043		

We observe that the selected LDFs fall within the range of the various averages both including and excluding AY 2012

Comparison of Results

We can also look at the results graphically, which better illustrates the position of the selected pattern amongst the averages.



	Smallest LDF	2nd smallest LDF	7 point weighted average	5 point weighted average	5 point ex hi/lo	5 point average	7 point average	Selected LDF	3 point weighted average	3 point average	2nd largest LDF	Largest LDF
Variance to Selected	-17%	-8%	-3%	-2%	-2%	-1%	-1%	0%	1%	2%	8%	22%

Selected results are close to straight and weighted averages and appear to be within a reasonable range.

Comparison of Results

Viewing the different averages may also uncover other trends in the data

	Smallest LDF	2nd smallest LDF	7 point weighted average	5 point weighted average	5 point ex hi/lo	5 point average	7 point average	Selected LDF	3 point weighted average	3 point average	2nd largest LDF	Largest LDF
Variance to Selected	-17%	-8%	-3%	-2%	-2%	-1%	-1%	0%	1%	2%	8%	22%

3 year averages are higher than 5 year and seven year. Are LDFs increasing?

Source of Change Analysis

In this analysis, we examine the drivers of differences between the prior and current ultimate loss selections.

We analyze three drivers:

Data

- Difference between actual and expected loss emergence from the prior analysis to the current analysis

Assumptions

- Difference between prior and current assumptions, including loss development factors and initial expected losses

Judgment

- Differences in “Actuarial Judgment” in the way ultimate losses are selected in relation to the ultimate losses indicated by the different actuarial methods

Source of Change Analysis

Analyzing these three drivers of change – data, assumptions, and judgment – allows us to comment on the following questions:

- What is the impact on ultimate loss estimates of data emerging in a different pattern than expected?
- What impact will changing an assumption have on the ultimate loss estimates?
- Do any changes in assumptions make sense in relation to what is happening in the data?
- Are ultimates selected in a consistent manner relative to the method results? And if not, is this inconsistency reasonable and explainable?

Source of Change Analysis

We must first calculate three Bornhuetter-Ferguson indications

Method A:
Prior Data
Prior Assumptions

- BF indication using data as of time t-1 and assumptions as of time t-1
- BF indication from prior analysis

Method B:
Current Data
Prior Assumptions

- BF indication using data as of time t-1 and assumptions as of time t
- This indication is not calculated or used in either the prior or current analysis

Method C:
Current Data
Current Assumptions

- BF indication using data as of time t and assumptions as of time t
- BF indication from current analysis

If exposures are not available, we can follow the same process using the loss development methods, but we have found the BF results to work best due to the stabilizing nature of the methodology that keeps it from over-reacting to large swings in the data.

BF Method Calculations

For this example, we assume time t-1 is 12/31/11 and time t is 12/31/12

Accident Year	Prior Incurred Loss	Prior Initial Expected Loss	Prior Percent Incurred at time t-1	Method A
	(1)	(2)	(3)	(4)
2004	621	682	97.6%	638
2005	1,468	1,470	95.6%	1,533
2006	1,283	1,405	93.3%	1,377
2007	1,064	1,045	90.6%	1,162
2008	1,510	1,600	84.7%	1,755
2009	857	1,574	79.1%	1,186
2010	847	1,539	58.6%	1,484
2011	108	1,539	4.5%	1,578
TOTAL	**7,758**	**10,854**		**10,713**

*(2) * [100% - (3)] + (1)*

Method A uses data as of time t-1 and initial expected loss and LDF assumptions as of time t-1

BF Method Calculations

For this example, we assume time t-1 is 12/31/11 and time t is 12/31/12

Accident Year	Current Incurred Loss	Prior Initial Expected Loss	Prior Percent Incurred at time t	Method B
	(1)	(2)	(3)	(4)
2004	621	682	98.8%	629
2005	1,452	1,470	97.6%	1,488
2006	1,232	1,405	95.6%	1,294
2007	1,131	1,045	93.3%	1,201
2008	1,759	1,600	90.6%	1,910
2009	850	1,574	84.7%	1,091
2010	1,122	1,539	79.1%	1,443
2011	1,291	1,539	58.6%	1,928
TOTAL	**9,458**	**10,854**		**10,984**

