

# *Reserve Variability*

*Report Card on Reserve Adequacy –  
A+ or C-*

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CAGNY  
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# ***Introductions***

## Presenters

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# *Purpose*

Loss reserving has been a fundamental element of actuarial practice and financial reporting for insurance companies for many years. The actuarial literature includes countless papers describing methods and data for evaluating unpaid claim estimates. So, while acknowledging that the reserves represent estimates, how well have those estimates performed with the benefit of hindsight?

The presenters will provide perspectives on historical and current reserve adequacy by line of business and trends in reserve development across lines. Is the phenomenon of adverse and favorable development of prior estimates pre-destined? Can practitioners improve upon the historical report card?

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# *Agenda*

- Historical reserve adequacy
- Reserve development drivers
- Grading the industry

# *Historical reserve adequacy*

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## ***Reserve accuracy poll***

At year-end 2013, what percentage of US P&C insurance companies' hindsight reserves from year-end 2007 were within -10% to +10% of their originally recorded value?

- a) 76% – isn't it called actuarial “science”?
- b) 52% – but on the other hand, there's loads of judgment
- c) 26% – loads and loads of judgment
- d) 11% – but at least it can't be negative

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## ***Reserve accuracy poll***

At year-end 2013, what percentage of US P&C insurance companies' hindsight reserves from year-end 2007 were within -10% to +10% of their originally recorded value?

- a) 76% – isn't it called actuarial "science"?
- b) 52% – but on the other hand, there's loads of judgment
- c) 26% – loads and loads of judgment
- d) 11% – but at least it can't be negative

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***Percentage of companies with 2013 hindsight reserves within X% of initial recorded reserves***

**Companies with initial recorded reserves in excess of \$1 million**

<b>Calendar Year End</b>	<b>Within +/- 5%</b>	<b>Within +/-10%</b>	<b>Within +/- 25%</b>
2004	18%	35%	64%
2005	18%	31%	62%
2006	16%	28%	61%
2007	13%	26%	63%
2008	17%	35%	66%
2009	16%	33%	68%
2010	22%	40%	74%
2011	29%	47%	79%
2012	41%	65%	89%

Source: SNL, 2013, Individual Company Statutory Statements



## ***Percentage of companies with 2013 hindsight reserves within X% of initial recorded reserves***

**Companies with initial recorded reserves in excess of \$500 million**

<b>Calendar Year End</b>	<b>Within +/- 5%</b>	<b>Within +/-10%</b>	<b>Within +/- 25%</b>
2004	23%	40%	76%
2005	22%	48%	76%
2006	21%	37%	83%
2007	20%	37%	83%
2008	24%	48%	82%
2009	24%	49%	84%
2010	41%	63%	91%
2011	57%	74%	95%
2012	67%	92%	99%

Source: SNL, 2013, Individual Company Statutory Statements

## ***Percentage of companies with 2013 hindsight reserves within X% of initial recorded reserves***

**Companies with initial recorded reserves in excess of \$500 million, ex 2003 & prior**

<b>Calendar Year End</b>	<b>Within +/- 5%</b>	<b>Within +/-10%</b>	<b>Within +/- 25%</b>
2004	9%	18%	79%
2005	8%	27%	72%
2006	11%	25%	68%
2007	15%	30%	75%
2008	9%	35%	77%
2009	15%	39%	82%
2010	24%	55%	91%
2011	46%	71%	95%
2012	64%	88%	99%

Source: SNL, 2013, Individual Company Statutory Statements

## ***Percentage of companies with 2013 hindsight reserves within 10% of initial recorded reserves***

**Companies with initial recorded reserves in excess of \$1 million – by line of business**

Calendar Year End	Within +/-10%					
	All	Other Liab	Med Mal	CMP	WC	PP AL
2004	35%	22%	15%	26%	34%	35%
2005	31%	25%	12%	26%	36%	32%
2006	28%	18%	19%	26%	35%	31%
2007	26%	16%	19%	27%	39%	42%
2008	35%	21%	19%	24%	42%	43%
2009	33%	24%	15%	32%	45%	49%
2010	40%	27%	14%	41%	50%	55%
2011	47%	41%	18%	42%	59%	58%
2012	65%	57%	44%	53%	77%	72%

