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Basic Reserving:
Estimating the Liability for Unpaid Claims

UCSB
April 28, 2017

Loss Reserve

What is a loss reserve?

- Amount necessary to settle unpaid claims
- Includes loss payments and defense costs (legal expense)

Why are loss reserves important?

- Accurate evaluation of balance sheet (financial condition and solvency) and income statement (profit or loss)

Components of a Reserve (unpaid losses)

- **Case Reserves** estimated by Claim Adjusters
- **Incurred but not reported ("IBNR") Reserves** estimated by Actuaries

Case Reserve Basics

- Estimated by a claim adjuster
- Based on individual details of a known claim
- Various reserving philosophies
  - Most likely settlement value (mode)
  - Expected value of settlement (mean)
  - Etc.

Hypothetical Claim Background

Auto liability insurance

- Policy period: January 1, 2012 - December 31, 2012
- Accident date: December 14, 2012
- Date of claim report: January 15, 2013

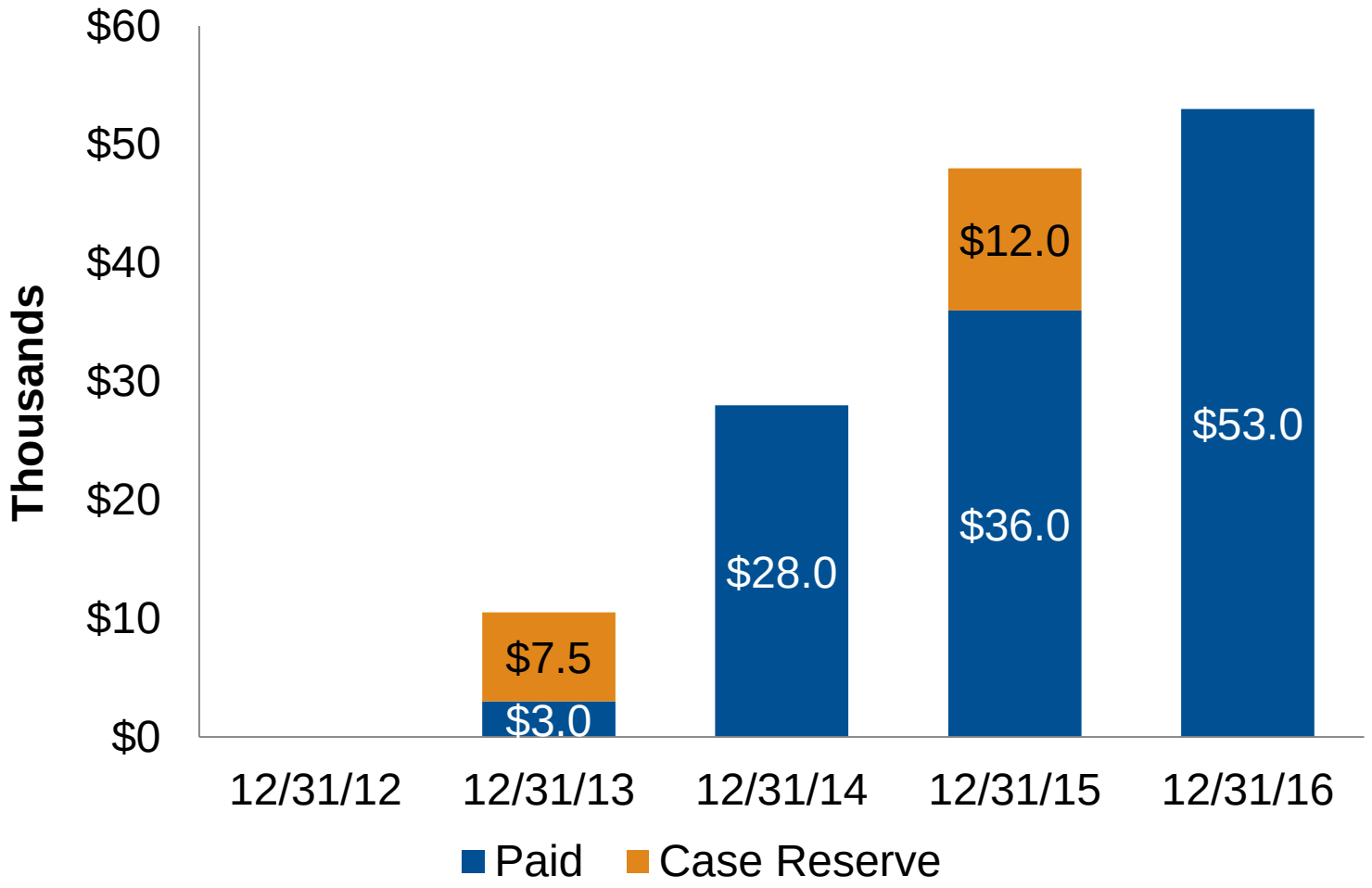
Hypothetical Claim Transactions – Part 1

