

# **Learning Lounge**

## **A Perspective of Hindsight Reserves and Actuarial Standards of Practice**

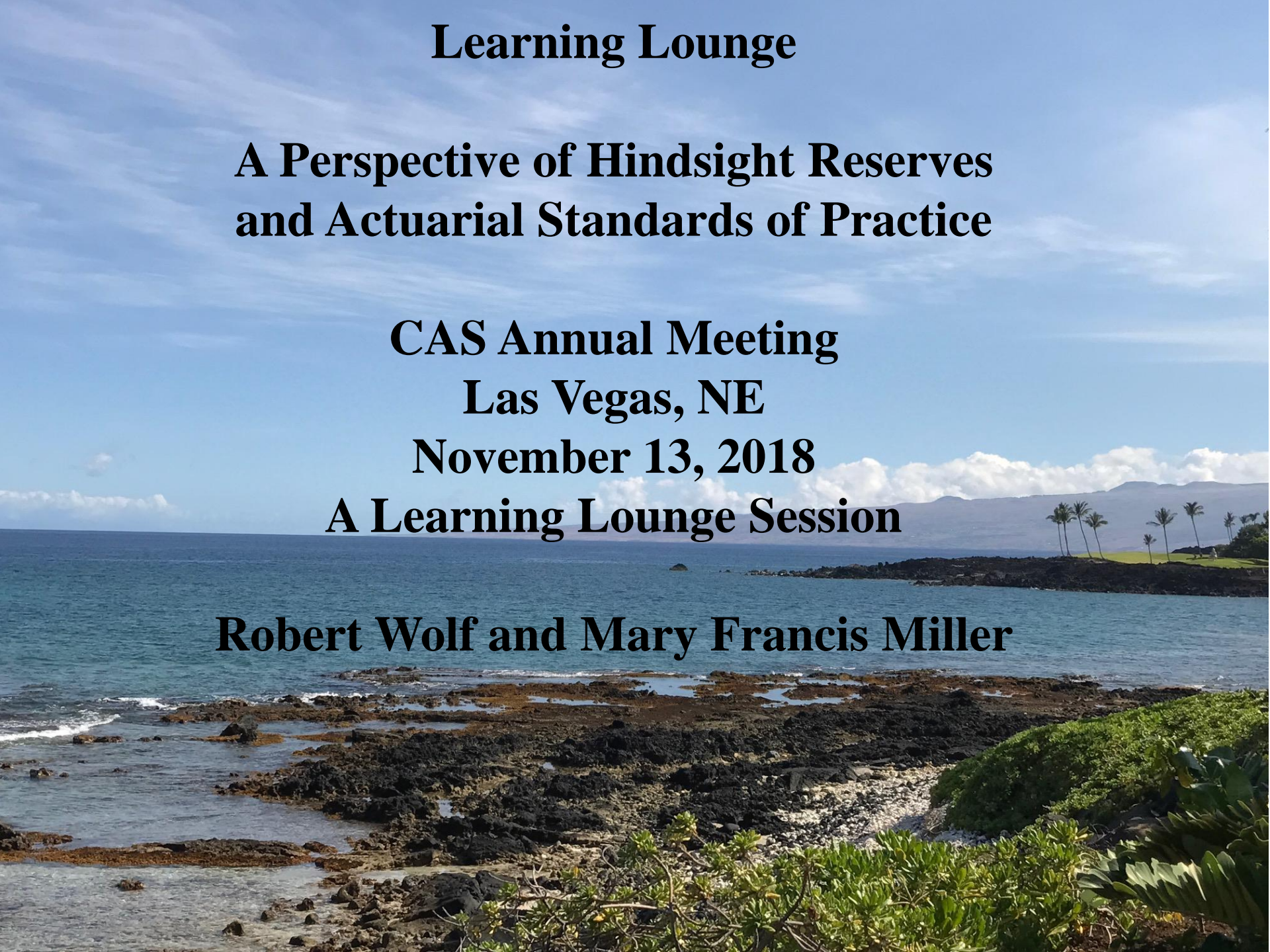
**CAS Annual Meeting**

**Las Vegas, NE**

**November 13, 2018**

**A Learning Lounge Session**

**Robert Wolf and Mary Francis Miller**



**XYZ COMMERCIAL INSURANCE COMPANY**  
**Total Net Results - All States**  
**Excludes Assigned Pools and Adjusting and Other Expenses**

Exhibit A

AS OF December 31, 2017  
(\$s are in 000s)

Accident Year	Per Occur Retention	Net Earned Premium (\$)	Net Paid Loss & DCC (\$)	Net Case Loss & DCC Reserves (\$)	Net Case Incurred Loss & DCC (\$)	Reported Net LR	Indicated			Prior Carried Ultimate	Ult LR	Change
							IBNR (\$)	Estimated Ultimate	Ult LR			
2002	750	13,750	7,036	-	7,036	51.2%	-	7,036	51.2%	7,036	51.2%	-
2003	750	28,052	11,117	-	11,117	39.6%	50	11,167	39.8%	11,182	39.9%	(15)
2004	750	44,853	27,859	-	27,859	62.1%	-	27,859	62.1%	27,859	62.1%	-
2005	750	70,507	41,875	-	41,875	59.4%	-	41,875	59.4%	41,900	59.4%	(25)
2006	750	80,285	45,199	-	45,199	56.3%	-	45,199	56.3%	45,199	56.3%	-
2007	750	96,286	57,378	-	57,378	59.6%	-	57,378	59.6%	57,378	59.6%	-
2008	750	130,481	65,943	191	66,134	50.7%	-	66,134	50.7%	66,134	50.7%	(0)
2009	750	142,059	48,346	809	49,155	34.6%	941	50,096	35.3%	49,254	34.7%	843
2010	750	131,024	70,789	2,418	73,207	55.9%	367	73,573	56.2%	71,817	54.8%	1,756
2011	750	131,870	87,468	3,151	90,618	68.7%	906	91,525	69.4%	91,000	69.0%	525
2012	750	122,125	80,433	3,686	84,119	68.9%	2,116	86,235	70.6%	83,750	68.6%	2,485
2013	750	125,456	81,000	6,226	87,226	69.5%	3,129	90,355	72.0%	87,500	69.7%	2,855
2014	750	201,129	91,884	13,884	105,768	52.6%	6,690	112,458	55.9%	105,000	52.2%	7,458
2015	750	271,351	109,789	24,939	134,729	49.7%	15,685	150,413	55.4%	144,750	53.3%	5,663
2016	750	297,237	96,858	43,599	140,457	47.3%	35,952	176,409	59.3%	171,500	57.7%	4,909
2017	750	292,035	36,954	59,274	96,228	33.0%	76,073	172,301	59.0%			
				158,178				141,909				26,453

2017 Calendar Year Impact (\$000s)

	NEP and ALAE		LR	
Cur AY	292,035	172,301	59.0%	Total Loss and DCC Reserves <u>300,086</u>
Prior AY		26,453	9.1%	
Total	292,035	198,754	68.1%	

# Adding some commentary

- Growth
- Claims philosophy changes

**XYZ COMMERCIAL INSURANCE COMPANY**

**Run-off of Net Carried Loss and DCC (aka ALAE Reserves) (\$000s)**

**Adequacy of Net reserves in Hindight at Prior-Year Ends**

*Source- Derivations from using December 31, 2017 Schedule P Data*

		1 Year Later	2 years later	3 years later
		(Paid + Remaining Reserves)		
Carried Reserves as of December 31, 2014	<u>\$ 145,170</u>	\$ 158,865 9.4%	\$ 166,370 14.6%	\$ 182,100 25.4%
Annual Change		\$ -	\$ -	\$ -
Cumulative Change		\$ 13,695	\$ 7,505	\$ 15,730
		\$ 13,695	\$ 21,200	\$ 36,930

		1 Year Later	2 years later	3 years later
		(Paid + Remaining Reserves)		
Carried Reserves as of December 31, 2015	<u>\$ 207,945</u>	\$ 208,500 0.3%	\$ 229,905 10.6%	
Annual Change		\$ -	\$ -	
Cumulative Change		\$ 555	\$ 21,405	
		\$ 555	\$ 21,960	

		1 Year Later	2 years later	3 years later
		(Paid + Remaining Reserves)		
Carried Reserves as of December 31, 2016	<u>\$ 244,470</u>	\$ 272,095 11.3%		
Annual Change		\$ -		
Cumulative Change		\$ 27,625		
		\$ 27,625		

		1 Year Later	2 years later	3 years later
		(Paid + Remaining Reserves)		
Carried Reserves as of December 31, 2017	<u>\$ 306,365</u>			
Annual Change				
Cumulative Change				

# Actuarial Opinion- History

	<u>Appointed Actuary</u>	<u>Carried Reserves</u>	<u>Appointed Actuary Central Estimate</u>	<u>Actuarial Opinion Summary Range</u>	<u>RMAD</u>
12/31/2014	A	145,170 Reasonable	145,170 0.0%	141,396 to 174,494 -2.6% 20.2%	NO
12/31/2015	A	207,945 Reasonable	207,945 0.0%	188,190 to 245,583 -9.5% 18.1%	NO
12/31/2016	A	244,470 Reasonable	253,675 3.8%	229,504 to 299,465 -6.1% 22.5%	NO
12/31/2017	B	306,365 Reasonable	306,365 0.0%	290,434 to 321,377 -5.2% 4.9%	NO

# Triangles

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Reported Claim Counts

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Closed Claim Counts

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Open Claim Counts

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Incurred Losses and DCC expenses

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Paid Losses and DCC expenses

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Reporting Patterns

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Closing Patterns

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Average Closed , Open, Incurred Claims







**XYZ Commercial Insurance Company**  
**Net of Reinsurance and Excluding Assigned Risk Plans**  
**Open Claim Counts**

**Exhibit 9**

Accident Year	Net EP	Months of Development											
		12	24	36	48	60	72	84	96	108	120	132	144
2002	13,750	150	50	15	10	5	5	10	10	10	5	-	-
2003	28,052	385	120	50	30	20	15	10	5	5	5	-	-
2004	44,853	435	195	75	50	35	20	15	10	-	-	-	-
2005	70,507	1,085	350	160	70	25	20	15	5	5	5	-	-
2006	80,285	1,135	300	145	85	45	35	10	10	-	-	-	-
2007	96,286	1,020	300	200	105	75	20	5	-	-	-	-	-
2008	130,481	1,375	425	225	115	45	10	10	5	5	5	-	-
2009	142,059	1,205	460	165	45	25	25	20	15	15	-	-	-
2010	131,024	1,540	485	185	95	65	45	25	20	-	-	-	-
2011	131,870	1,940	425	205	105	65	55	30	-	-	-	-	-
2012	122,125	975	455	245	120	55	50	-	-	-	-	-	-
2013	125,456	1,065	430	235	75	50	-	-	-	-	-	-	-
2014	201,129	1,610	490	245	140	-	-	-	-	-	-	-	-
2015	271,351	2,025	610	325	-	-	-	-	-	-	-	-	-
2016	297,237	1,965	680	-	-	-	-	-	-	-	-	-	-
2017	292,035	1,595	-	-	-	-	-	-	-	-	-	-	-

XYZ Commercial Insurance Company  
 Net of Reinsurance and Excluding Assigned Risk Plans  
 Incurred Loss and ALAE @ 12/31/2016 (\$000s)

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Exhibit 4

Accident Year	Net EP	Months of Development									
		12	24	36	48	60	72	84	96	108	120
2002	13,750	6,854	6,965	7,219	7,272	6,972	6,744	7,014	7,226	7,226	7,367
2003	28,052	7,804	13,788	11,254	11,213	11,021	11,111	11,199	11,135	11,136	11,096
2004	44,853	14,359	21,351	22,556	25,231	26,953	26,924	27,337	28,289	27,859	27,859
2005	70,507	23,760	39,268	40,515	40,660	40,779	41,112	42,200	42,095	41,835	41,812
2006	80,285	27,174	38,781	42,962	43,274	44,120	44,948	44,770	44,928	45,201	45,199
2007	96,286	29,773	45,059	54,469	56,253	59,426	57,110	57,406	57,382	57,378	57,378
2008	130,481	29,627	53,872	59,953	63,663	63,597	64,456	65,215	66,132	66,134	66,134
2009	142,059	32,438	50,831	50,769	48,804	49,099	49,102	49,266	49,155	49,155	
2010	131,024	38,497	63,485	66,792	65,229	66,183	68,574	71,246	73,207		-
2011	131,870	52,947	76,199	81,686	84,281	86,822	89,920	90,618		-	-
2012	122,125	53,419	63,784	69,160	76,615	82,018	84,119		-	-	-
2013	125,456	50,486	64,995	80,575	83,244	87,226		-	-	-	-
2014	201,129	49,803	78,066	93,247	105,768		-	-	-	-	-
2015	271,351	85,226	117,401	134,729		-	-	-	-	-	-
2016	297,237	106,780	140,457		-	-	-	-	-	-	-
2017	292,035	96,228		-	-	-	-	-	-	-	-

# Implied Incurred/Current Ultimate

XYZ Commercial Insurance Company  
 Net of Reinsurance and Excluding Assigned Risk Plans  
 Incurred/Ultimate

Accident Year	Net EP	Months of Development									
		12	24	36	48	60	72	84	96	108	120
2002	13,750	0.974	0.990	1.026	1.033	0.991	0.959	0.997	1.027	1.027	1.047
2003	28,052	0.699	1.235	1.008	1.004	0.987	0.995	1.003	0.997	0.997	0.994
2004	44,853	0.515	0.766	0.810	0.906	0.967	0.966	0.981	1.015	1.000	1.000
2005	70,507	0.567	0.938	0.968	0.971	0.974	0.982	1.008	1.005	0.999	0.998
2006	80,285	0.601	0.858	0.951	0.957	0.976	0.994	0.991	0.994	1.000	1.000
2007	96,286	0.519	0.785	0.949	0.980	1.036	0.995	1.000	1.000	1.000	1.000
2008	130,481	0.448	0.815	0.907	0.963	0.962	0.975	0.986	1.000	1.000	1.000
2009	142,059	0.648	1.015	1.013	0.974	0.980	0.980	0.983	0.981	0.981	-
2010	131,024	0.523	0.863	0.908	0.887	0.900	0.932	0.968	0.995	-	-
2011	131,870	0.579	0.833	0.893	0.921	0.949	0.982	0.990	-	-	-
2012	122,125	0.619	0.740	0.802	0.888	0.951	0.975	-	-	-	-
2013	125,456	0.559	0.719	0.892	0.921	0.965	-	-	-	-	-
2014	201,129	0.443	0.694	0.829	0.941	-	-	-	-	-	-
2015	271,351	0.567	0.781	0.896	-	-	-	-	-	-	-
2016	297,237	0.605	0.796	-	-	-	-	-	-	-	-
2017	292,035	0.558	-	-	-	-	-	-	-	-	-

**XYZ Commercial Insurance Company**  
**Net of Reinsurance and Excluding Assigned Risk Plans**  
**Paid Loss and ALAE @ 12/31/2016 (\$000s)**

**Exhibit 5**

Accident Year	Net EP	Months of Development									
		12	24	36	48	60	72	84	96	108	120
2002	13,750	3,932	5,433	6,603	6,889	6,804	6,636	6,708	6,737	6,747	6,983
2003	28,052	4,221	10,524	10,104	10,801	10,995	11,045	11,144	11,119	11,094	11,096
2004	44,853	7,092	14,932	19,452	21,775	23,889	26,347	26,650	26,892	27,859	27,859
2005	70,507	10,817	26,592	33,798	37,658	40,153	40,639	41,413	42,066	41,806	41,809
2006	80,285	14,213	29,818	36,457	40,407	41,836	42,752	44,092	44,370	45,201	45,199
2007	96,286	18,154	36,864	44,990	50,141	54,944	56,191	57,187	57,382	57,378	57,378
2008	130,481	16,135	38,011	48,785	56,531	59,863	63,658	64,290	65,233	65,368	65,943
2009	142,059	17,343	36,865	43,524	45,849	47,001	47,427	47,951	48,209	48,346	
2010	131,024	19,062	41,991	54,581	61,198	64,547	65,771	69,165	70,789		-
2011	131,870	23,838	54,002	70,778	78,614	81,902	83,795	87,468		-	-
2012	122,125	20,553	46,740	62,731	71,624	76,943	80,433		-	-	-
2013	125,456	19,554	51,401	67,911	76,037	81,000		-	-	-	-
2014	201,129	21,390	59,353	80,161	91,884		-	-	-	-	-
2015	271,351	35,108	87,167	109,789		-	-	-	-	-	-
2016	297,237	44,246	96,858		-	-	-	-	-	-	-
2017	292,035	36,954		-	-	-	-	-	-	-	-