Source: SNL, 2013, Individual Company Statutory Statements

## ***Calendar year-end hindsight (redundancy)/deficiency***

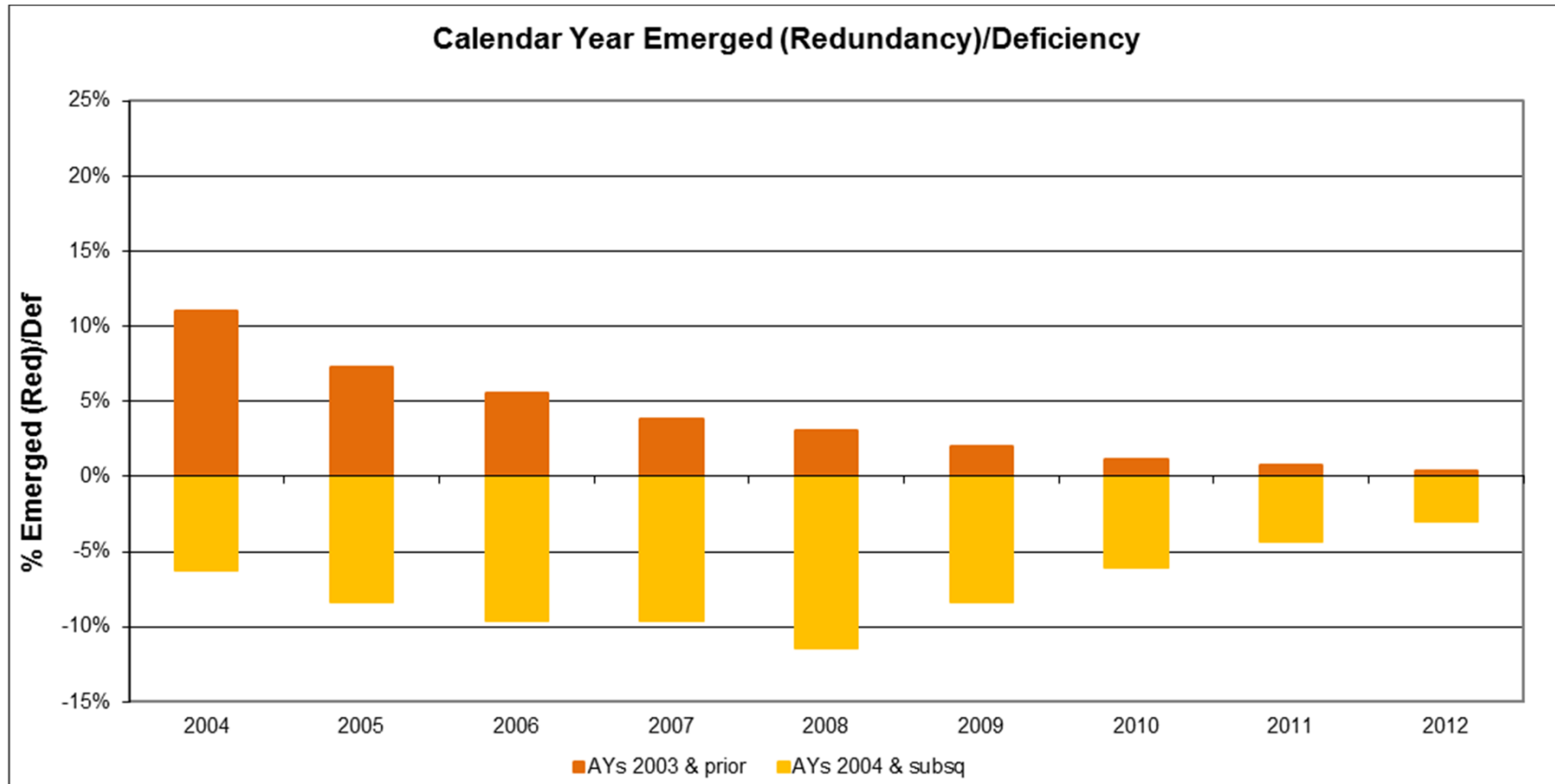
**Emerged (redundancy)/deficiency as a % of initial booked reserves**

<b>Calendar Year End</b>	<b>All</b>	<b>Other Liab</b>	<b>Med Mal</b>	<b>CMP</b>	<b>WC</b>	<b>PP AL</b>
2004	5%	21%	-16%	-3%	10%	-5%
2005	-1%	6%	-23%	-4%	2%	-6%
2006	-4%	0%	-27%	-11%	-1%	-6%
2007	-6%	-3%	-28%	-12%	-1%	-5%
2008	-8%	-2%	-26%	-10%	0%	-6%
2009	-6%	-2%	-23%	-7%	0%	-7%
2010	-5%	-3%	-18%	-4%	-1%	-6%
2011	-4%	-1%	-13%	-2%	0%	-4%
2012	-3%	-1%	-7%	-1%	0%	-1%