*(2) * [100% - (3)] + (1)*

Method B uses data as of time t and initial expected loss and LDF assumptions as of time t-1 (interpolated to time t)

BF Method Calculations

For this example, we assume time t-1 is 12/31/11 and time t is 12/31/12

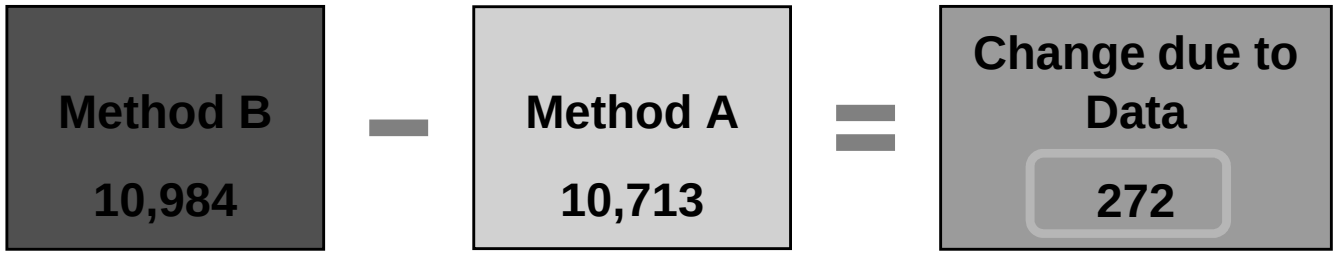
Accident Year	Current Incurred Loss	Current Initial Expected Loss	Current Percent Incurred at time t	Method C
	(1)	(2)	(3)	(4)
2004	621	621	99.5%	624
2005	1,452	1,475	98.8%	1,470
2006	1,232	1,350	97.4%	1,268
2007	1,131	1,150	95.4%	1,183
2008	1,759	1,750	92.7%	1,887
2009	850	1,300	86.6%	1,024
2010	1,122	1,442	80.9%	1,397
2011	1,291	1,875	57.8%	2,082
TOTAL	**9,458**	**10,963**		**10,935**

*(2) * [100% - (3)] + (1)*

Method C uses data as of time t and initial expected loss and LDF assumptions as of time t

Change due to Data

The first source of change considered is the change due to data. Unless losses have emerged exactly as expected, updating the loss experience in the analysis will change the resulting method values.

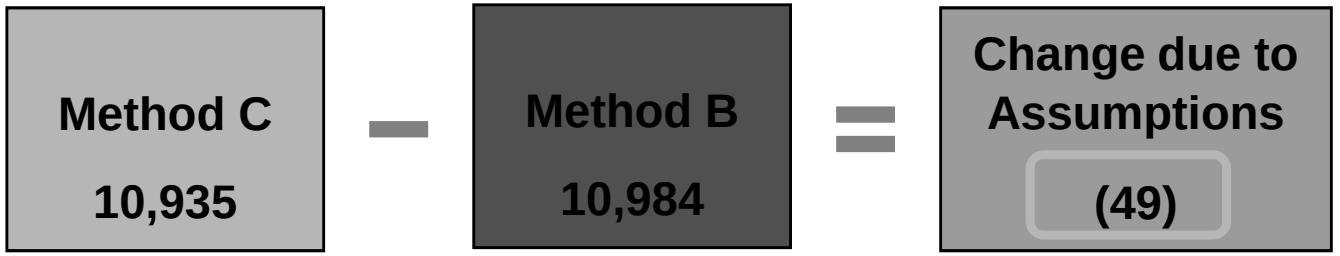


The results show that the data has emerged higher than expected. An increase in the method results due to a change in data indicates that either the assumptions underlying the prior analysis projected too little development in the period or that the ultimate losses from the prior analysis should be increased (or some combination of the two)

Change due to data should be similar to the indirect actual vs. expected results. However, this test goes one step further to tell us how much the change in data is impacting our method indications.

Change due to Assumptions

The second source of change considered is the change due to assumptions – in this case loss development factors and initial expected losses. Additional insight from having another year's worth of data may lead us to change our assumptions.



The results show that the assumptions in the current analysis are lower than the assumptions in the prior analysis.