# Implied Paid/Current Ultimate

XYZ Commercial Insurance Company  
 Net of Reinsurance and Excluding Assigned Risk Plans  
 Paid/Ultimate

Accident Year	Net EP	Months of Development									
		12	24	36	48	60	72	84	96	108	120
2002	13,750	0.559	0.772	0.938	0.979	0.967	0.943	0.953	0.957	0.959	0.992
2003	28,052	0.378	0.942	0.905	0.967	0.985	0.989	0.998	0.996	0.993	0.994
2004	44,853	0.255	0.536	0.698	0.782	0.857	0.946	0.957	0.965	1.000	1.000
2005	70,507	0.258	0.635	0.807	0.899	0.959	0.970	0.989	1.005	0.998	0.998
2006	80,285	0.314	0.660	0.807	0.894	0.926	0.946	0.975	0.982	1.000	1.000
2007	96,286	0.316	0.642	0.784	0.874	0.958	0.979	0.997	1.000	1.000	1.000
2008	130,481	0.245	0.576	0.740	0.857	0.908	0.965	0.975	0.989	0.991	1.000
2009	142,059	0.346	0.736	0.869	0.915	0.938	0.947	0.957	0.962	0.965	-
2010	131,024	0.255	0.561	0.729	0.818	0.863	0.879	0.924	0.946	-	-
2011	131,870	0.258	0.585	0.767	0.852	0.887	0.908	0.947	-	-	-
2012	122,125	0.238	0.542	0.727	0.831	0.892	0.933	-	-	-	-
2013	125,456	0.218	0.572	0.756	0.846	0.901	-	-	-	-	-
2014	201,129	0.190	0.528	0.713	0.817	-	-	-	-	-	-
2015	271,351	0.233	0.580	0.730	-	-	-	-	-	-	-
2016	297,237	0.251	0.549	-	-	-	-	-	-	-	-
2017	292,035	0.217	-	-	-	-	-	-	-	-	-

# Vertical Trends – 4.5% is reasonable

XYZ Commercial Insurance Company  
 Net of Reinsurance and Excluding Assigned Risk Plans  
 Average Closed  
 Exhibit 6

Accident Year	Net EP	Months of Development									
		12	24	36	48	60	72	84	96	108	120
2002	13,750	8.5	9.5	10.8	11.2	11.0	10.7	10.9	11.0	11.0	11.3
2003	28,052	5.4	8.3	7.5	7.9	8.0	8.0	8.0	8.0	8.0	8.0
2004	44,853	4.2	7.0	8.6	9.5	10.3	11.3	11.4	11.5	11.9	11.9
2005	70,507	6.1	9.5	11.3	12.2	12.8	12.9	13.2	13.3	13.3	13.3
2006	80,285	7.0	9.8	11.3	12.3	12.6	12.8	13.1	13.2	13.4	13.4
2007	96,286	7.6	10.9	12.8	13.9	15.1	15.2	15.4	15.5	15.5	15.5
2008	130,481	6.4	10.1	12.3	13.8	14.4	15.2	15.3	15.6	15.6	15.7
2009	142,059	6.7	10.4	11.3	11.5	11.8	11.9	12.0	12.0	12.1	-
2010	131,024	6.0	9.4	11.4	12.6	13.2	13.3	14.0	14.3	-	-
2011	131,870	6.5	10.0	12.5	13.7	14.2	14.5	15.1	-	-	-
2012	122,125	5.7	10.5	13.4	14.9	15.8	16.5	-	-	-	-
2013	125,456	6.3	12.6	15.8	17.0	18.1	-	-	-	-	-
2014	201,129	4.9	10.0	12.9	14.6	-	-	-	-	-	-
2015	271,351	7.1	12.8	15.4	-	-	-	-	-	-	-
2016	297,237	8.3	13.8	-	-	-	-	-	-	-	-
2017	292,035	8.3	-	-	-	-	-	-	-	-	-

XYZ Commercial Insurance Company  
 Net of Reinsurance and Excluding Assigned Risk Plans  
 Average Open

Exhibit 7

Accident Year	Net EP	Months of Development									
		12	24	36	48	60	72	84	96	108	120
2002	13,750	19.5	30.6	41.1	38.3	33.5	21.6	30.6	48.9	47.9	76.9
2003	28,052	9.3	27.2	23.0	13.7	1.3	4.4	5.4	3.3	8.3	-
2004	44,853	16.7	32.9	41.4	69.1	87.5	28.9	45.8	139.7	-	-
2005	70,507	11.9	36.2	42.0	42.9	25.1	23.7	52.4	5.9	5.7	0.6
2006	80,285	11.4	29.9	44.9	33.7	50.8	62.8	67.8	55.8	-	-
2007	96,286	11.4	27.3	47.4	58.2	59.8	46.0	43.8	-	-	-
2008	130,481	9.8	37.3	49.6	62.0	83.0	79.8	92.6	179.8	153.1	38.2
2009	142,059	12.5	30.4	43.9	65.7	83.9	67.0	65.7	63.1	53.9	-
2010	131,024	12.6	44.3	66.0	42.4	25.2	62.3	83.2	120.9	-	-
2011	131,870	15.0	52.2	53.2	54.0	75.7	111.4	105.0	-	-	-
2012	122,125	33.7	37.5	26.2	41.6	92.3	73.7	-	-	-	-
2013	125,456	29.0	31.6	53.9	96.1	124.5	-	-	-	-	-
2014	201,129	17.6	38.2	53.4	99.2	-	-	-	-	-	-
2015	271,351	24.7	49.6	76.7	-	-	-	-	-	-	-
2016	297,237	31.8	64.1	-	-	-	-	-	-	-	-
2017	292,035	37.2	-	-	-	-	-	-	-	-	-

# Implied Average Unpaid (Reflecting Current IBNR)

XYZ Commercial Insurance Company  
 Net of Reinsurance and Excluding Assigned Risk Plans  
 Average Unpaid  
 Exhibit 6

Accident Year	Net EP	Months of Development									
		12	24	36	48	60	72	84	96	108	120
2002	13,750	19.4	29.2	28.9	14.8	46.4	80.0	32.8	29.9	28.9	10.7
2003	28,052	11.2	5.1	21.3	12.2	8.6	8.1	2.3	9.7	14.5	14.1
2004	44,853	30.8	58.8	98.9	121.7	113.4	75.6	80.6	96.7	-	-
2005	70,507	22.2	41.9	49.0	60.2	68.9	61.8	30.8	(38.1)	13.8	13.2
2006	80,285	23.4	48.8	60.3	56.4	74.7	69.9	110.8	82.9	-	-
2007	96,286	29.6	64.1	61.9	68.9	32.5	59.4	38.3	-	-	-
2008	130,481	29.8	65.0	74.6	81.9	135.3	229.1	166.0	143.4	116.3	1.4
2009	142,059	23.0	28.2	39.8	94.4	123.8	106.7	107.3	125.8	116.6	
2010	131,024	30.8	63.8	109.4	143.4	158.1	258.6	226.3	201.7		
2011	131,870	31.4	87.1	110.4	152.2	189.3	154.9	161.6			
2012	122,125	50.1	85.9	100.0	121.7	168.9	116.0				
2013	125,456	49.0	83.6	95.4	184.2	177.1					
2014	201,129	43.1	105.2	131.8	147.0						
2015	271,351	45.8	98.8	121.3							
2016	297,237	55.2	109.8								
2017	292,035	67.4									



# Discussion

What happened?

Should this happen?

ASOPs? What was violated? If any?

# MY TAKE

# Considerations

XYZ Commercial Insurance Company  
 Net of Reinsurance and Excluding Assigned Risk Plans  
 Average Closed  
 Exhibit 6

Accident Year	Net EP	Months of Development									
		12	24	36	48	60	72	84	96	108	120
2002	13,750	8.5	9.5	10.8	11.2	11.0	10.7	10.9	11.0	11.0	11.3
2003	28,052	5.4	8.3	7.5	7.9	8.0	8.0	8.0	8.0	8.0	8.0
2004	44,853	4.2	7.0	8.6	9.5	10.3	11.3	11.4	11.5	11.9	11.9
2005	70,507	6.1	9.5	11.3	12.2	12.8	12.9	13.2	13.3	13.3	13.3
2006	80,285	7.0	9.8	11.3	12.3	12.6	12.8	13.1	13.2	13.4	
2007	96,286	7.6	10.9	12.8	13.9	15.1	15.2	15.4	15.5		
2008	130,481	6.4	10.1	12.3	13.8	14.4	15.2	15.3			
2009	142,059	6.7	10.4	11.3	11.5	11.8	11.9				
2010	131,024	6.0	9.4	11.4	12.6	13.2					
2011	131,870	6.5	10.0	12.5	13.7						
2012	122,125	5.7	10.5	13.4							
2013	125,456	6.3	12.6								
2014	201,129	4.9									
2015	-										
2016	-										
2017	-										

**XYZ Commercial Insurance Company  
Net of Reinsurance and Excluding Assigned Risk Plans**

**Average Open**

**Exhibit 7**

Accident Year	Net EP	Months of Development									
		12	24	36	48	60	72	84	96	108	120
2002	13,750	19.5	30.6	41.1	38.3	33.5	21.6	30.6	48.9	47.9	76.9
2003	28,052	9.3	27.2	23.0	13.7	1.3	4.4	5.4	3.3	8.3	-
2004	44,853	16.7	32.9	41.4	69.1	87.5	28.9	45.8	139.7	-	-
2005	70,507	11.9	36.2	42.0	42.9	25.1	23.7	52.4	5.9	5.7	0.6
2006	80,285	11.4	29.9	44.9	33.7	50.8	62.8	67.8	55.8	-	-
2007	96,286	11.4	27.3	47.4	58.2	59.8	46.0	43.8	-	-	-
2008	130,481	9.8	37.3	49.6	62.0	83.0	79.8	92.6	-	-	-
2009	142,059	12.5	30.4	43.9	65.7	83.9	67.0	-	-	-	-
2010	131,024	12.6	44.3	66.0	42.4	25.2	-	-	-	-	-
2011	131,870	15.0	52.2	53.2	54.0	-	-	-	-	-	-
2012	122,125	33.7	37.5	26.2	-	-	-	-	-	-	-
2013	125,456	29.0	31.6	-	-	-	-	-	-	-	-
2014	201,129	17.6	-	-	-	-	-	-	-	-	-
2015											
2016											
2017											

Actuary A has to pay attention to this.

- Confusion on Ranges, RMADs, .....

# What is a reserve range?



# Types of ranges

- Two types of ranges are commonly discussed:
  - ▣ **Range of possible outcomes:** includes the full range of potential results of the claim process
  - ▣ **Range of reasonable estimates:** expresses the degree of uncertainty in an estimate
- Sometimes, both are referred to as “ranges,” but they have very different meanings
- A **range of possible outcomes** is not the same as a **range of reasonable estimates!**
- The type of range will vary depending on its intended purpose or use



# Examples of uses of ranges

Range of Reasonable Estimates	Range of Possible Outcomes
<u>Reports supporting the SAO</u> : opinion on carried loss and LAE reserves	<u>Capital modeling</u> : full probability distribution for aggregate reserves
<u>Internal communications</u> : Aid in setting management's best estimate	<u>Risk management</u> : scenario testing
<u>Audits and statutory exams</u> : testing management's best estimate	<u>Planning</u> : subset of the full distribution provides an outcome confidence interval
<u>SEC filings</u> : comments on reliability of current earnings could relate to uncertainty in the range of estimates or variability around the estimates	
<u>M&amp;A</u> : profitability, ranges of future outcomes could relate to the uncertainty in the range of estimates or variability around the estimates	





# Focus of this section

- This section is not intended to cover the topic of reserve variability
  - ▣ We will not spend much time discussing the distribution of possible outcomes
- Our focus = estimating a range of reasonable actuarial central estimates (ACE)
  - ▣ ACE = expected value over the range of reasonably possible outcomes (ASOP No. 43)
  - ▣ Range defined by a set of Low and High estimates; each a reasonable estimate of the ACE



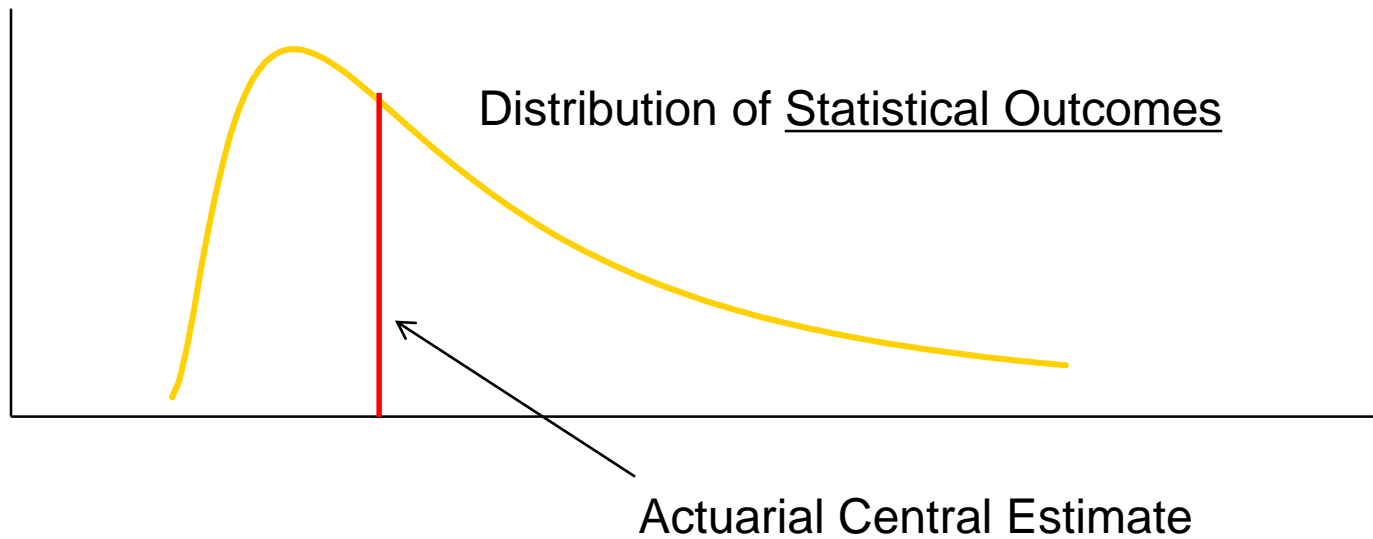
# Definitions

*A range of reasonable actuarial central estimates considers primarily **parameter** and **model** risk, not **process** risk*

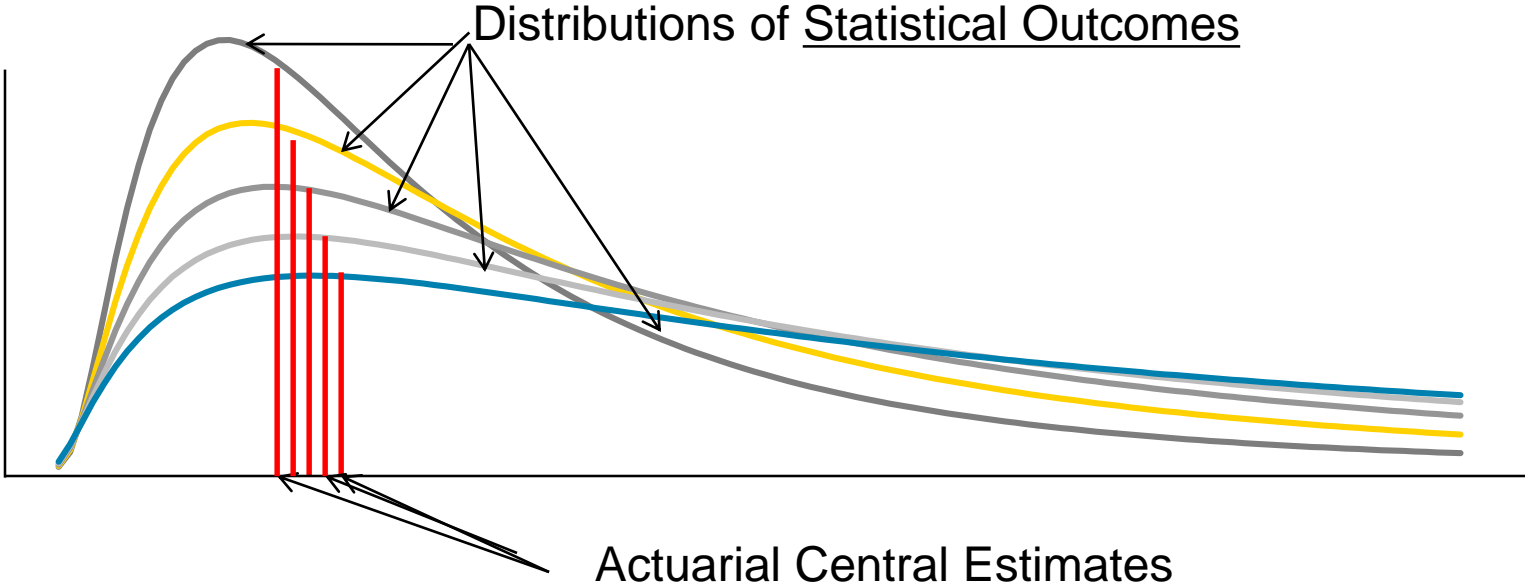
- **Process Risk:** *the randomness of future outcomes given a known distribution of possible outcomes*
- **Parameter Risk:** *the potential error in the estimated parameters used to describe the distribution of possible outcomes, assuming the process generating the outcomes is known*
- **Model Risk:** *the chance that the model (“process”) used to estimate the distribution of possible outcomes is incorrect or incomplete*