Source: SNL, 2013, Individual Company Statutory Statements

# *Calendar year-end hindsight (redundancy)/deficiency*

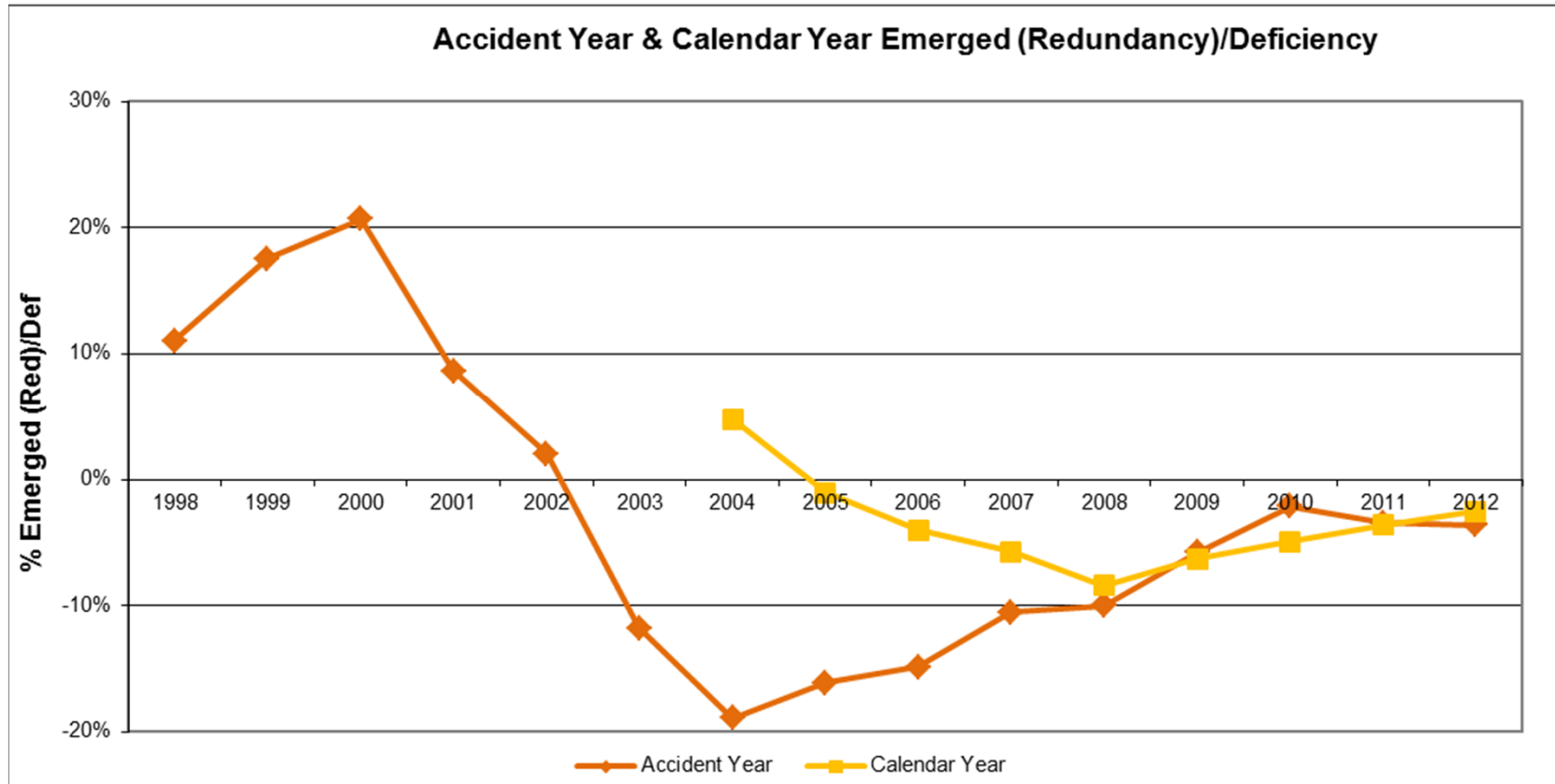
**Emerged (redundancy)/deficiency as a % of initial booked reserves**