Change due to Assumptions – Detailed

For methods with multiple assumptions, we can break out the change in assumptions to measure the change due to each individual assumption, if desired. To do so, calculate successive method values changing one assumption at a time.

Method B1

- BF indication using current data and all prior assumptions

Method B2

- BF indication using current data, current age to age factors, prior tail factor (interpolated to current age), and prior initial expected losses

Method B3

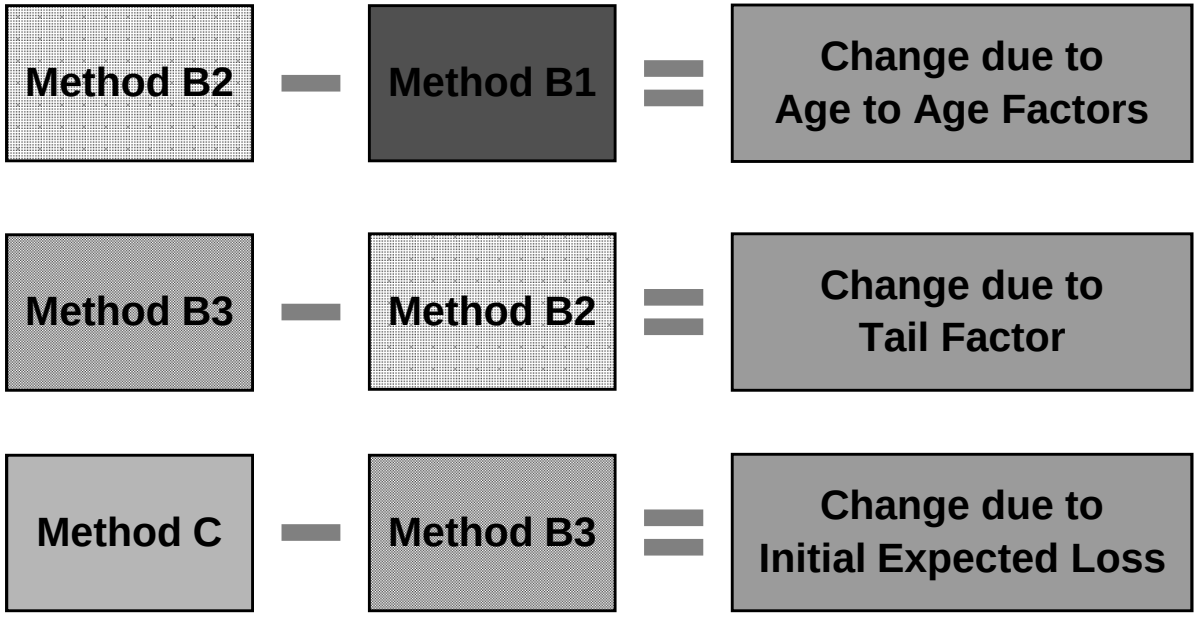
- BF indication using current data, current age to age factors, current tail factor, and prior initial expected losses