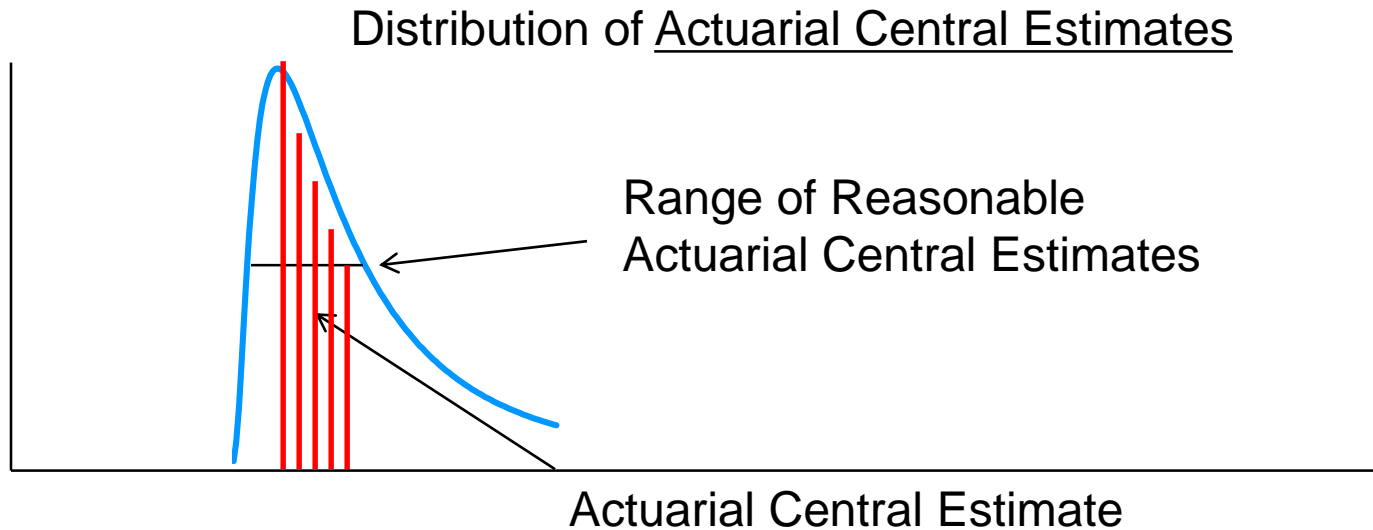
# What is a range of reasonable actuarial central estimates?



# What is a range of reasonable actuarial central estimates?



# What is a range of reasonable actuarial central estimates?



# Sources of guidance and information

- Guidance:
  - ▣ ASOP Nos. 36 and 43
  - ▣ Statements of Statutory Accounting Principles
  - ▣ NAIC Annual Statement Instructions
  
- Actuarial Literature
  - ▣ Mack; England/Verrall—each describe advanced techniques on reserve variability—both include process risk
  - ▣ Walker/Littman (2013)—attempt to establish a potential connection between a range of reasonable estimates and a range of possible outcomes



# ASOP No. 36: SAOs Regarding P/C Loss and Loss Adjustment Expense Reserves

- 3.7 Reserve Evaluation (emphasis added)—The actuary **should consider a reserve to be reasonable if it is within a range of estimates that *could be produced by an unpaid claim estimate analysis*** that is, in the actuary’s professional judgment, consistent with both ASOP No. 43, *Property/Casualty Unpaid Claim Estimates*, and the identified stated basis of reserve presentation.
- 3.7.1 Evaluation Based on Actuary’s Unpaid Claim Estimates (emphasis added)—When developing unpaid claim estimates to evaluate the reasonableness of a reserve, the actuary may develop **a point estimate, a range of estimates, or both**. The actuary should be **guided by ASOP No. 43** for the development of these unpaid claim estimates.



# SSAP 55, Paragraphs 11-12

- “[M]anagement shall record its best estimate” ... **by line and in the aggregate**

*(This is tougher than constraint put on actuary.)*

- “[Management’s analysis] ... shall include an analysis of the amount of variability in the estimate”
- Management may consider a range of “... reserve estimates bounded by a high and a low estimate ...” and record within that range
- “Management’s range shall be realistic and, therefore, shall not include the set of all possible outcomes but only those outcomes that are considered reasonable”





# SSAP 55, Key Points

- The carried loss reserves are management's best estimate, not the actuary's
  - ▣ Management is not required to use the actuarial central estimate
  - ▣ In the Actuarial Opinion Summary, the requirement is to disclose the point estimate, range (if any), and management estimate
- In the event that management decides to use an estimate other than that of the actuary, it should document why it chose that value



# Actuarial Opinion Summary industry statistics (2016)

- 59% of Actuarial Opinion Summaries produced an explicit range of reasonable estimates
  - 48% produced both a point estimate and a range
  - 11% produced a range with no point estimate
  - Even if no explicit range, there is an implied range
- 86% of companies did not book actuary's point estimate (or midpoint of range where no point estimate)
- 75% of companies booked within +/- 5 percent of the actuary's point estimate (on a net of reinsurance basis)
  
- Source: 2016 AOS data collected for companies domiciled in NY, PA, TX, IL, OH, and CT. Excludes companies that carry zero reserves. (658 companies out of 2,456, or 27% of filings)



# Audience Discussion

- What do you think

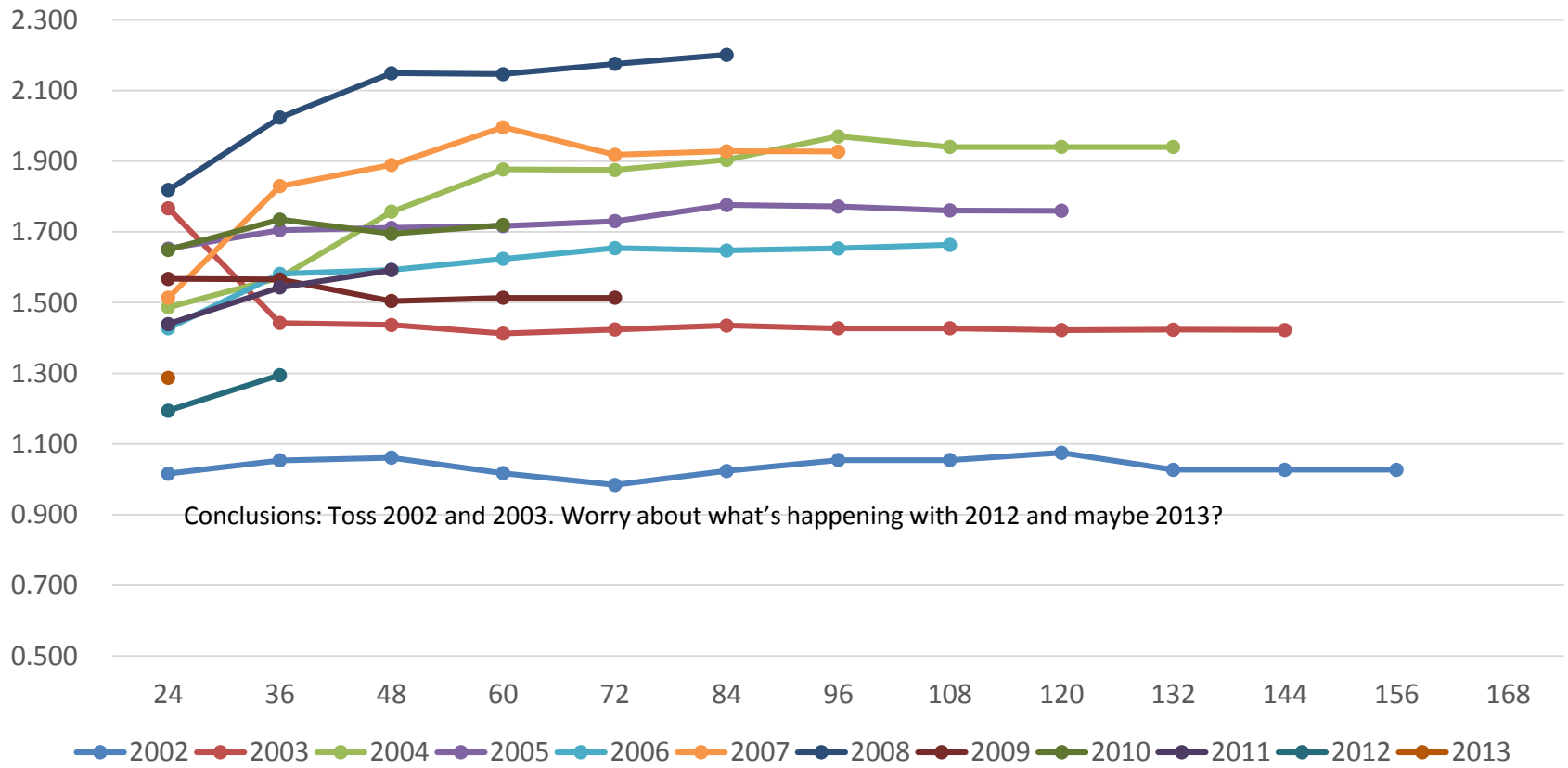


# My take: Mary Frances

- So, I tried to put myself in this actuary's shoes
- I pretended that I had not seen 2015-2017 and started with the 2014 data
- Assumptions I had to make (did I inquire?):
  - Rate changes have kept up with inflation (frankly, for most of this decade loss cost inflation has been about zero anyway)
  - No access to the 2013 actuarial analysis
  - No significant change in the type of risk being written (even with the substantial premium growth)
  - No significant change to claims handling (added a lot of staff with growth, though)