Source: SNL, 2013, Individual Company Statutory Statements

# *Accident year and calendar year hindsight emergence*

**Emerged (redundancy)/deficiency as a % of initial booked reserves**



Source: SNL, 2013, Individual Company Statutory Statements

# Accident year loss ratio development

All Lines of Business Combined – heat map

AY	12	24	36	48	60	72	84	96	108	120	Hindsight
1992	0.800										0.735
1993	0.737										0.671
1994	0.779										0.735
1995	0.732										0.694
1996	0.738										0.715
1997	0.693										0.692
1998	0.715										0.757
1999	0.717										0.783
2000	0.729										0.807
2001	0.768										0.803
2002	0.678										0.686
2003	0.639										0.596
2004	0.629										0.559
2005	0.663										0.600
2006	0.597										0.546
2007	0.638										0.600
2008	0.733										0.691
2009	0.684										0.662
2010	0.684										0.676
2011	0.741										0.728
2012	0.691										0.678
2013	0.634										0.634

Source: SNL, 2013, Individual Company Statutory Statements

# Accident year loss ratio development

## Workers' Compensation – heat map

<u>AY</u>	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>	<u>60</u>	<u>72</u>	<u>84</u>	<u>96</u>	<u>108</u>	<u>120</u>	<u>Hindsight</u>
1998	0.765										0.895
1999	0.785										0.973
2000	0.767										0.962
2001	0.747										0.868
2002	0.708										0.783
2003	0.717										0.666
2004	0.703										0.566
2005	0.690										0.549
2006	0.681										0.596
2007	0.701										0.664
2008	0.718										0.728
2009	0.744										0.747
2010	0.773										0.811
2011	0.775										0.788
2012	0.746										0.732
2013	0.702										0.702

Source: SNL, 2013, Individual Company Statutory Statements



# ***Accident year loss ratio development***

## **Workers' Compensation**

Persistency of change from initial to second to latest valuation

<b>Workers' Compensation</b>			
<b><u>AY</u></b>	<b><u>Up / Up</u></b>	<b><u>Down / Down</u></b>	<b><u>Persistency</u></b>
2004	7%	62%	69%
2005	5%	68%	73%
2006	8%	61%	69%
2007	15%	49%	63%
2008	22%	29%	51%
2009	29%	38%	67%
2010	39%	27%	66%
2011	37%	25%	62%

Source: SNL, 2013, Individual Company Statutory Statements

# Accident year loss ratio development

## Medical Malpractice – heat map

<u>AY</u>	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>	<u>60</u>	<u>72</u>	<u>84</u>	<u>96</u>	<u>108</u>	<u>120</u>	<u>Hindsight</u>
1998	1.106										1.311
1999	1.040										1.282
2000	0.944										1.193
2001	1.030										1.187
2002	0.976										1.031
2003	0.898										0.736
2004	0.825										0.569
2005	0.783										0.541
2006	0.772										0.511
2007	0.760										0.536
2008	0.753										0.584
2009	0.782										0.646
2010	0.793										0.696
2011	0.795										0.749
2012	0.815										0.773
2013	0.791										0.791

Source: SNL, 2013, Individual Company Statutory Statements

# ***Accident year loss ratio development***

## **Medical Malpractice**

*Persistency of change from initial to second to latest valuation*

<b>Medical Malpractice</b>			
<b><u>AY</u></b>	<b><u>Up / Up</u></b>	<b><u>Down / Down</u></b>	<b><u>Persistency</u></b>
2004	11%	53%	64%
2005	11%	64%	74%
2006	6%	63%	69%
2007	3%	67%	71%
2008	9%	61%	69%
2009	11%	54%	65%
2010	10%	52%	62%
2011	21%	45%	66%

Source: SNL, 2013, Individual Company Statutory Statements

# Accident year loss ratio development

## Other Liability – heat map

<u>AY</u>	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>	<u>60</u>	<u>72</u>	<u>84</u>	<u>96</u>	<u>108</u>	<u>120</u>	<u>Hindsight</u>
1998	0.775										0.953
1999	0.758										1.065
2000	0.764										1.043
2001	0.840										1.038
2002	0.710										0.854
2003	0.682										0.634
2004	0.674										0.502
2005	0.645										0.502
2006	0.639										0.513
2007	0.663										0.582
2008	0.688										0.640
2009	0.694										0.666
2010	0.687										0.665
2011	0.681										0.683
2012	0.662										0.664
2013	0.633										0.633