Method C

- BF indication using current data and all current assumptions

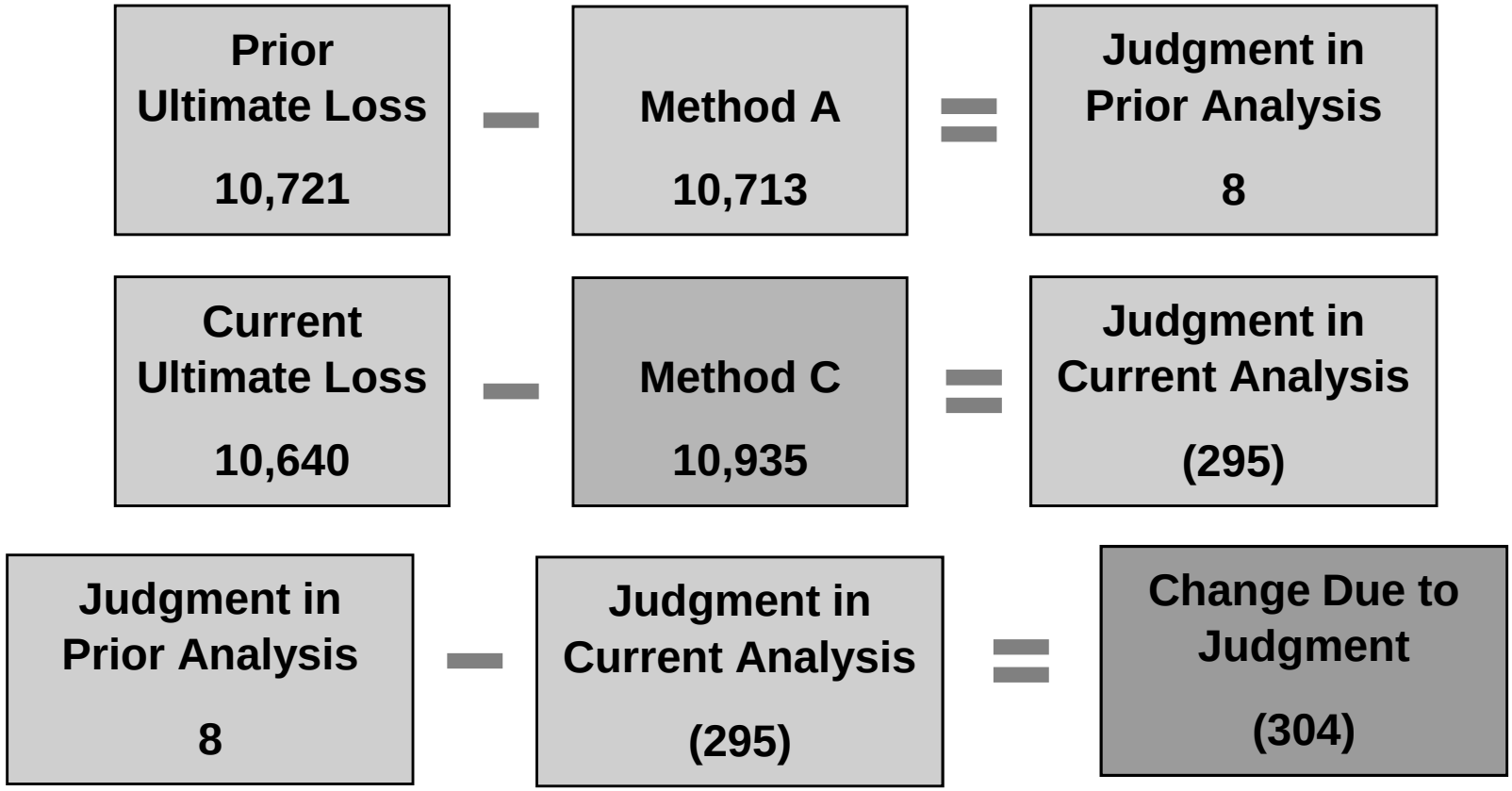
Change due to Assumptions – Detailed

With these methods, we can break the change in assumptions down into its component parts.



Change due to Judgment

The third and final source of change considered is the change due to actuarial judgment. We define actuarial judgment to be the amount that the selected ultimate loss differs from the indicated method values. The base method for comparison must be the same method (or combination of methods) used to calculate the changes due to data and assumptions.



Change due to Judgment

We can also demonstrate that the change due to judgment is equal to the remaining change in ultimates that is not accounted for in the change due to data or the change due to assumptions.