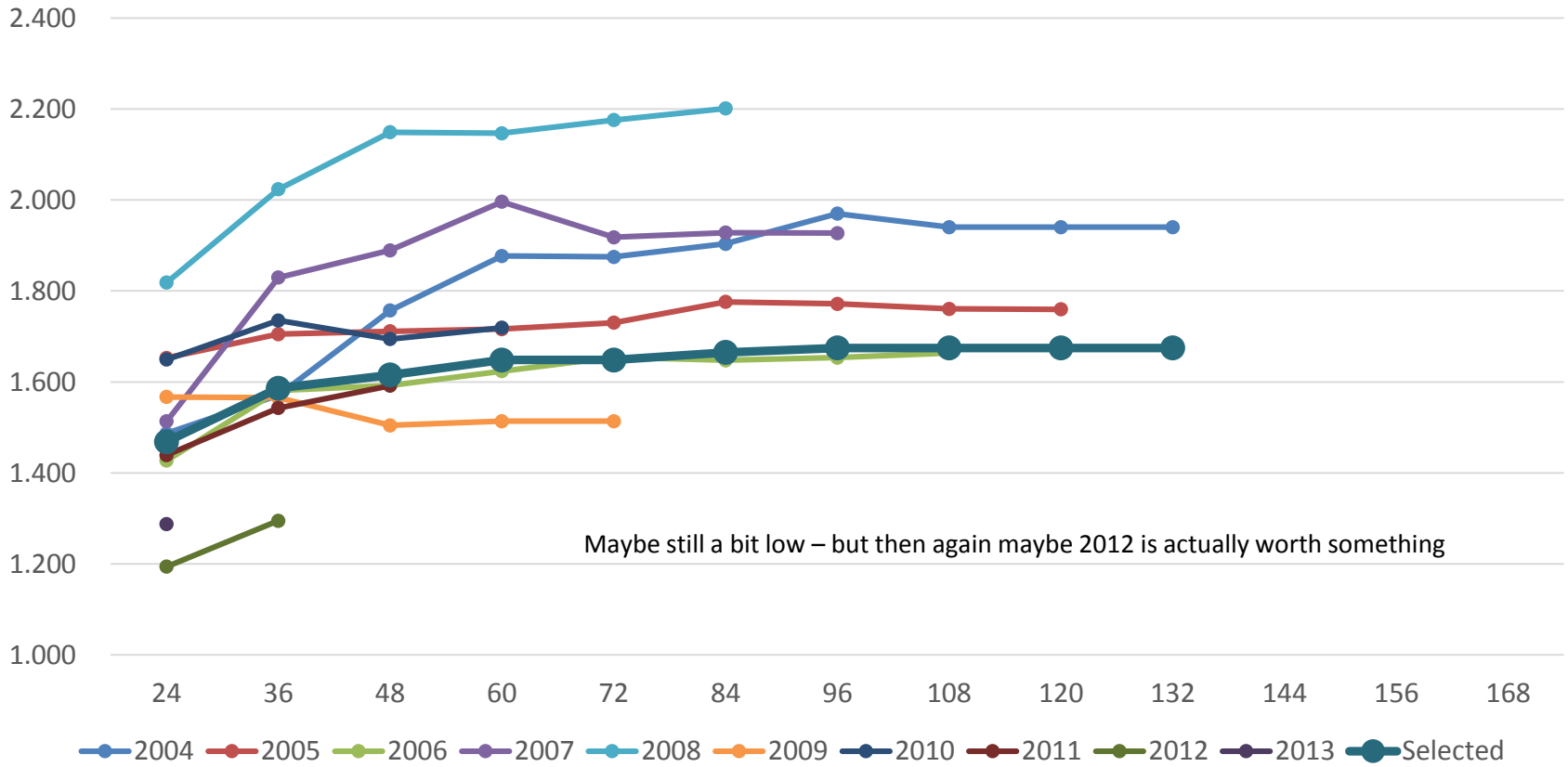
# 2014 Analysis

## Incurred Loss Development



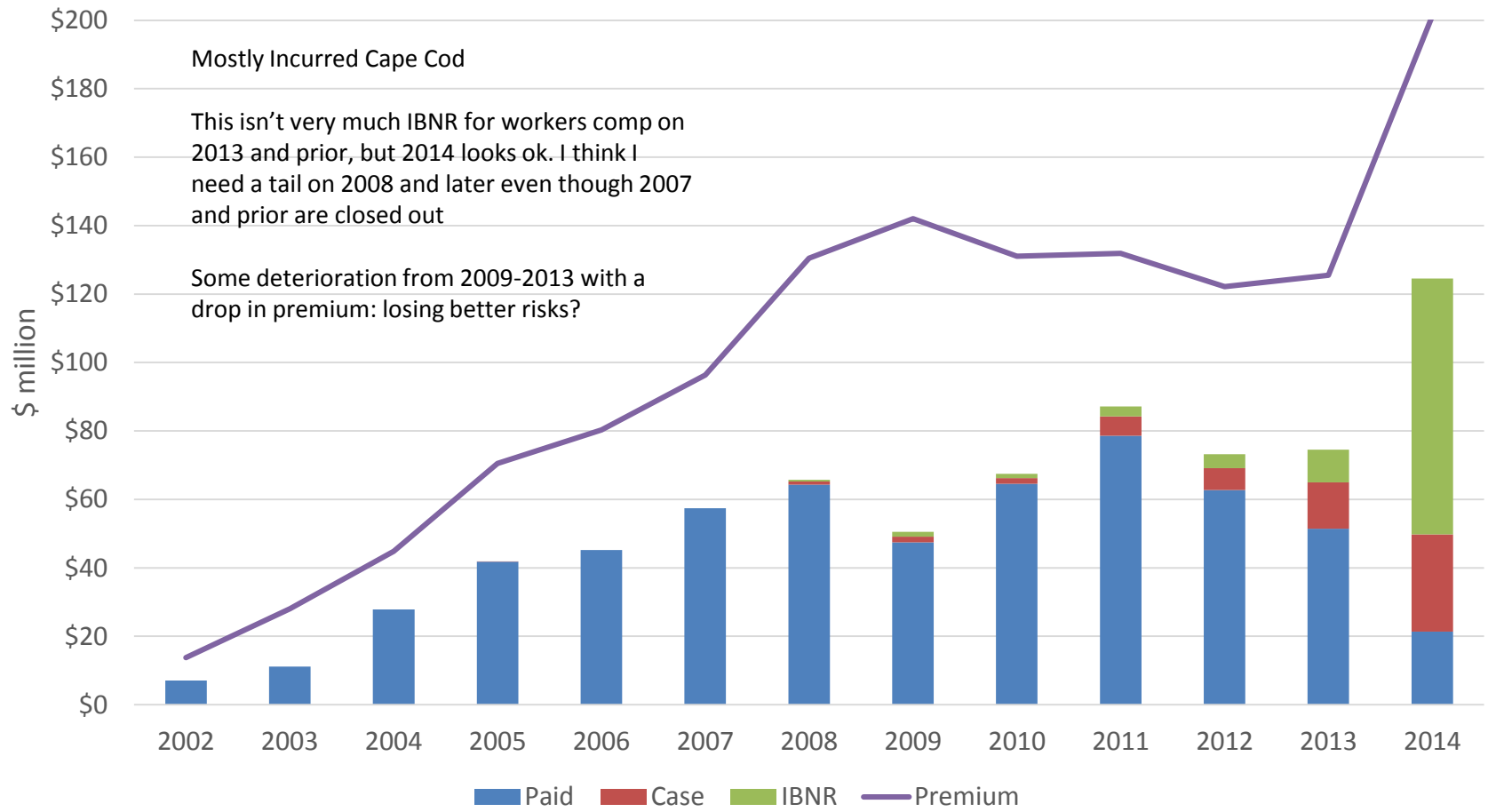
# 2014 Analysis

## Incurred Loss Development Excluding 2002 and 2003



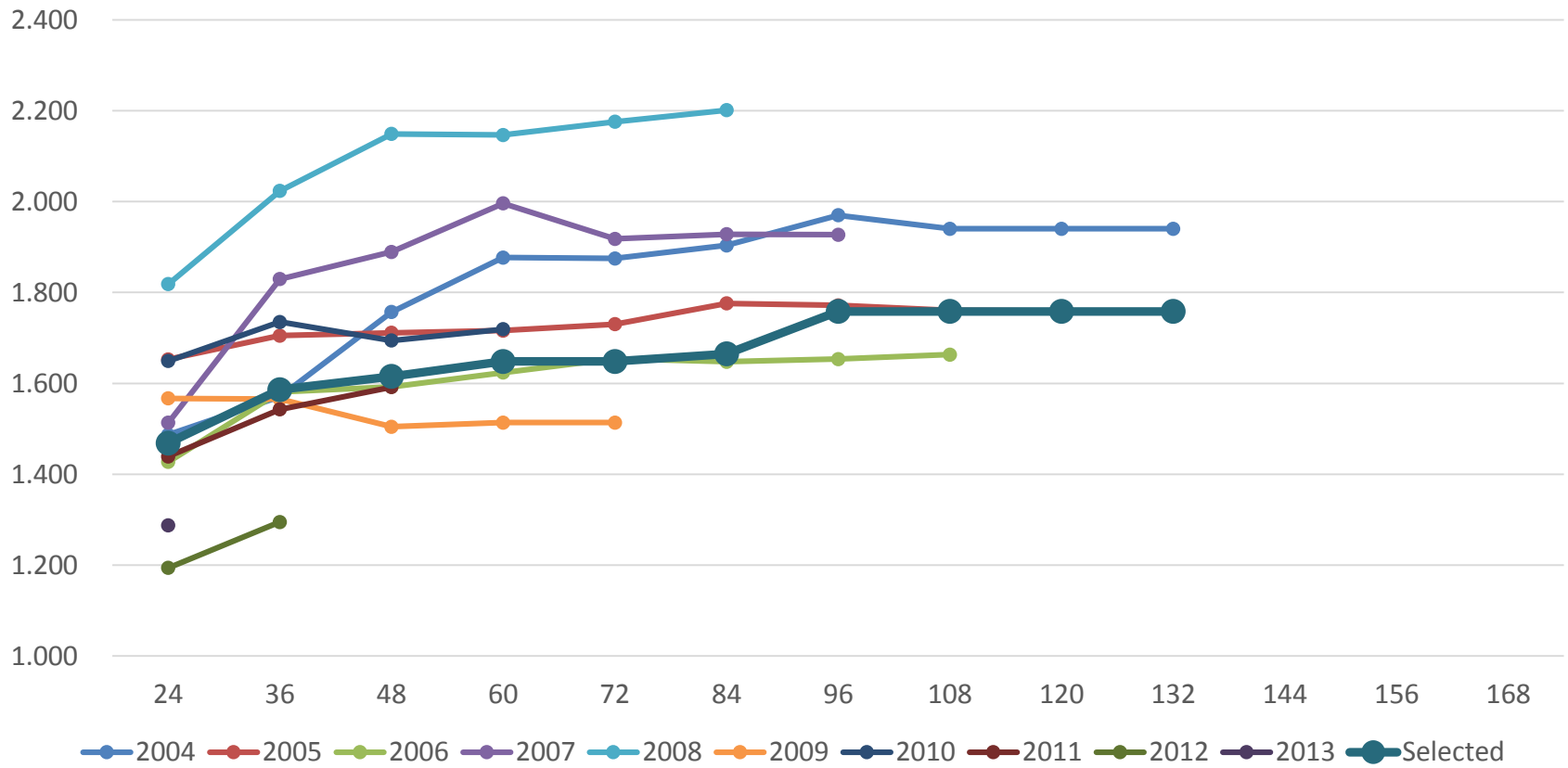
# Ultimates @12/31/14

## First Pass



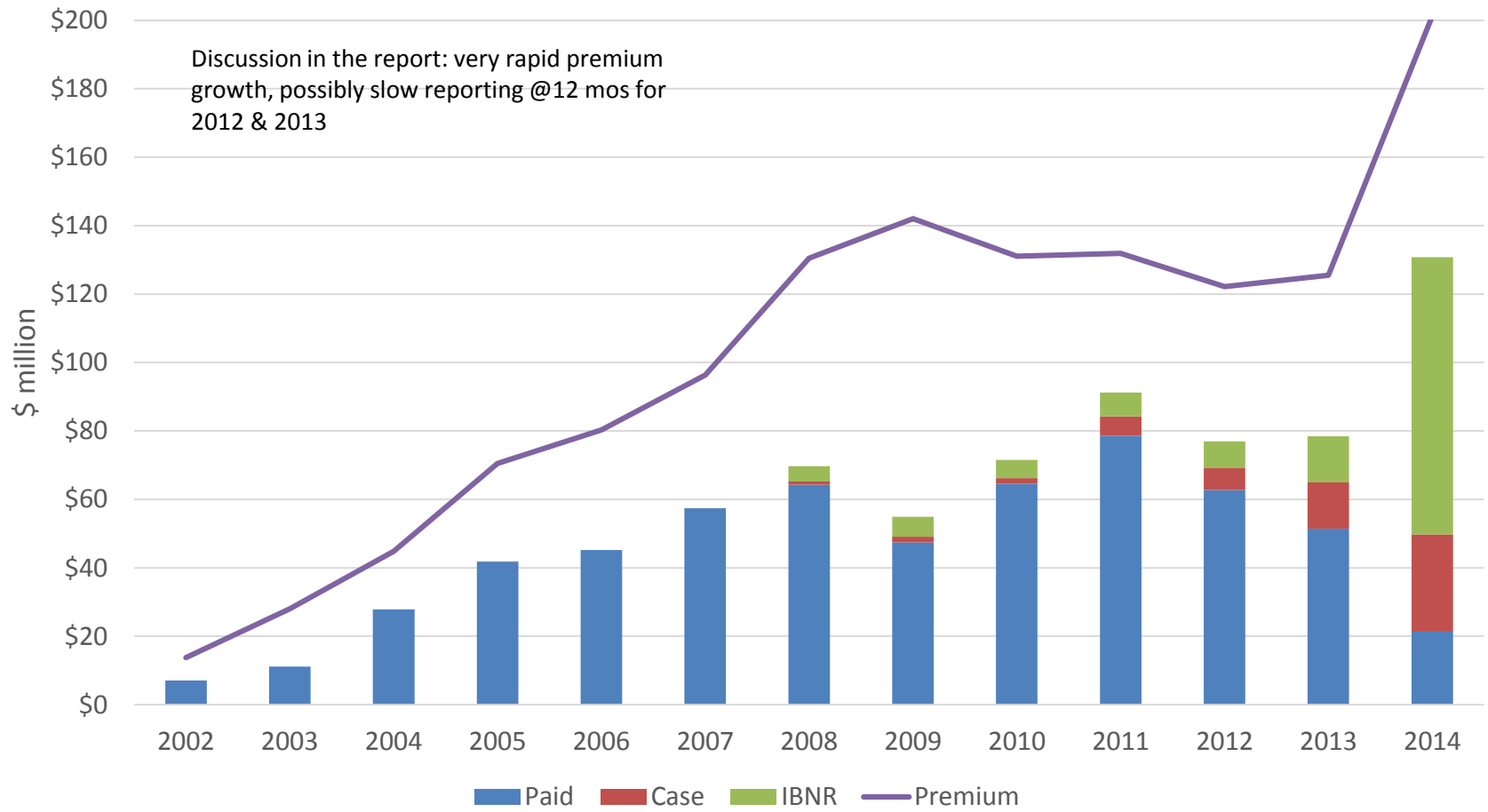
# 2014 Analysis: + 5% tail

Incurred Loss Development Excluding 2002 and 2003

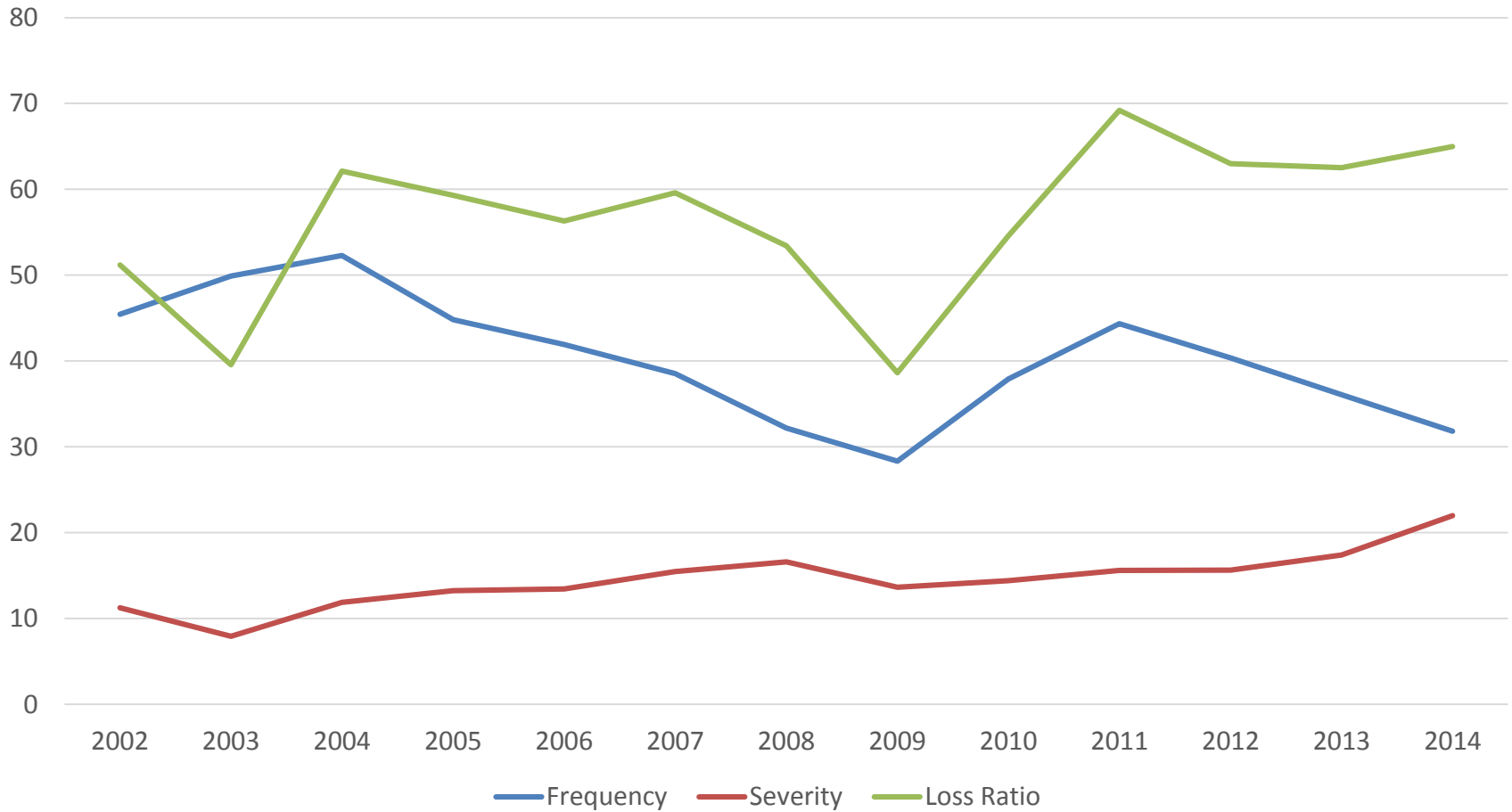




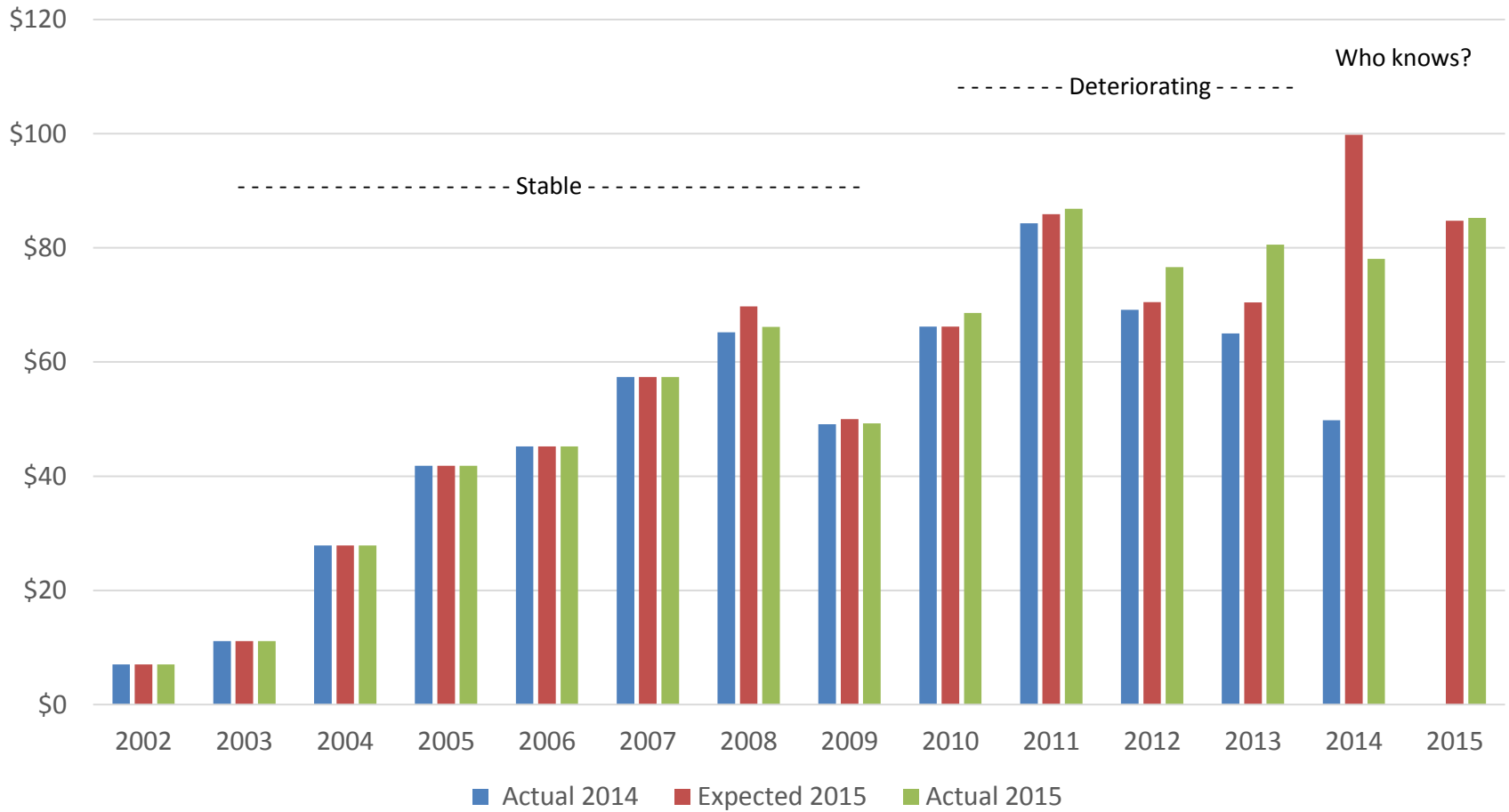
# Ultimates @12/31/14



# 2014 Diagnostics

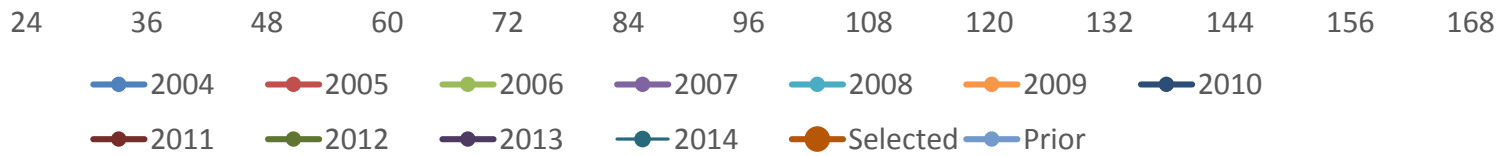
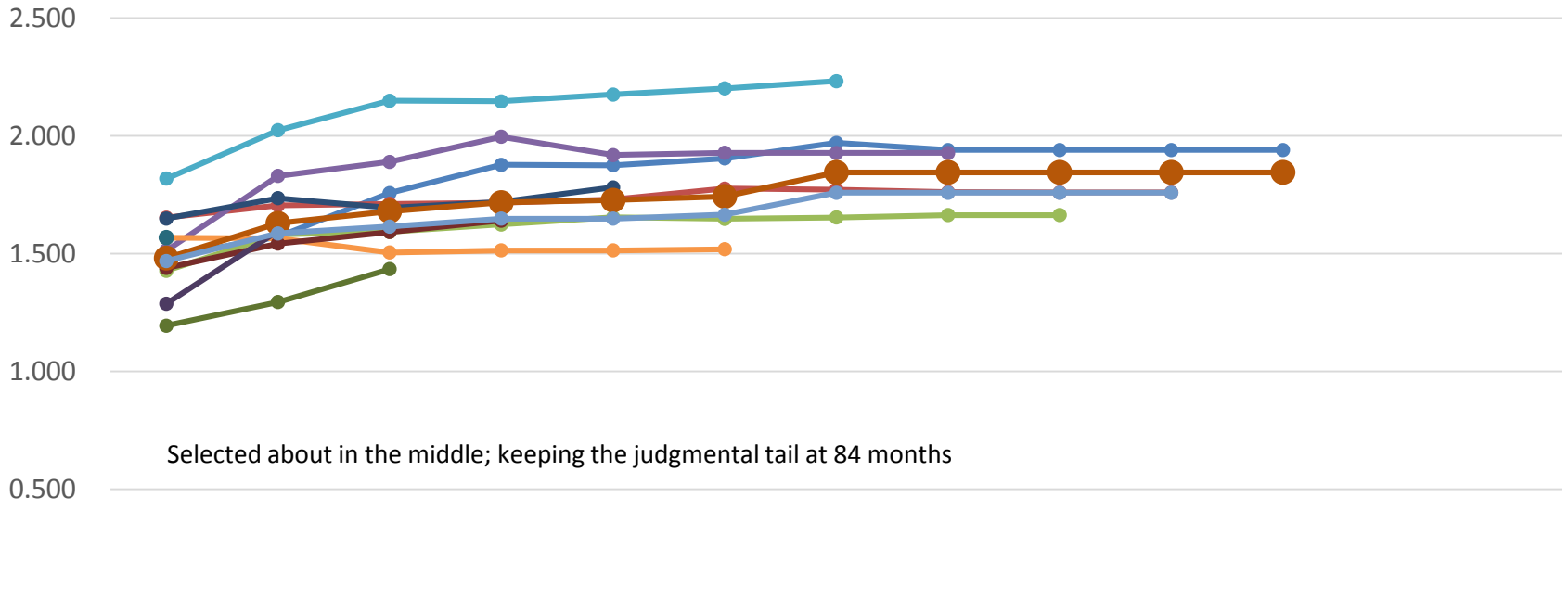