Source: SNL, 2013, Individual Company Statutory Statements

## ***Accident year loss ratio development***

### **Other Liability**

*Persistency of change from initial to second to latest valuation*

<b>Other Liability</b>			
<b><u>AY</u></b>	<b><u>Up / Up</u></b>	<b><u>Down / Down</u></b>	<b><u>Persistency</u></b>
2004	11%	57%	68%
2005	10%	54%	64%
2006	11%	47%	58%
2007	11%	43%	54%
2008	18%	36%	54%
2009	19%	38%	57%
2010	19%	32%	51%
2011	29%	34%	63%

Source: SNL, 2013, Individual Company Statutory Statements

# Accident year loss ratio development

## Commercial Multiple Peril – heat map

<u>AY</u>	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>	<u>60</u>	<u>72</u>	<u>84</u>	<u>96</u>	<u>108</u>	<u>120</u>	<u>Hindsight</u>
1998	0.738										0.803
1999	0.736										0.809
2000	0.712										0.808
2001	0.746										0.766
2002	0.603										0.585
2003	0.560										0.510
2004	0.587										0.525
2005	0.613										0.558
2006	0.527										0.469
2007	0.548										0.499
2008	0.693										0.654
2009	0.604										0.599
2010	0.640										0.636
2011	0.748										0.743
2012	0.665										0.656
2013	0.567										0.567

Source: SNL, 2013, Individual Company Statutory Statements

## ***Accident year loss ratio development***

### **Commercial Multiple Peril**

Persistency of change from initial to second to latest valuation

<b>Commercial Multiple Peril</b>			
<b><u>AY</u></b>	<b><u>Up / Up</u></b>	<b><u>Down / Down</u></b>	<b><u>Persistency</u></b>
2004	14%	48%	62%
2005	9%	50%	59%
2006	9%	58%	67%
2007	9%	53%	62%
2008	17%	41%	58%
2009	18%	42%	60%
2010	25%	36%	60%
2011	28%	32%	60%

Source: SNL, 2013, Individual Company Statutory Statements

## ***Accident year hindsight (redundancy)/deficiency***

**Emerged (redundancy)/deficiency as a % of initial booked reserves**

<b>Accident Year</b>	<b>All</b>	<b>Other Liab</b>	<b>Med Mal</b>	<b>CMP</b>	<b>WC</b>	<b>PP AL</b>
1998	11%	26%	19%	15%	23%	-4%
1999	18%	47%	24%	17%	32%	0%
2000	21%	44%	28%	23%	34%	2%
2001	9%	27%	16%	4%	21%	-1%
2002	2%	24%	6%	-5%	13%	-3%
2003	-12%	-8%	-18%	-14%	-9%	-9%
2004	-19%	-28%	-32%	-16%	-23%	-11%
2005	-16%	-25%	-32%	-13%	-25%	-10%
2006	-15%	-22%	-35%	-17%	-15%	-6%
2007	-11%	-14%	-30%	-14%	-6%	-5%
2008	-10%	-8%	-23%	-9%	2%	-6%
2009	-6%	-5%	-18%	-2%	1%	-6%
2010	-2%	-3%	-13%	-1%	6%	-4%
2011	-3%	0%	-6%	-1%	2%	-3%
2012	-4%	0%	-5%	-2%	-2%	-2%