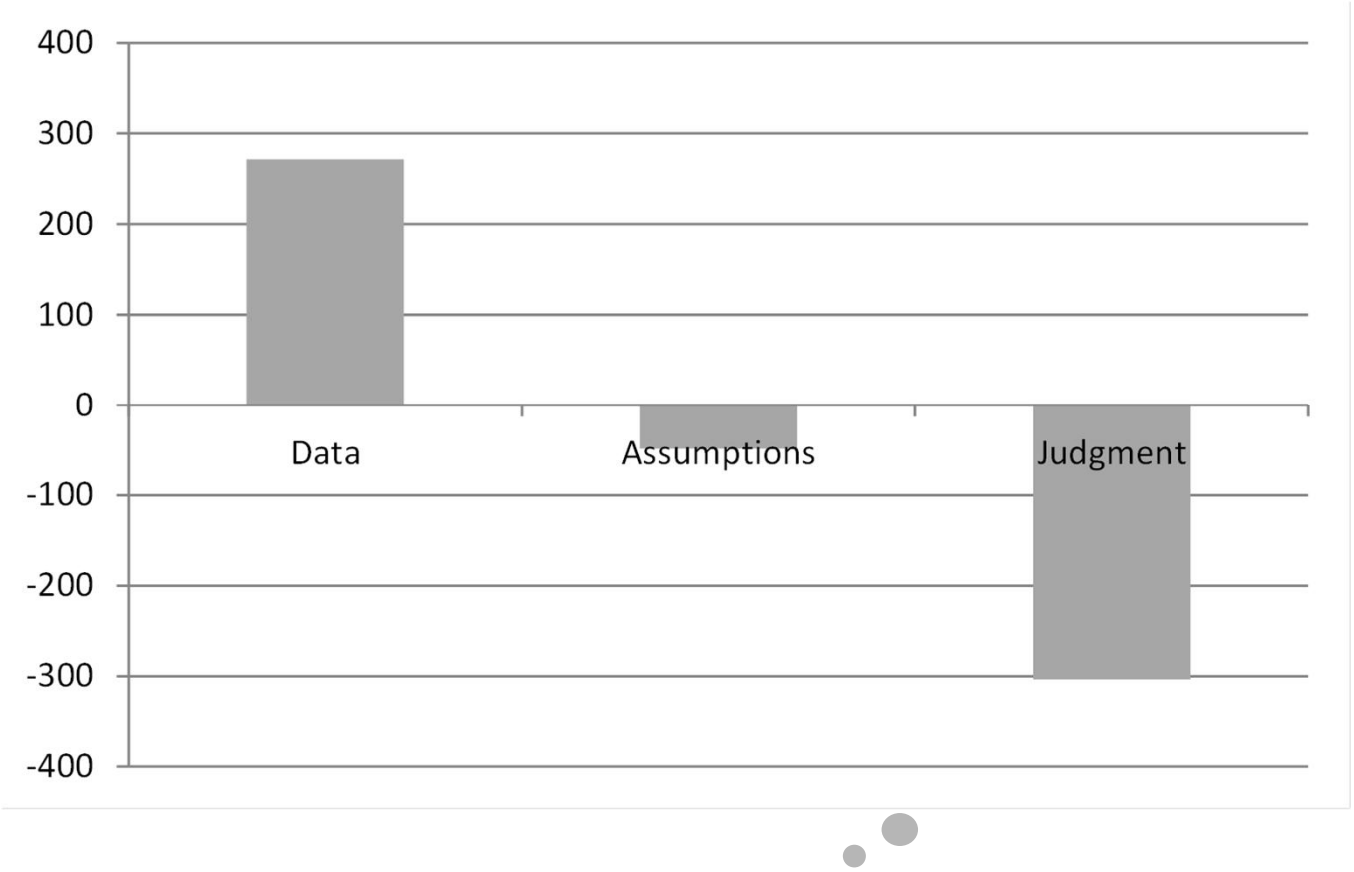
Prior Ultimate Loss	–	Current Ultimate Loss	=	Change in Ultimate Loss
10,721		10,640		(81)

Change in Ultimate Loss	–	Change due to Data	–	Change due to Assumptions	=	Change Due to Judgment
(81)		272		(49)		(304)

Judgment in Prior Analysis	–	Judgment in Current Analysis	=	Change Due to Judgment
8		(295)		(304)