# 2015 Actual vs Expected Incurred Losses



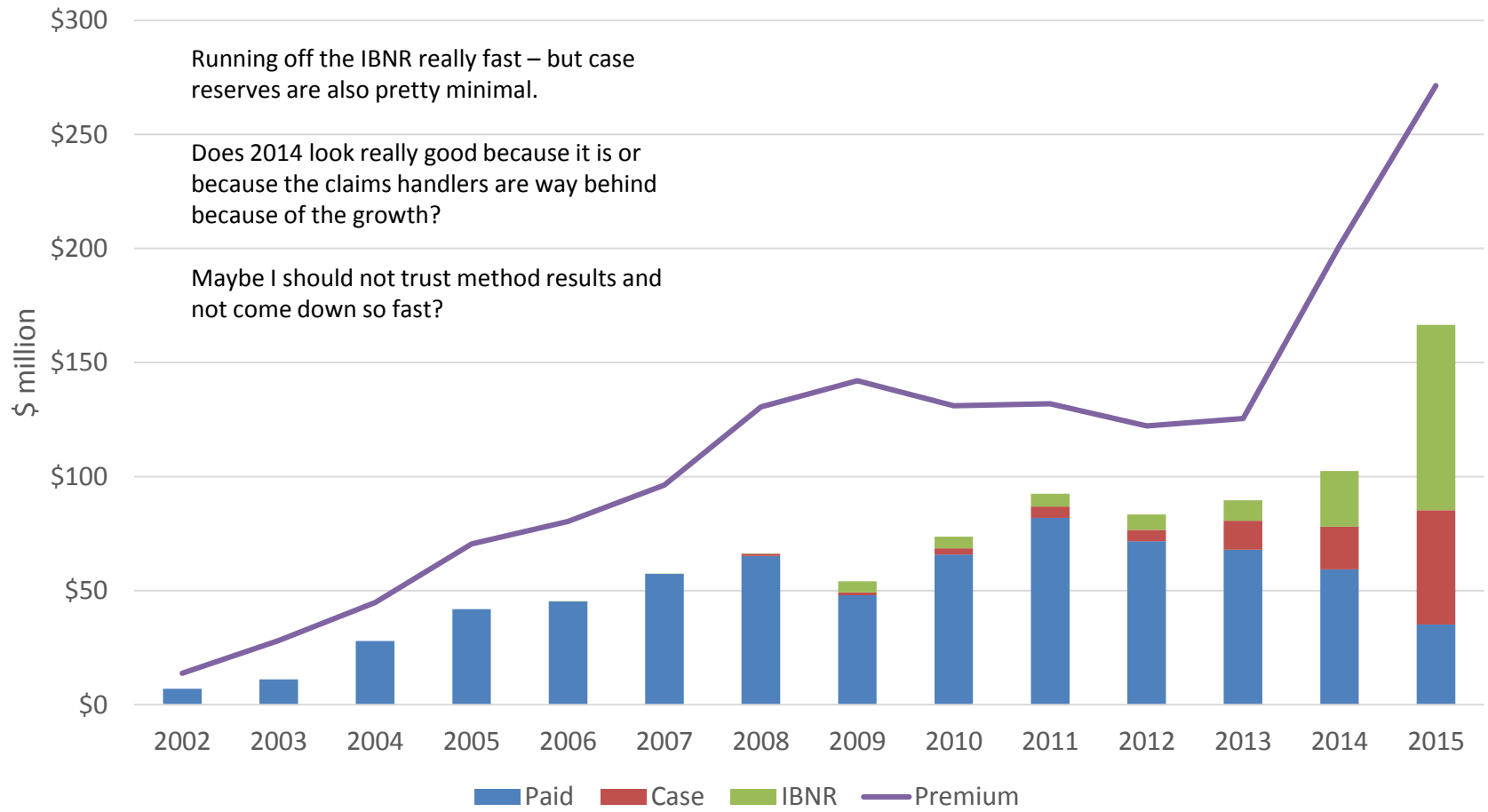
# 2015 Analysis

Incurred Loss Development Excluding 2002 and 2003

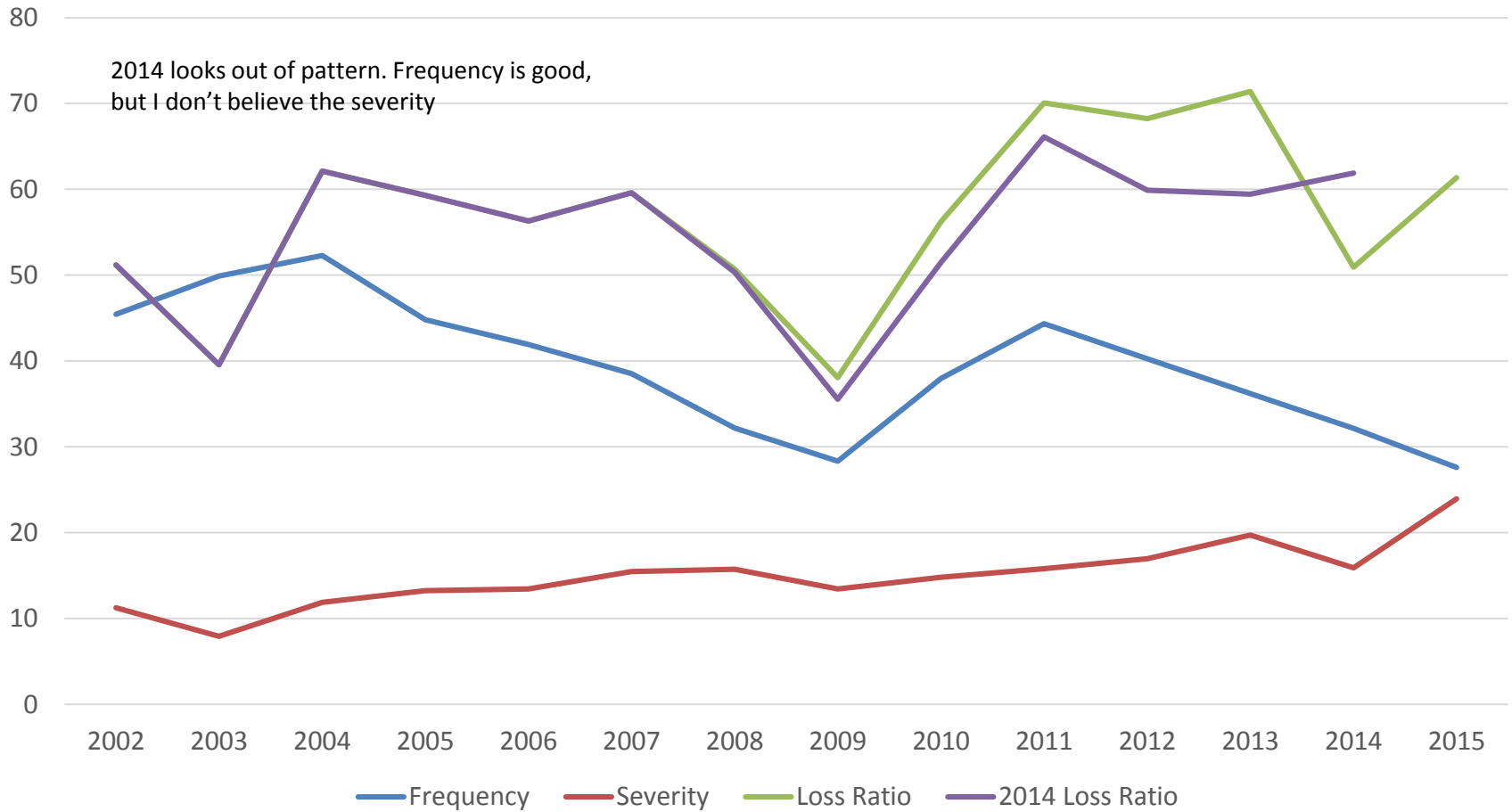


# Ultimates @12/31/15

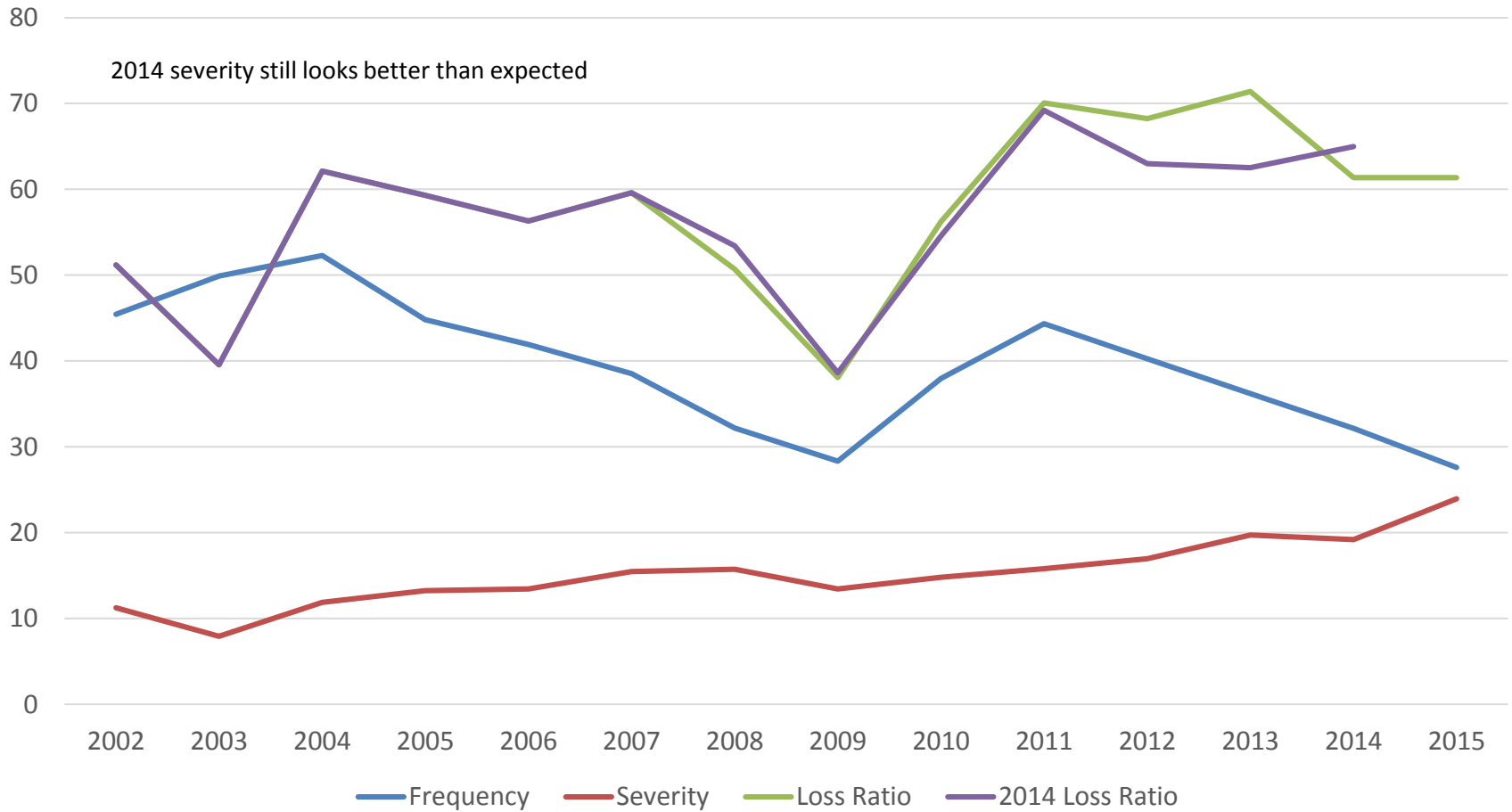
## First Pass



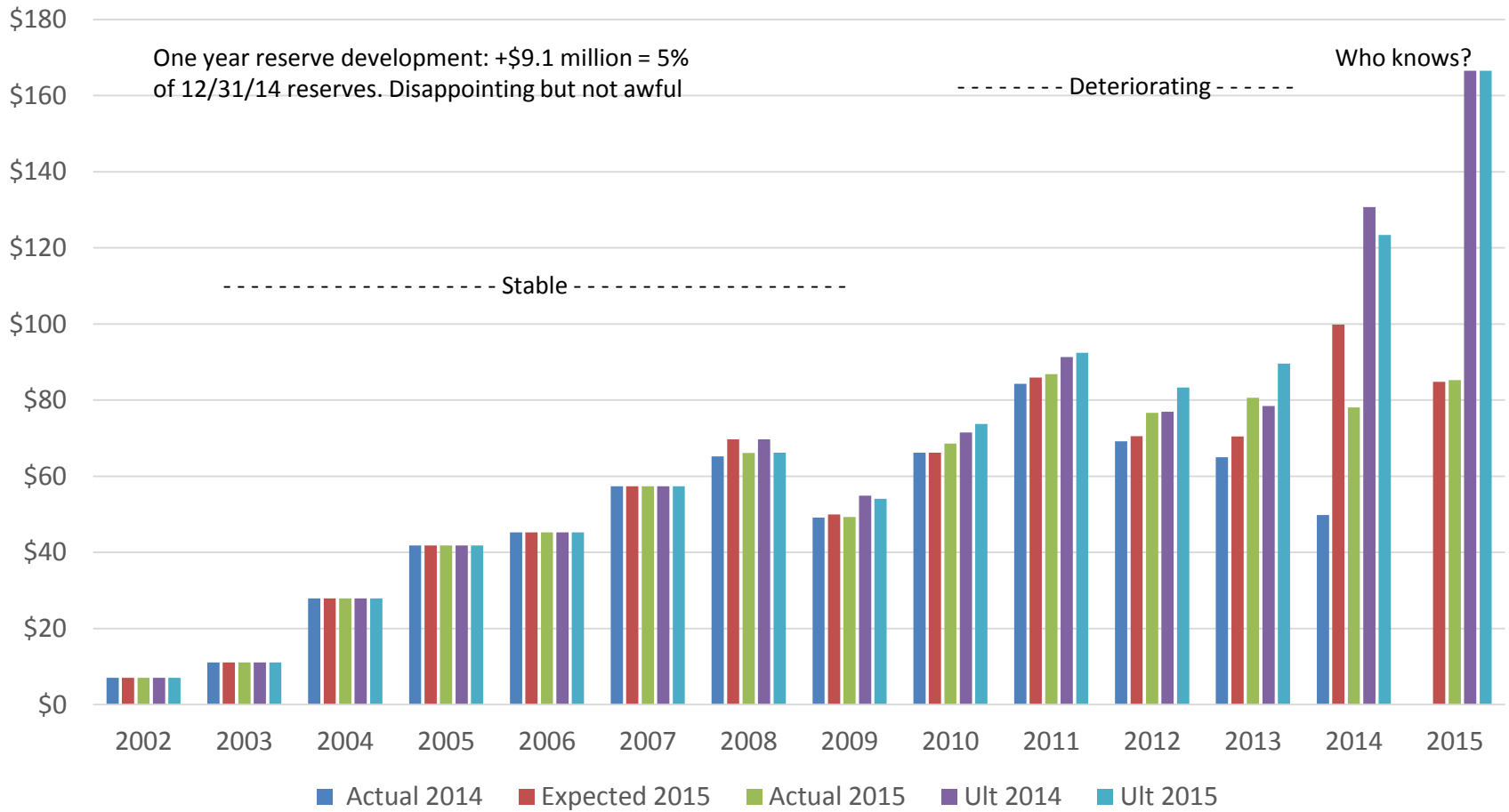