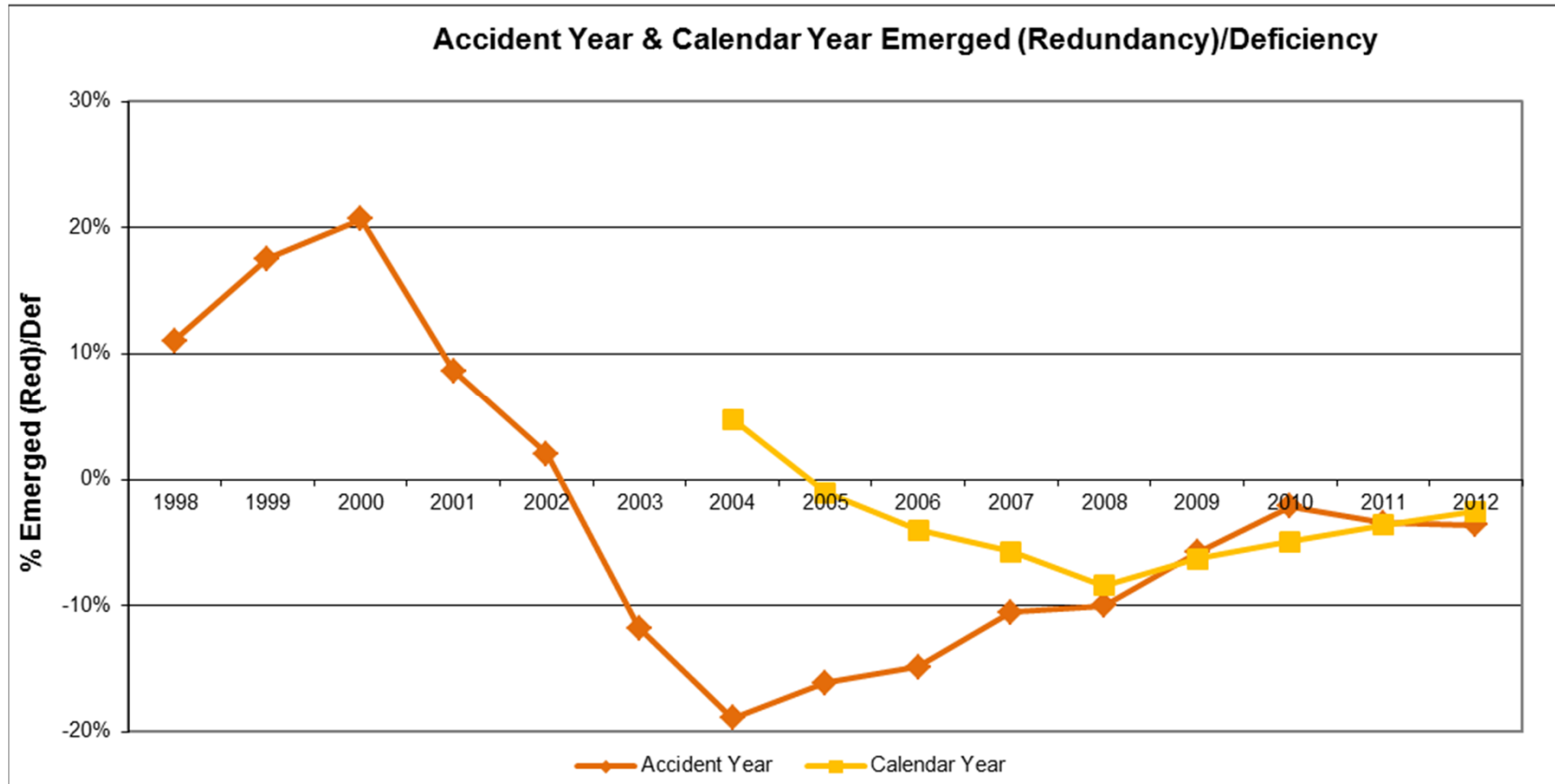
Source: SNL, 2013, Individual Company Statutory Statements