Date	Transaction	Reported Claim Value	Cumulative Paid to Date	Case Reserves
Jan. 15, 2013	Case reserve of $10,000 established	$10,000	$0	$10,000
Mar. 22, 2013	$2,500 payment for medical costs; Case reserve reduced to $7,500	$10,000	$2,500	$7,500
Apr. 18, 2013	$500 payment to independent adjuster; No change to case reserve	$10,500	$3,000	$7,500
Oct. 14, 2014	Case reserve increased from $7,500 to $50,000	$53,000	$3,000	$50,000
Dec. 18, 2014	Claim settled with $25,000 payment for lost wages and additional medical costs; Case reserve decreased to $0	$28,000	$28,000	$0

Hypothetical Claim Transactions – Part 2

Date	Transaction	Reported Claim Value	Cumulative Paid to Date	Case Reserves
Sep. 3, 2015	Claim reopened with case reserve of $15,000 for legal defense costs and $5,000 for future loss payments to claimant	$48,000	$28,000	$20,000
Dec. 8, 2015	Payment of $8,000 for legal costs; Case reserve for defense costs reduced to $7,000	$48,000	$36,000	$12,000
Aug. 30, 2016	Final loss payment to claimant of an additional $9,000; Case reserve for loss payment to claimant reduced to $0	$52,000	$45,000	$7,000
Sep. 15, 2016	Final payment for defense costs of an additional $8,000; Case reserve reduced to $0	$53,000	$53,000	$0

Hypothetical Claim Year-End Losses



The Problem

- Policy was sold in early 2012
- Claim isn’t fully paid until late 2016
- How does the company know if its business is profitable?