Source of Change – Interpreting Results

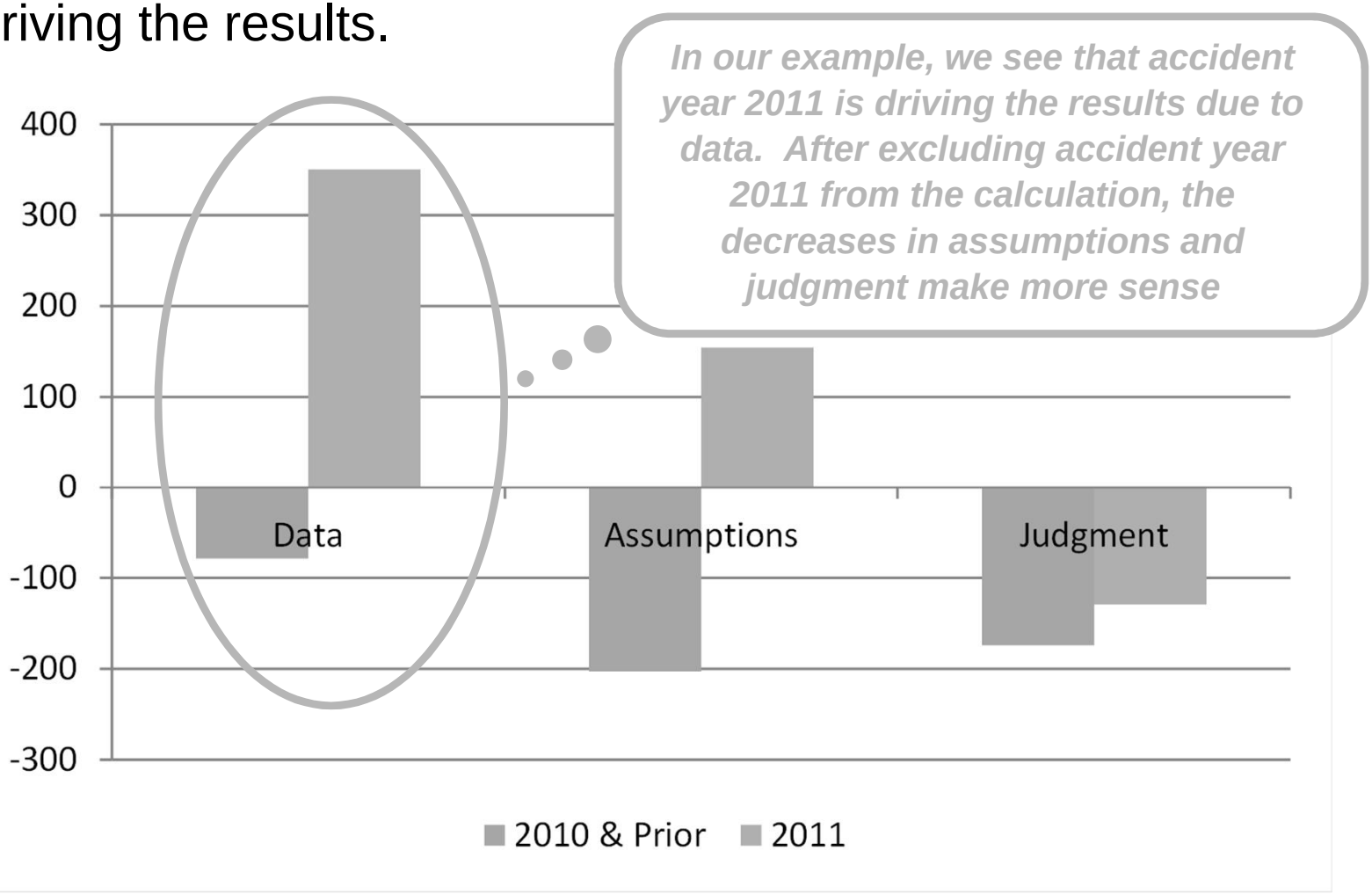
We have found it beneficial to view the Source of Change results graphically.



The graph shows us that while data has emerged higher than expected, the actuary is lowering LDF assumptions and judgment in the current analysis. This may lead us to ask why?

Source of Change – Interpreting Results

It can be helpful to break the changes down into smaller steps. We can look at the assumptions separately, as discussed earlier, or look at the component changes for each accident year to see if there is one year driving the results.



Discussion Questions

- Do I worry if the change due to data is inconsistent with the actual vs. expected results?
- Do I worry if I see different directional changes in my LDF picks and my IELR?
- Do I worry if I see a large judgment impact?

Conclusions

- Methodology is not designed to provide answers, but rather a structured framework through which to examine a reserve analysis.
- Methodology is designed to lead the actuary to ask questions that lead to a better understanding of the results of the actuarial analysis.
- Can be a valuable tool in teaching less experienced practitioners the type of critical thinking needed when performing a reserve analysis.
- Source of change results over multiple years can be used to evaluate trends in the analysis over time.

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