# *Reserve development drivers*

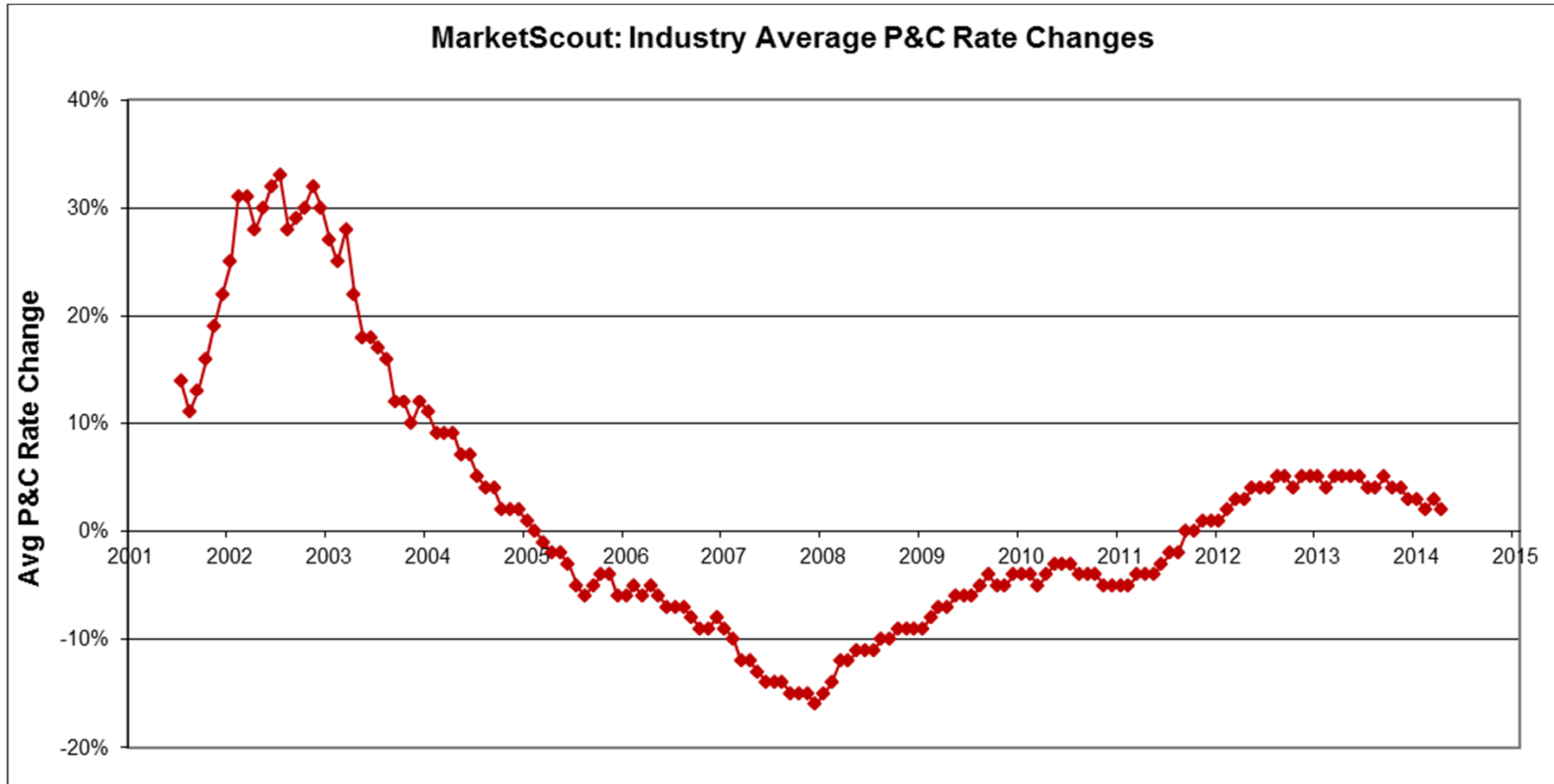
# *Accident year and calendar year hindsight emergence*

**Emerged (redundancy)/deficiency as a % of initial booked reserves**



Source: SNL, 2013, Individual Company Statutory Statements

# *Industry average rate changes*



Source: [www.MarketScout.com](http://www.MarketScout.com)

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## *What are the drivers of reserve development?*

1. Classic uncertainty
2. Emergence of unknowables

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## ***What are the drivers of reserve development?***

1. Classic uncertainty
2. Emergence of unknowables
3. Effective monitoring of knowables?
4. Estimation of pricing impacts?
5. Responsiveness to emerging experience?
6. Other considerations?

# *Grading the industry*

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## *Grading the industry development*

- Inspect distribution of companies' reserve development by line of business
- Grade the industry development based on ranges of development

# ***Distribution of Company Reserve Development***

## ***All Lines of Business Combined***

			2004	2005	2006	2007	2008	2009	2010	2011	2012
			Reserve Development								
<u>low</u>	<u>high</u>	<u>grade</u>	<i>Distribution of companies to grade ranges</i>								
-100%	-25%	F-	278	340	385	370	343	307	223	167	62
-25%	-20%	E-	93	87	101	97	87	89	97	66	49
-20%	-15%	D-	98	104	122	143	126	129	135	105	70
-15%	-10%	C-	80	138	149	185	144	184	149	157	129
-10%	-5%	B-	149	141	141	149	199	198	210	200	260
-5%	5%	A	253	257	222	200	260	257	349	466	658
5%	10%	B	79	57	47	51	70	66	77	70	112
10%	15%	C	62	34	42	52	44	54	51	65	27
15%	20%	D	42	45	45	42	39	41	51	56	24
20%	25%	E	26	19	18	15	20	24	20	25	18
25%	100%	F	118	92	73	73	69	63	72	59	35
			1278	1314	1345	1377	1401	1412	1434	1436	1444
			<i>Industry development &amp; associated grade</i>								
			4.8%	-1.1%	-4.0%	-5.7%	-8.4%	-6.3%	-5.0%	-3.6%	-2.5%
			A	A	A	B-	B-	B-	A	A	A