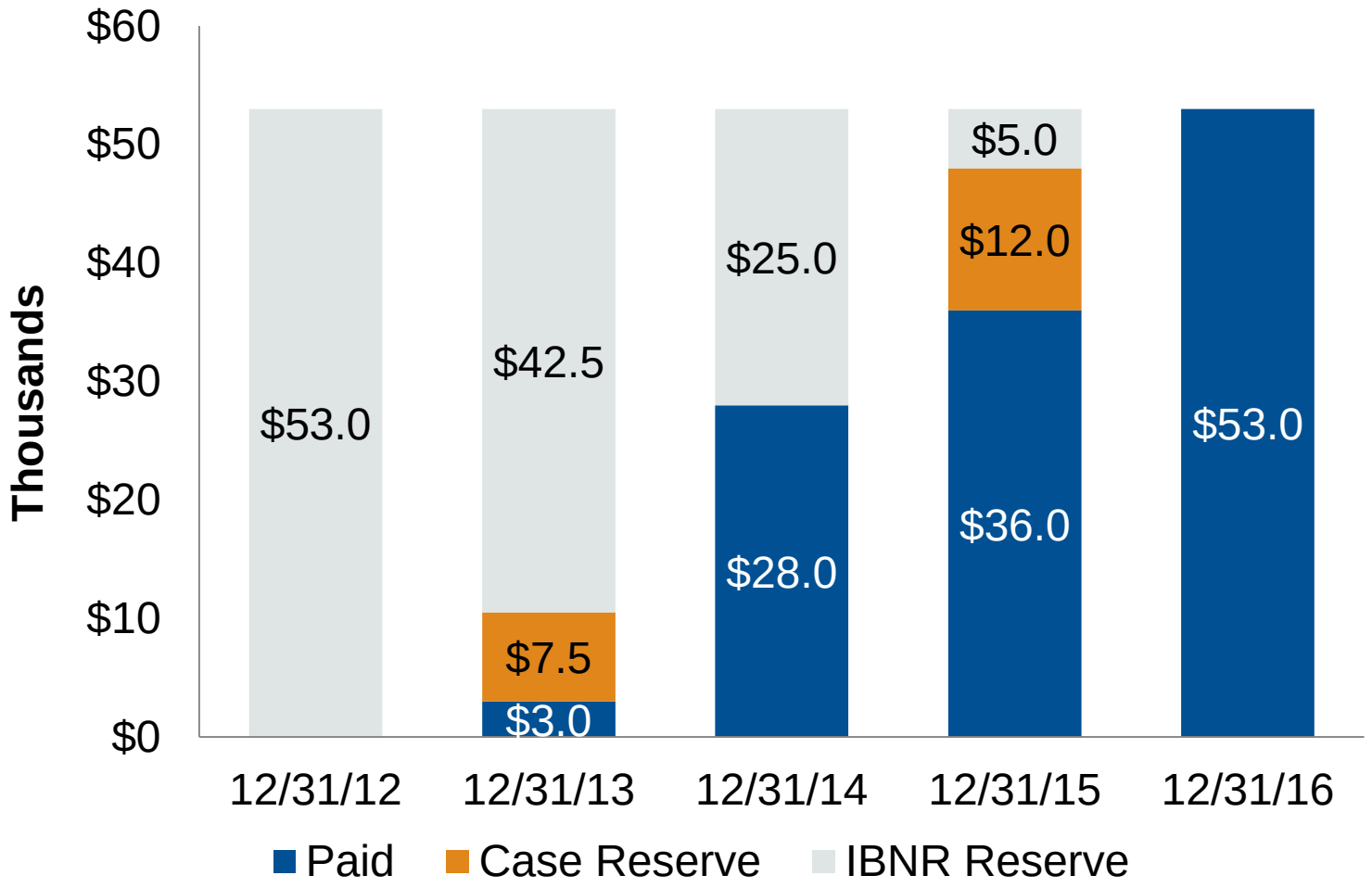
Ultimate Losses

Ultimate Losses = Paid Losses + Unpaid Losses

= Paid Losses + Total Reserves

= Paid Losses + (Case Reserves + IBNR Reserves)

Hypothetical Claim Year-End Losses



IBNR Reserve Basics

- Estimated by actuaries
- Based on aggregated claim info and patterns over time
- Case Reserve issues:
  - Pattern changes caused by changes in claim environment
  - Pattern changes caused by changes in staff
  - Pattern changes caused by change in management philosophy

Basic Methods

Expected Method: Loss Ratio
Single Accident Year

- Premium Earned for Accident Year (AY) 2012 = $5 million
- Expected loss ratio* = 80%
- Expected losses = $5 million x 80%
  = $4 million
- Total payments as of 12/31/2016
  = $1.5 million
- Total reserves as of 12/31/2016
  = $4 million - $1.5 million
  = $2.5 million

** Loss Ratio = Losses/Premium*

Expected Loss Ratio of 75% Multiple Years

(1) Accident Year	(2) Earned Premium	(3) Expected Loss Ratio	(4) = (2) x (3) Expected Ultimate Loss	(5) Paid Loss as of 12/31/12	(6) = (4) – (5) Estimated Loss Reserve
2009	14,784	75%	11,088	10,852	236
2010	17,468	75%	13,101	15,045	(1,944)
2011	19,550	75%	14,663	15,878	(1,215)
2012	21,243	75%	15,932	14,967	965
2013	24,003	75%	18,002	15,425	2,577
2014	24,866	75%	18,649	11,836	6,813
2015	25,843	75%	19,382	5,609	13,773
2016	27,487	75%	20,615	1,406	19,209
Total	**175,244**		**131,433**	**91,018**	**40,415**

Expected Loss Ratio
Pros and Cons

Strengths

- Simple calculation, easy to explain
- Minimal data requirements
- Not sensitive to data fluctuations

Weaknesses

- Not responsive to data fluctuations
- Not responsive to changes in risk environment

Development Method: Paid Loss Data Accounting Configuration

Accident Year	Accident Year Paid Losses (in $000s) Cumulative Totals as of 12/31/16							
	2009	2010	2011	2012	2013	2014	2015	2016
2009	696	2,785	5,262	8,178	9,522	10,604	10,803	10,852
2010		776	3,907	8,383	12,748	14,161	14,805	15,045
2011			1,058	4,344	8,501	11,912	15,148	15,878
2012				1,106	4,589	7,929	12,618	14,967
2013					1,230	4,829	10,355	15,425
2014						1,281	5,696	11,836
2015							1,217	5,609
2016								1,406

Paid Loss Development Data
Actuarial Configuration

Accident Year	Accident Year Paid Losses (in $000s) Cumulative Totals by Development Age in Months							
	12	24	36	48	60	72	84	96
2009	696	2,785	5,262	8,178	9,522	10,604	10,803	10,852
2010	776	3,907	8,383	12,748	14,161	14,805	15,045	
2011	1,058	4,344	8,501	11,912	15,148	15,878		
2012	1,106	4,589	7,929	12,618	14,967			
2013	1,230	4,829	10,355	15,425				
2014	1,281	5,696	11,836					
2015	1,217	5,609						
2016	1,406							

Loss Development Factor From 12 Months to 24 Months

Accident Year	Cumulative Paid at 12 Months	Cumulative Paid at 24 Months	Loss Development Factor
2009	696	2,785	4.002 = 2,785 / 696
2010	776	3,907	5.032 = 3,907 / 776
2011	1,058	4,344	4.107 = 4,344 / 1,058
2012	1,106	4,589	4.151 = 4,589 / 1,106
2013	1,230	4,829	3.926 = 4,829 / 1,230
2014	1,281	5,696	4.445 = 5,696 / 1,281
2015	1,217	5,609	4.611 = 5,609 / 1,217
Total	**7,364**	**31,759**	**4.313 = 31,759 / 7,364**
2016	**1,406**	**???**	**???**