# 2015 Diagnostics: First Pass



# 2015 Diagnostics

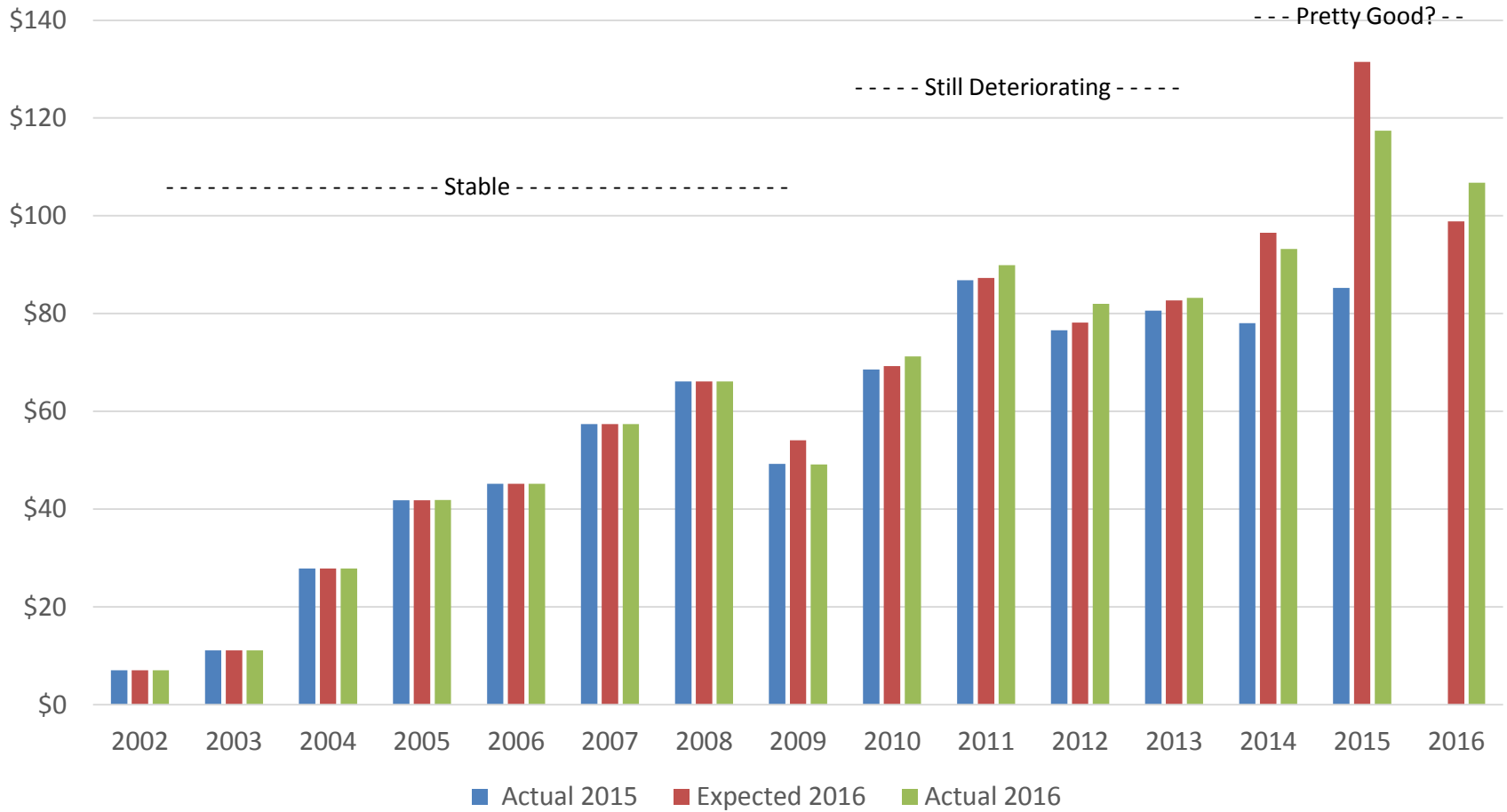


# 2015 Actual vs Expected Incurred Losses and Ultimate Estimates



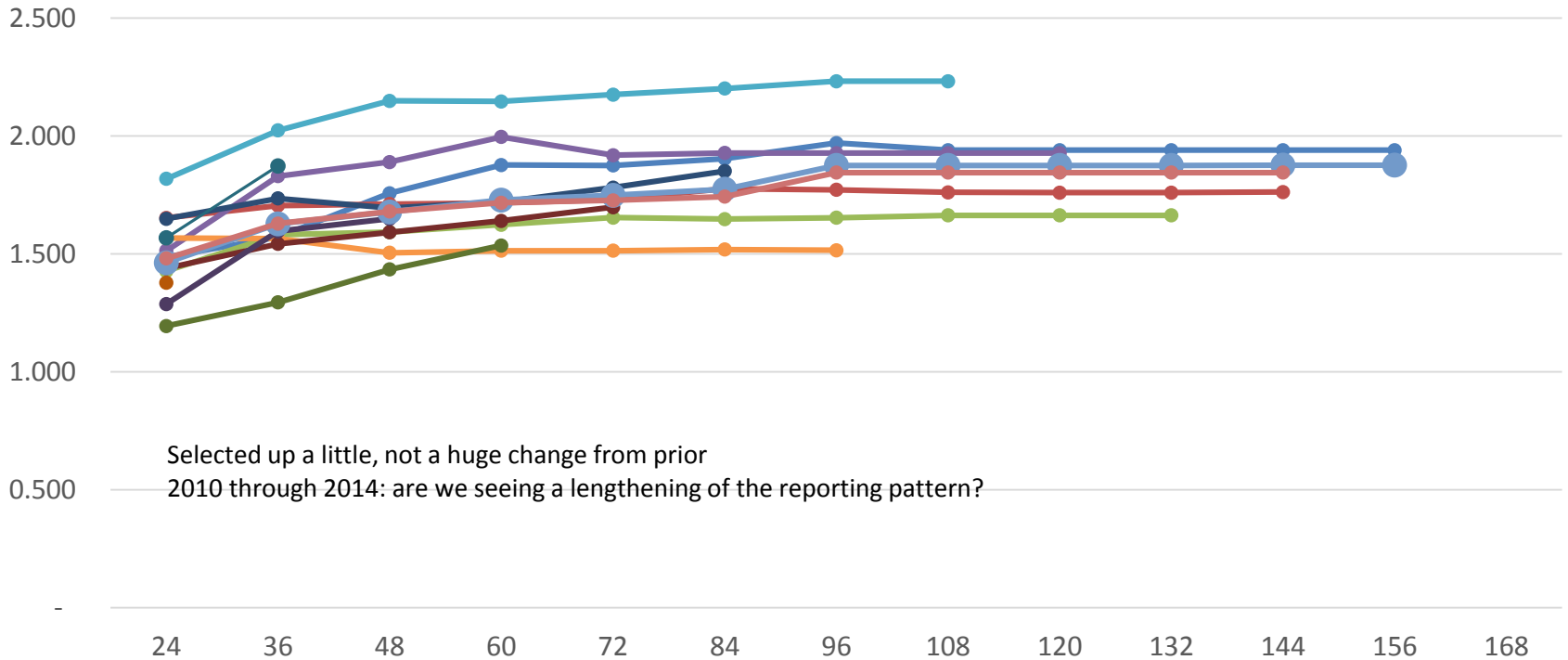


# 2016 Actual vs Expected Incurred Losses



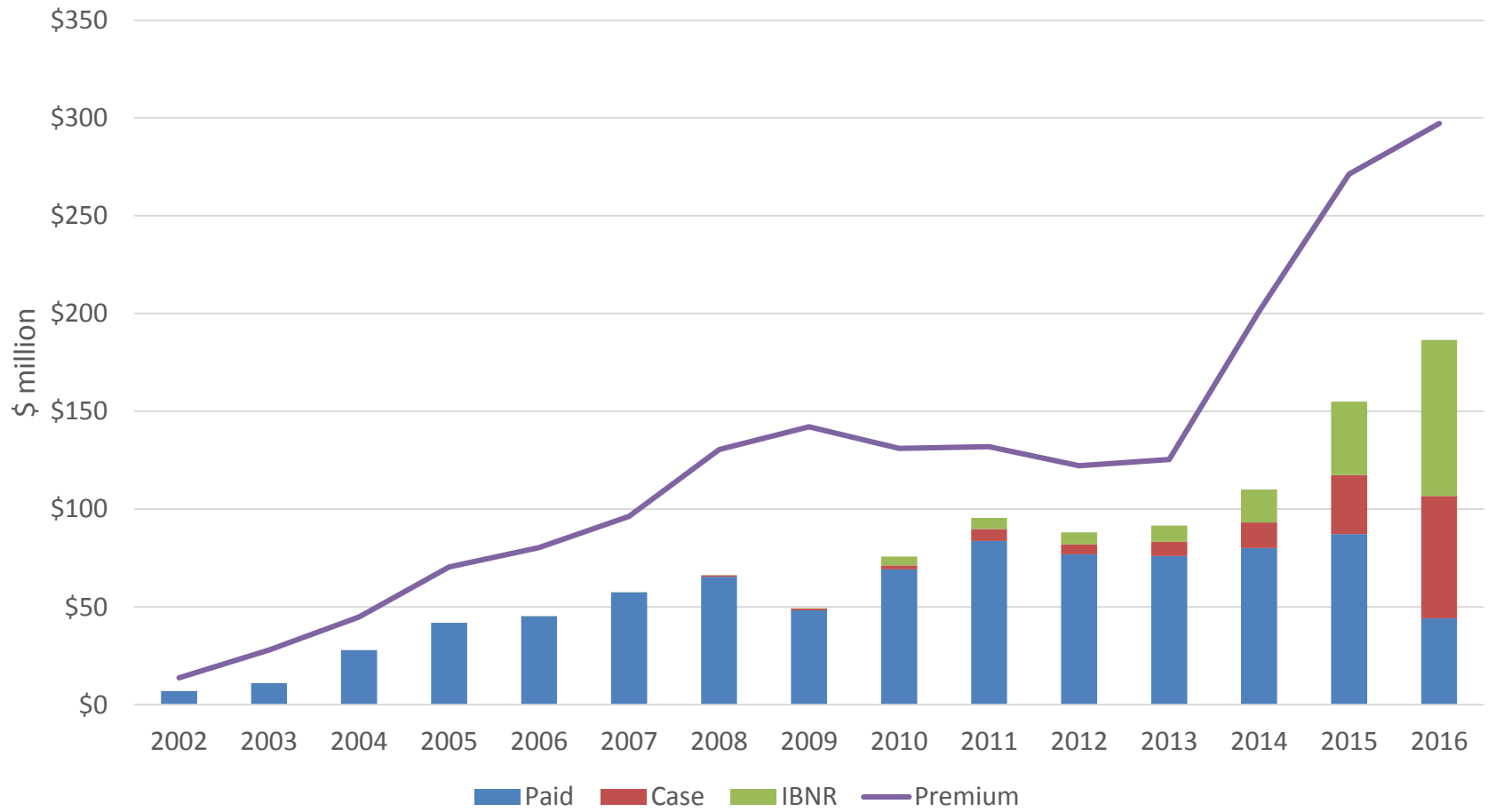
# 2016 Analysis

Incurred Loss Development Excluding 2002 and 2003



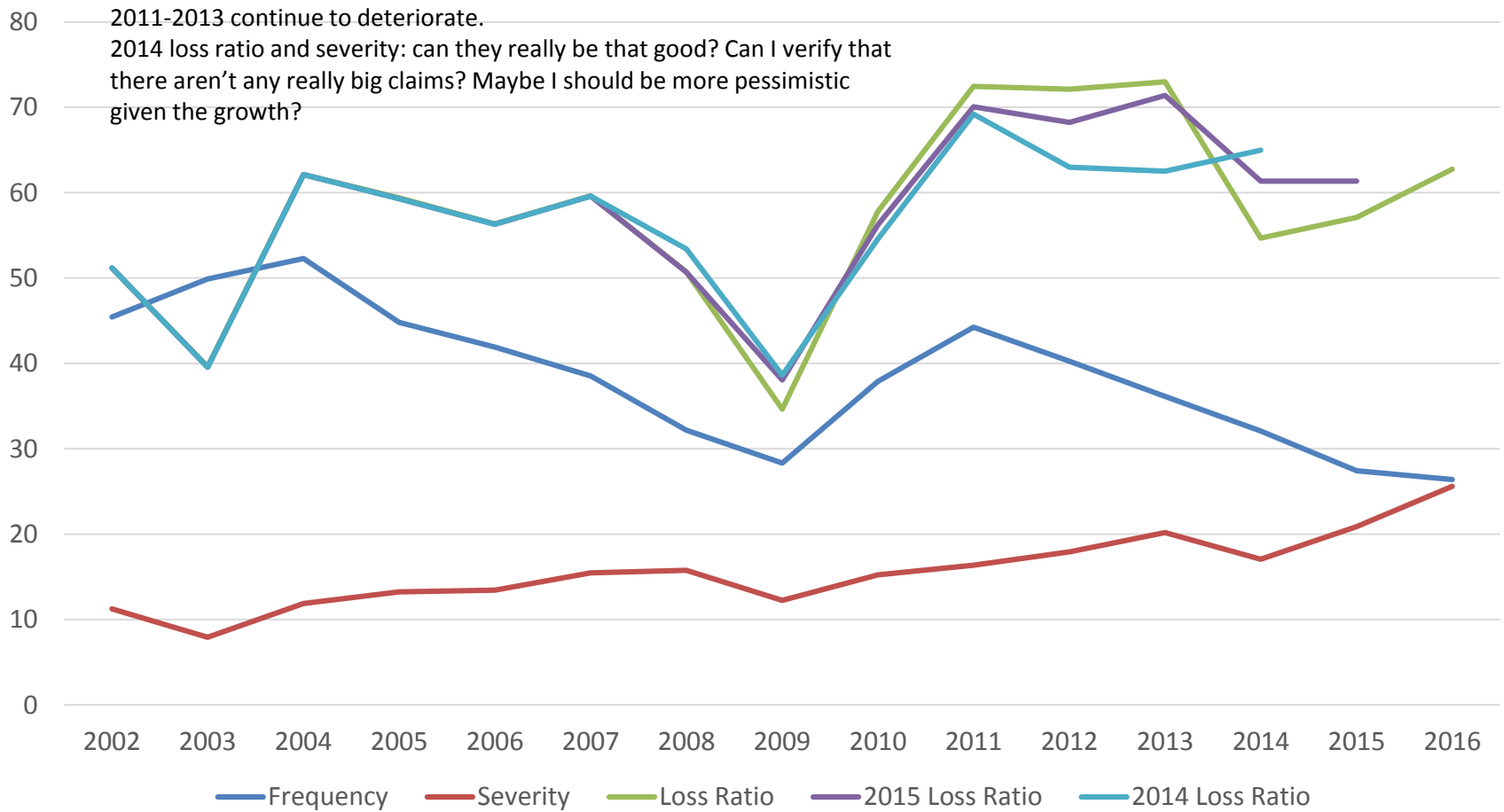