Loss Development Factor From 12 Months to 24 Months

Accident Year	Cumulative Paid at 12 Months	Cumulative Paid at 24 Months	Loss Development Factor
2009	696	2,785	4.002 = 2,785 / 696
2010	776	3,907	5.032 = 3,907 / 776
2011	1,058	4,344	4.107 = 4,344 / 1,058
2012	1,106	4,589	4.151 = 4,589 / 1,106
2013	1,230	4,829	3.926 = 4,829 / 1,230
2014	1,281	5,696	4.445 = 5,696 / 1,281
2015	1,217	5,609	4.611 = 5,609 / 1,217
Total	**7,364**	**31,759**	**4.313 = 31,759 / 7,364**
2016	1,406	**1,406 x 4.300 = 6,046**	**4.300**

Paid Loss Development Data
Actuarial Configuration

Accident Year	Accident Year Paid Losses (in $000s) Cumulative Totals by Development Age in Months							
	12	24	36	48	60	72	84	96
2009	696	2,785	5,262	8,178	9,522	10,604	10,803	10,852
2010	776	3,907	8,383	12,748	14,161	14,805	15,045	
2011	1,058	4,344	8,501	11,912	15,148	15,878		
2012	1,106	4,589	7,929	12,618	14,967			
2013	1,230	4,829	10,355	15,425				
2014	1,281	5,696	11,836					
2015	1,217	5,609						
2016	1,406	**6,046**						

Paid Loss Development Data
Loss Development Factor Selection

Accident Year	12-24	24-36	36-48	58-60	60-72	72-84	84-96	96-Ult
2009	4.002	1.889	1.554	1.164	1.114	1.019	1.005	
2010	5.032	2.146	1.521	1.111	1.045	1.016		
2011	4.107	1.957	1.401	1.272	1.048			
2012	4.151	1.728	1.591	1.186				
2013	3.926	2.144	1.490					
2014	4.445	2.078						
2015	4.611							
2016								
Wtd Avg	4.313	1.999	1.506	1.184	1.063	1.017	1.005	
Selected	**4.300**	**2.000**	**1.500**	**1.185**	**1.065**	**1.017**	**1.005**	**???**

Paid Loss Development Data
Loss Development Factor Projection

Accident Year	12-24	24-36	36-48	58-60	60-72	72-84	84-96	96-Ult
2009	4.002	1.889	1.554	1.164	1.114	1.019	1.005	???
2010	5.032	2.146	1.521	1.111	1.045	1.016	**1.005**	???
2011	4.107	1.957	1.401	1.272	1.048	**1.017**	**1.005**	???
2012	4.151	1.728	1.591	1.186	**1.065**	**1.017**	**1.005**	???
2013	3.926	2.144	1.490	**1.185**	**1.065**	**1.017**	**1.005**	???
2014	4.445	2.078	**1.500**	**1.185**	**1.065**	**1.017**	**1.005**	???
2015	4.611	**2.000**	**1.500**	**1.185**	**1.065**	**1.017**	**1.005**	???
2016	**4.300**	**2.000**	**1.500**	**1.185**	**1.065**	**1.017**	**1.005**	???
Selected	**4.300**	**2.000**	**1.500**	**1.185**	**1.065**	**1.017**	**1.005**	???

Calculating Ultimate Losses
"Squaring the Triangle"

Accident Year	Accident Year Paid Losses (in $000s) Cumulative Totals by Development Age in Months							
	12	24	36	48	60	72	84	96
2009	696	2,785	5,262	8,178	9,522	10,604	10,803	10,852
2010	776	3,907	8,383	12,748	14,161	14,805	15,045	15,121
2011	1,058	4,344	8,501	11,912	15,148	15,878	16,148	16,229
2012	1,106	4,589	7,929	12,618	14,967	15,940	16,211	16,292
2013	1,230	4,829	10,355	15,425	18,278	19,466	19,797	19,896
2014	1,281	5,696	11,836	17,754	21,038	22,405	22,786	22,900
2015	1,217	5,609	11,218	16,827	19,940	21,236	21,597	21,705
2016	1,406	6,046	12,090	18,135	21,490	22,887	23,276	23,392

Reserve Calculation @ 12/31/16

Accident Year	Cumulative Paid at 12/31/16	Selected Ultimate Losses	Reserves = Ultimate – Cumulative Paid
2009	10,852	10,852	0
2010	15,121	15,045	76
2011	16,229	15,878	351
2012	16,292	14,967	1,325
2013	19,896	15,425	4,471
2014	22,900	11,836	11,064
2015	21,705	5,609	16,096
2016	23,392	1,406	21,986
Total	**146,387**	**91,018**	**55,369**