# Ultimates @12/31/16

## First Pass



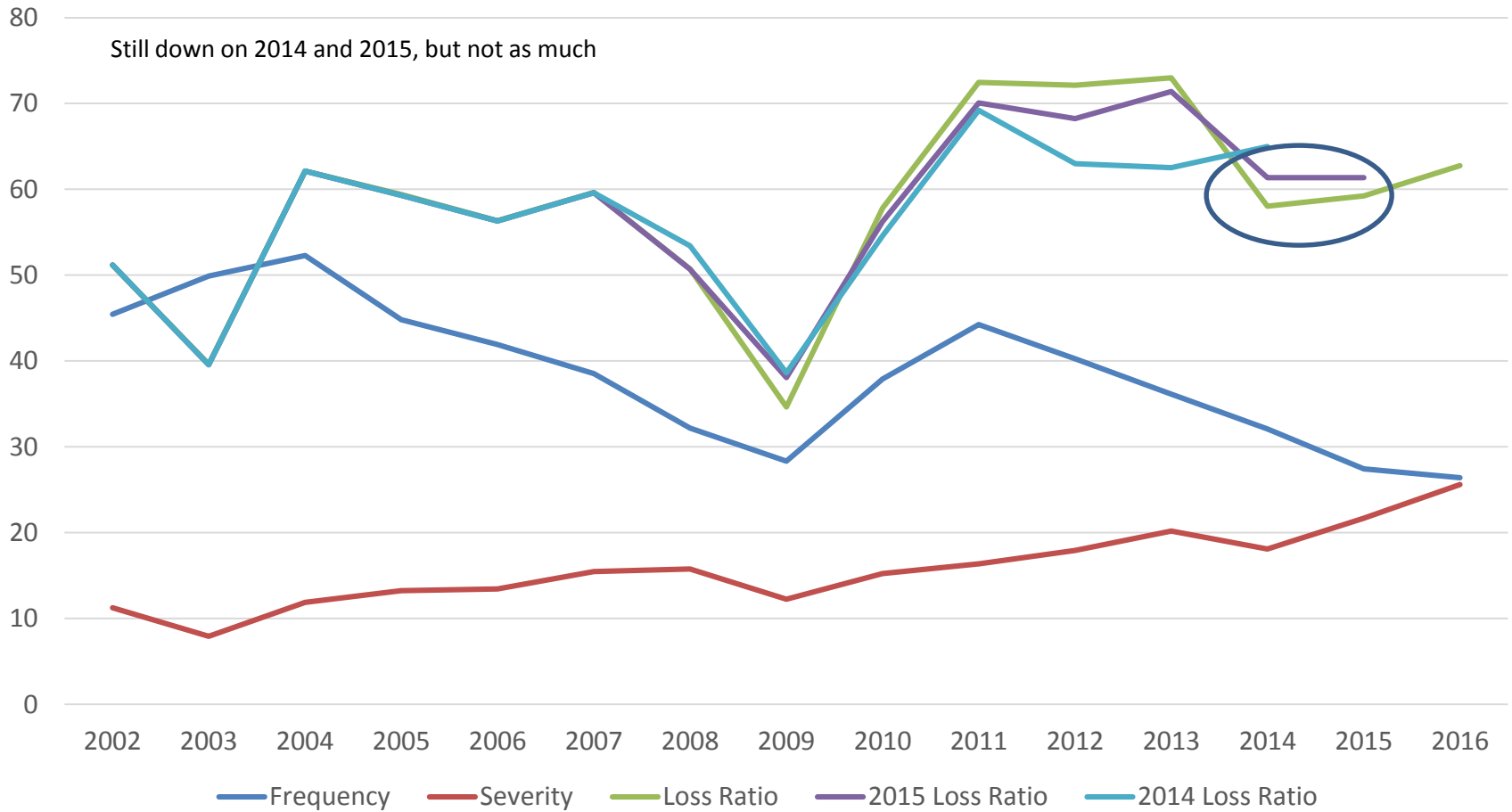
# 2016 Diagnostics

## First Pass

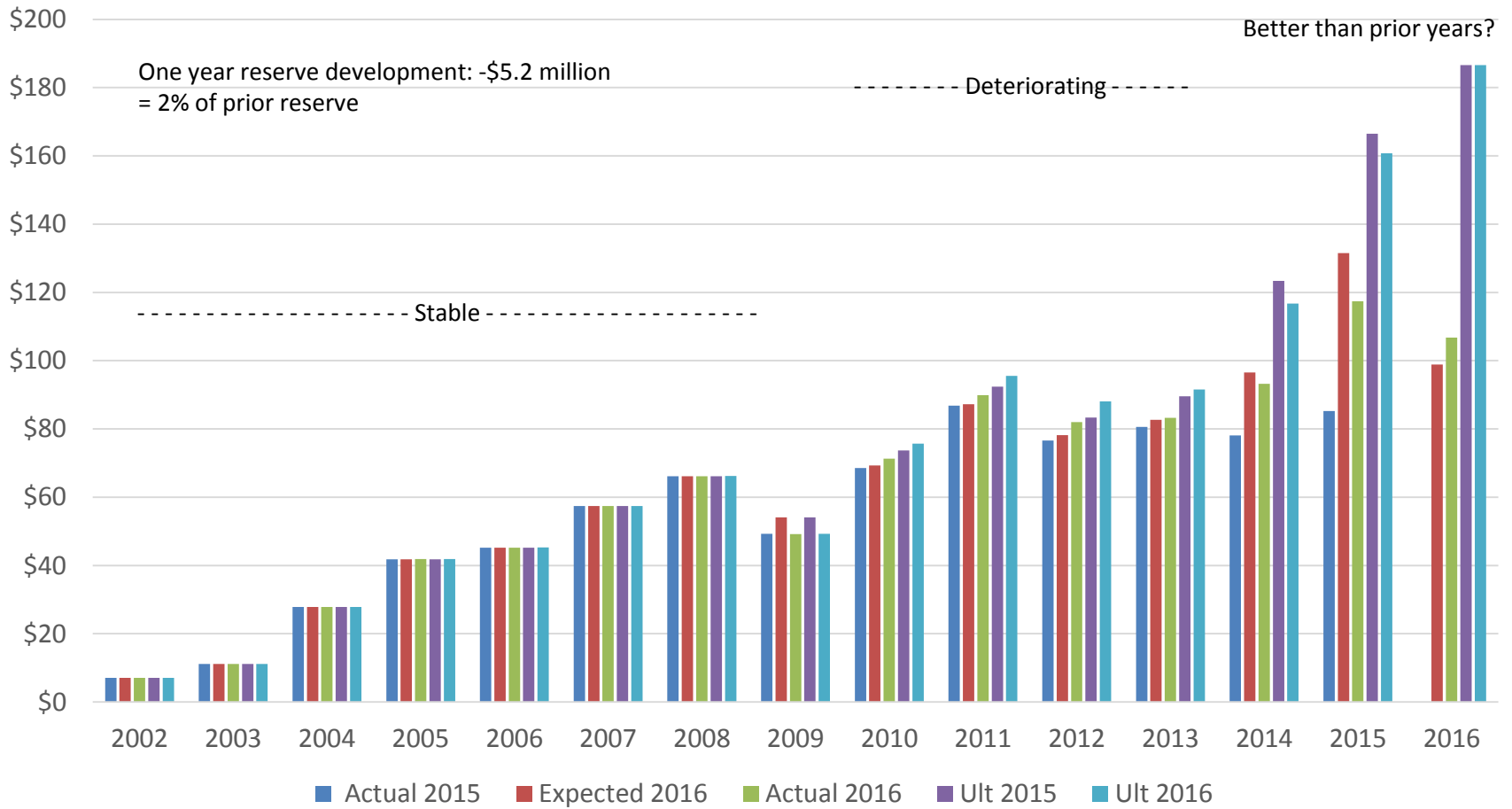


# 2016 Diagnostics

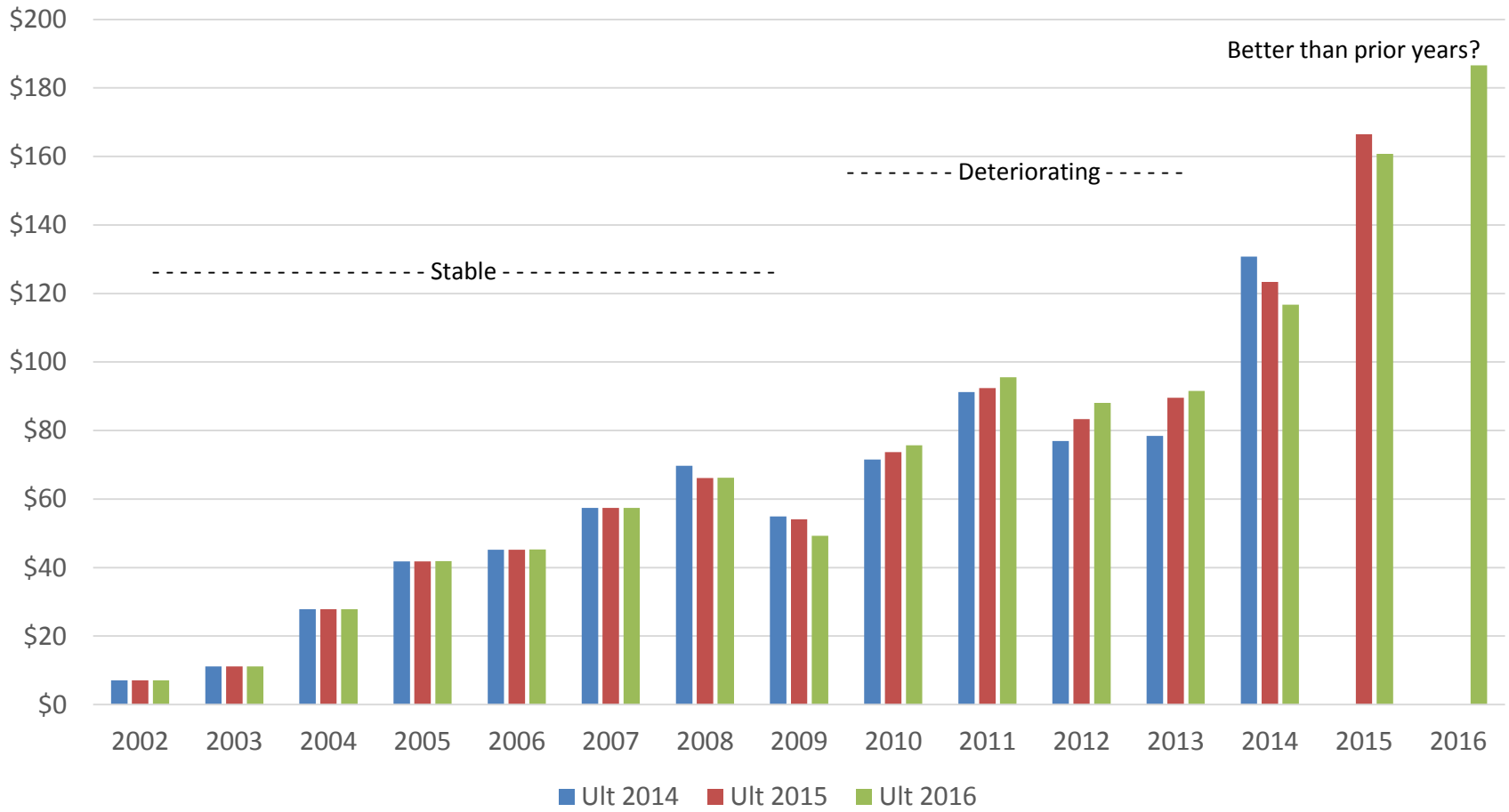
## Revised Selections for 2014-15



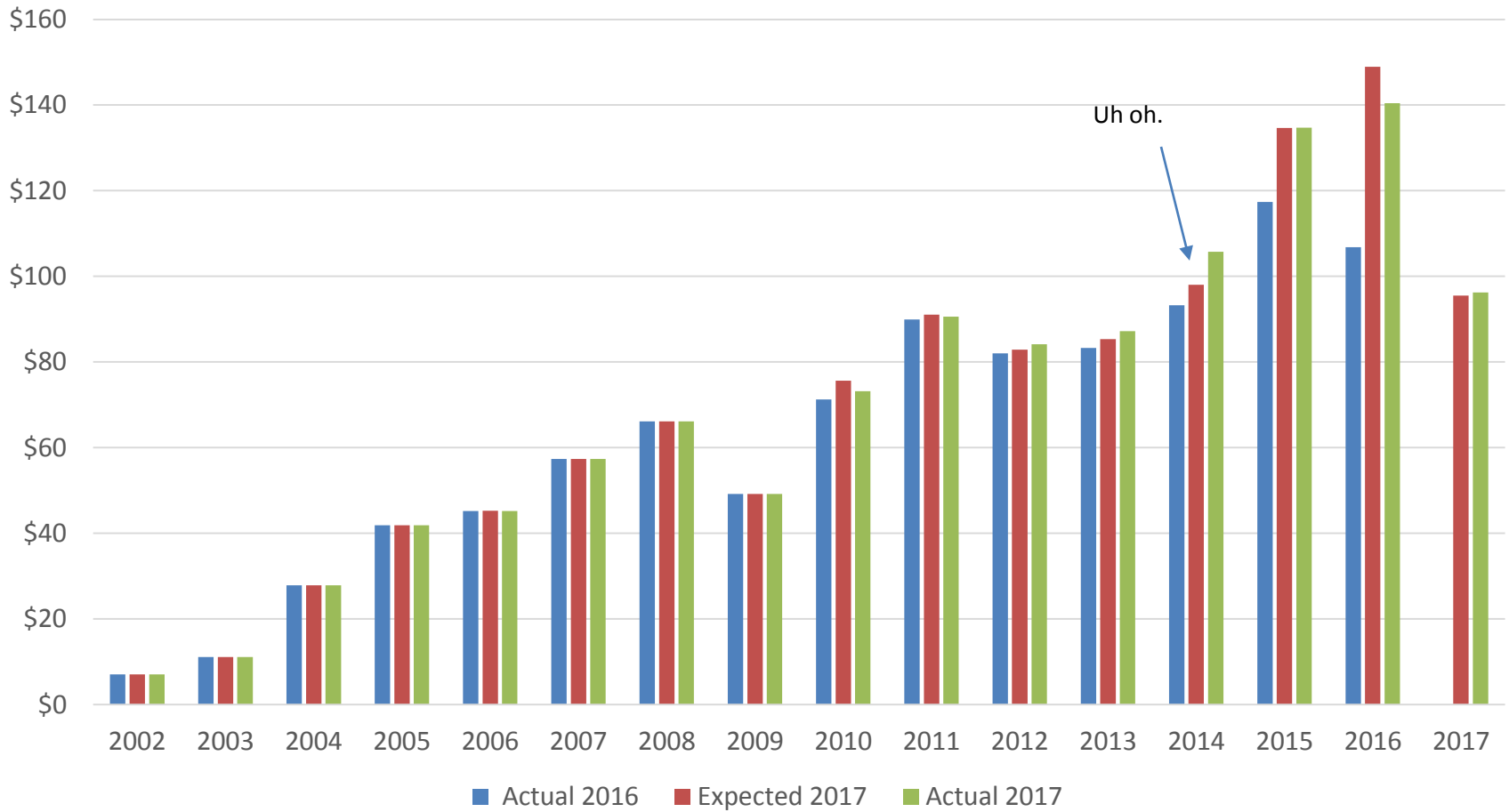
# 2016 Actual vs Expected Incurred Losses and Ultimate Estimates



# Changes in Ultimates, 2014-2016



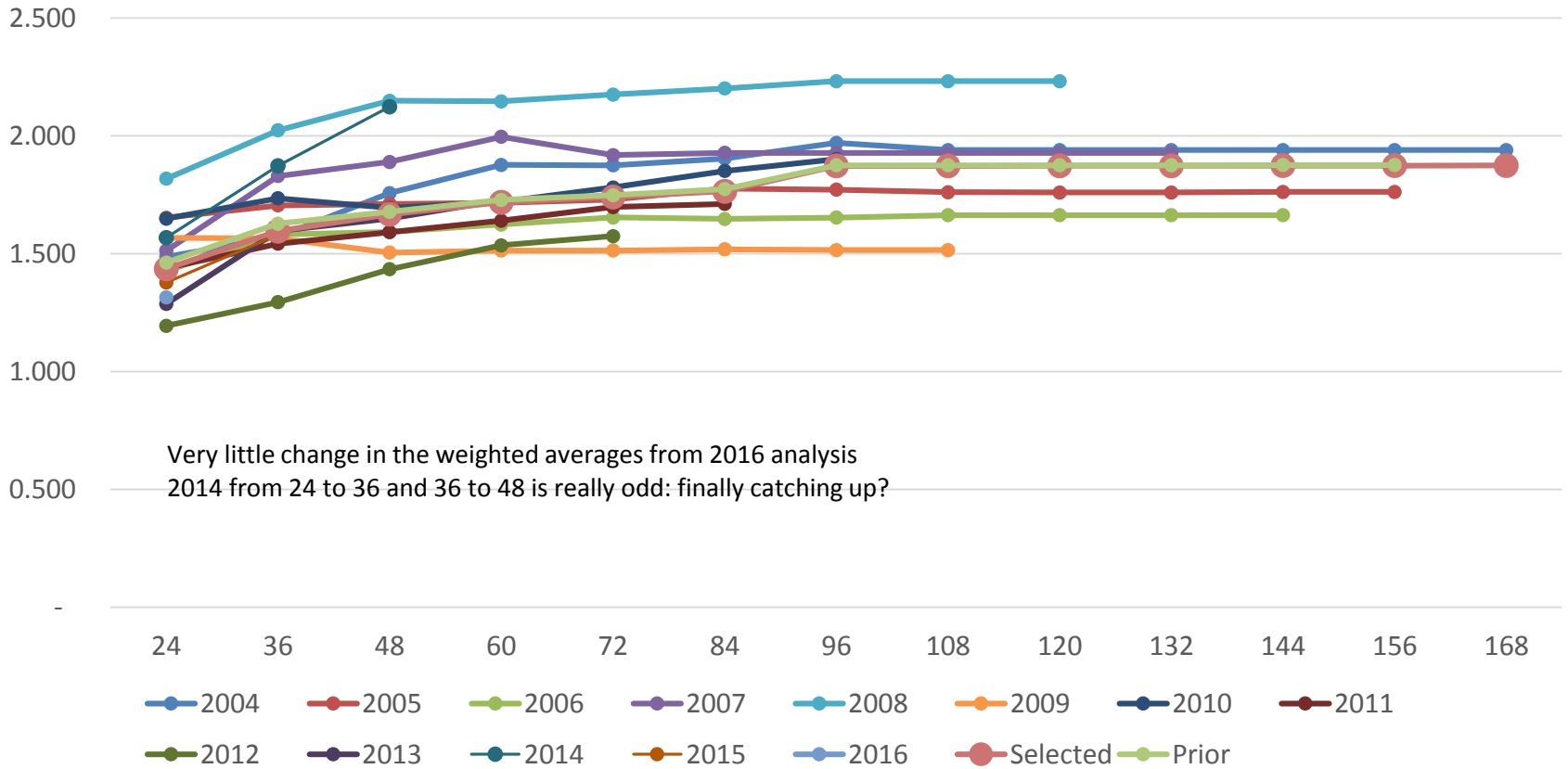
# 2017 Actual vs Expected Incurred Losses



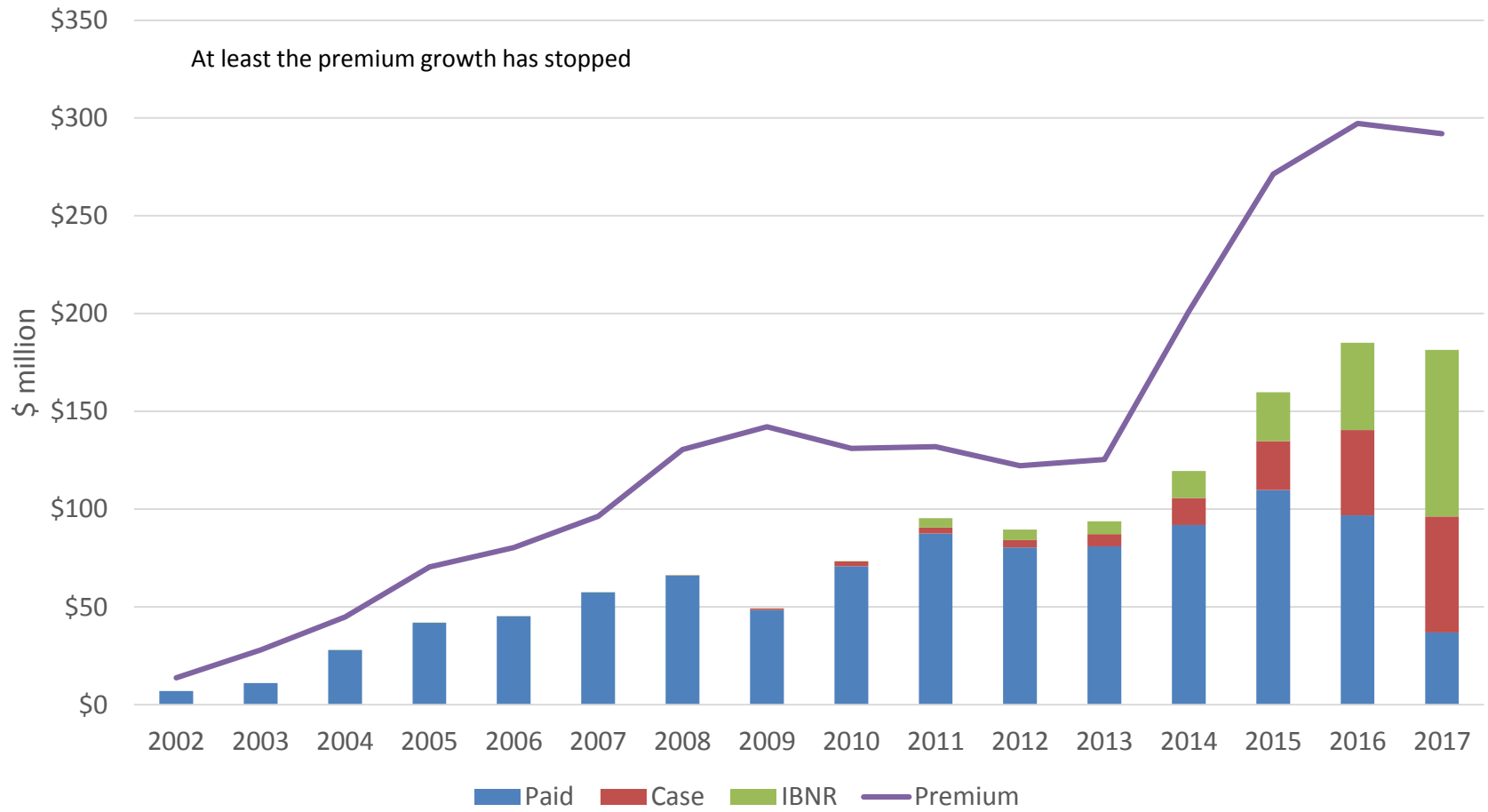


# 2017 Analysis

Incurred Loss Development Excluding 2002 and 2003



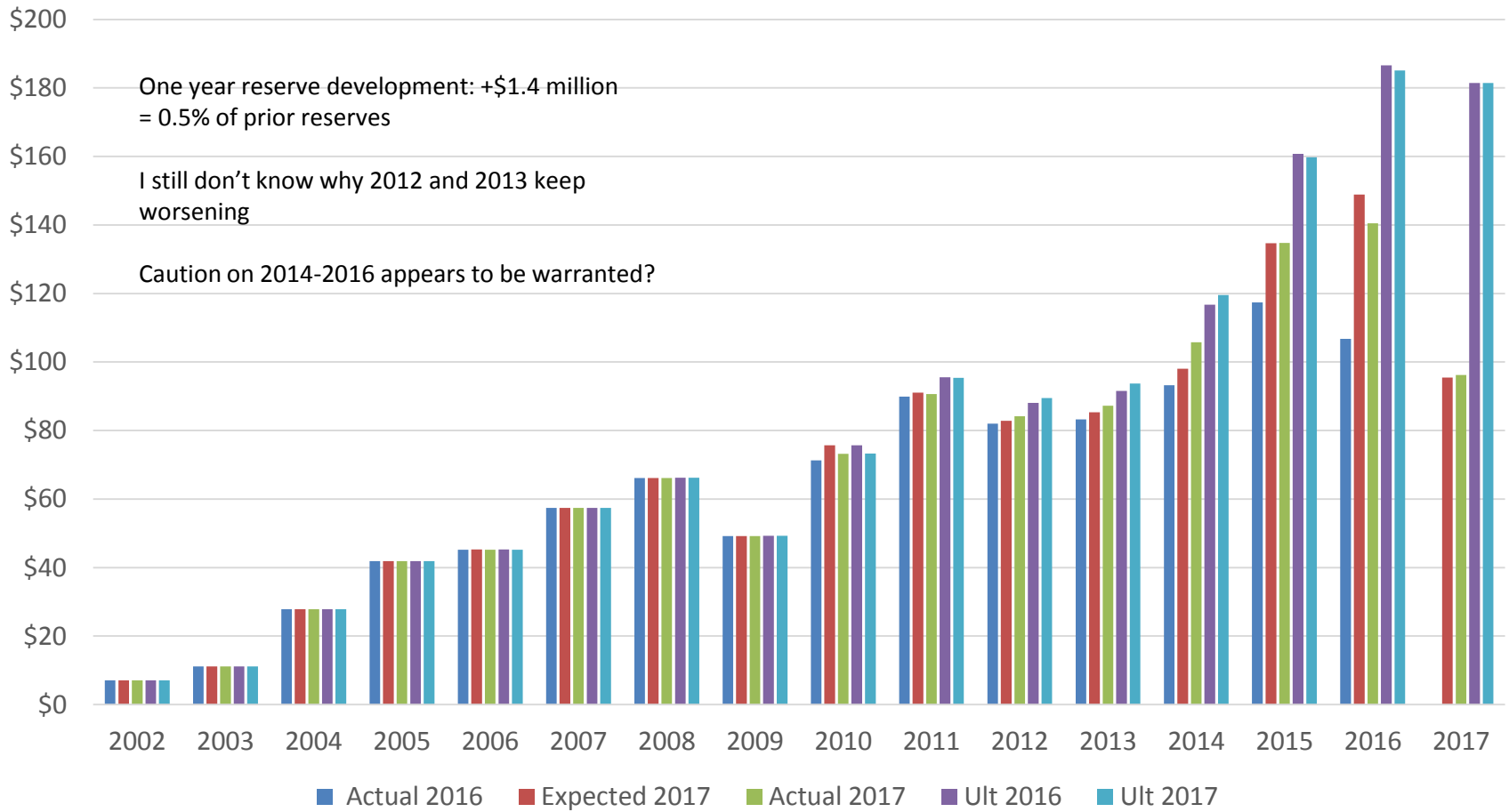
# Ultimates @12/31/17



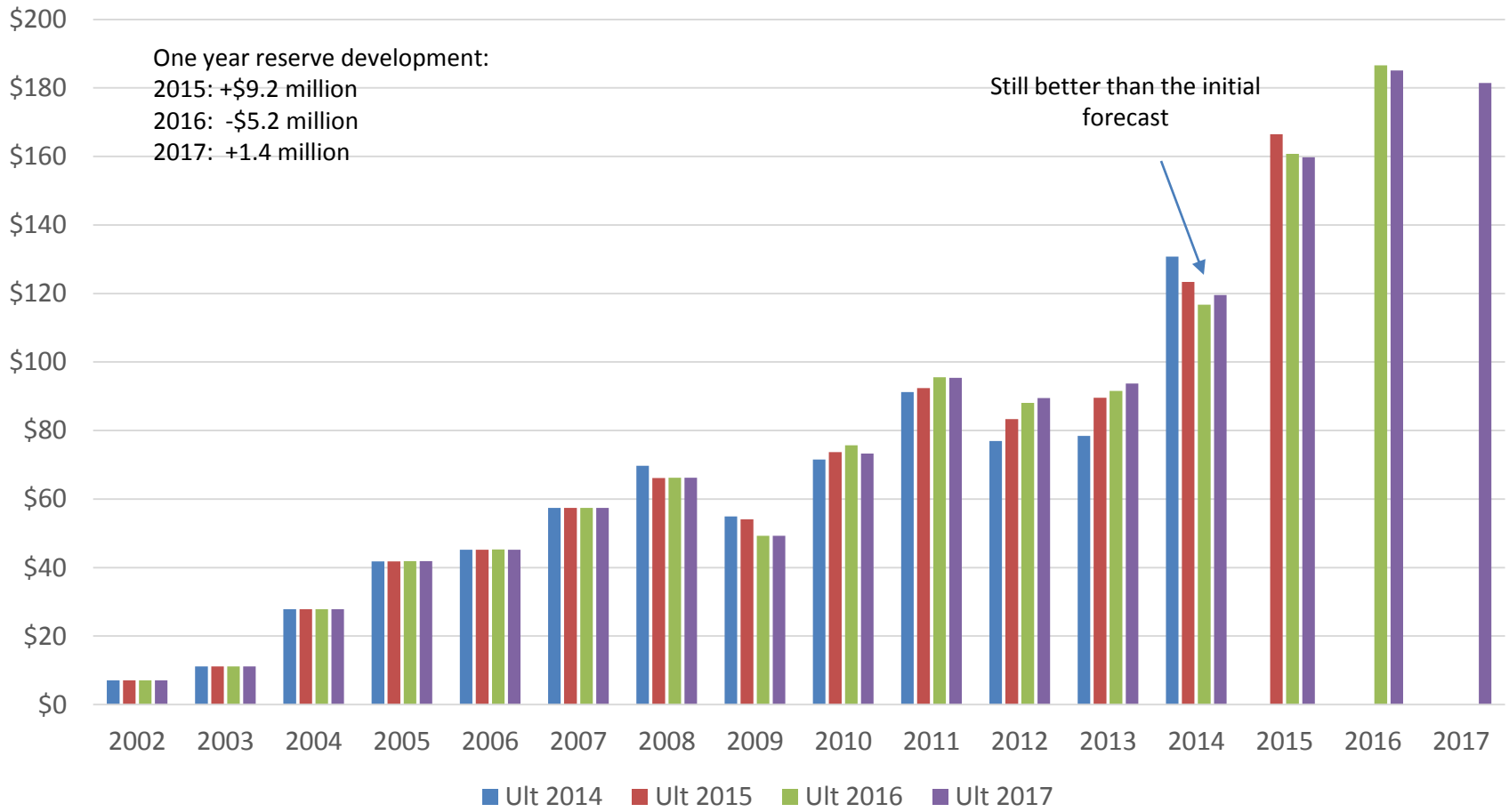
# 2017 Diagnostics



# 2017 Actual vs Expected Incurred Losses and Ultimate Estimates



# Changes in Ultimates, 2014-2017



# My Estimates vs Company Actuary