Source: SNL, 2013, Individual Company Statutory Statements



# ***Distribution of Company Reserve Development***

## ***Other Liability***

			2004	2005	2006	2007	2008	2009	2010	2011	2012
			Reserve Development								
<u>low</u>	<u>high</u>	<u>grade</u>	<i>Distribution of companies to grade ranges</i>								
-100%	-25%	F-	106	133	149	152	149	134	108	68	41
-25%	-20%	E-	32	30	39	68	44	53	48	30	21
-20%	-15%	D-	24	38	102	69	51	40	55	46	21
-15%	-10%	C-	20	47	49	55	96	70	92	50	41
-10%	-5%	B-	35	43	21	37	35	63	37	72	79
-5%	5%	A	76	86	47	40	45	61	110	166	257
5%	10%	B	18	19	25	14	32	25	18	33	36
10%	15%	C	61	30	11	31	21	13	21	16	20
15%	20%	D	8	9	15	14	10	30	17	7	6
20%	25%	E	6	6	23	18	18	8	7	15	6
25%	100%	F	109	84	58	52	57	58	51	47	31
			495	525	539	550	558	555	564	550	559
			<i>Industry development &amp; associated grade</i>								
			21.3%	6.1%	-0.2%	-3.3%	-1.8%	-2.3%	-3.3%	-1.3%	-1.4%
			E	B	A	A	A	A	A	A	A

Source: SNL, 2013, Individual Company Statutory Statements

# ***Distribution of Company Reserve Development***

## ***Medical Malpractice***

2004	2005	2006	2007	2008	2009	2010	2011	2012
Reserve Development								

<u>low</u>	<u>high</u>	<u>grade</u>	<i>Distribution of companies to grade ranges</i>								
-100%	-25%	F-	82	101	120	119	121	109	90	62	19
-25%	-20%	E-	10	11	11	7	10	17	16	27	13
-20%	-15%	D-	4	8	7	10	7	12	15	22	20
-15%	-10%	C-	2	5	12	10	7	9	25	31	44
-10%	-5%	B-	14	7	3	4	7	15	7	12	44
-5%	5%	A	11	17	12	12	17	8	17	19	40
5%	10%	B	3	6	15	12	8	3	6	7	7
10%	15%	C	5	15	0	9	6	3	2	4	3
15%	20%	D	20	3	6	2	2	9	8	0	5
20%	25%	E	1	0	3	0	1	5	3	3	2
25%	100%	F	13	10	4	7	9	7	12	15	6
			165	183	193	192	195	197	201	202	203

### *Industry development & associated grade*

-16.4%	-22.8%	-27.1%	-27.9%	-26.1%	-23.3%	-18.1%	-12.8%	-7.5%
D-	E-	F-	F-	F-	E-	D-	C-	B-

Source: SNL, 2013, Individual Company Statutory Statements

# ***Distribution of Company Reserve Development***

## ***Commercial Multiple Peril***

			2004	2005	2006	2007	2008	2009	2010	2011	2012
			Reserve Development								
<u>low</u>	<u>high</u>	<u>grade</u>	<i>Distribution of companies to grade ranges</i>								
-100%	-25%	F-	65	83	118	86	94	83	63	42	25
-25%	-20%	E-	16	54	18	64	25	35	22	29	10
-20%	-15%	D-	45	24	43	43	35	42	23	15	16
-15%	-10%	C-	19	25	36	29	67	29	33	22	46
-10%	-5%	B-	33	18	26	19	39	40	62	61	48
-5%	5%	A	60	60	58	82	45	72	94	108	161
5%	10%	B	29	29	27	9	13	18	18	21	32
10%	15%	C	19	6	17	15	20	15	11	29	14
15%	20%	D	8	11	6	7	10	20	15	23	30
20%	25%	E	14	7	6	11	8	12	9	7	7
25%	100%	F	64	68	40	27	34	19	33	28	11
			372	385	395	392	390	385	383	385	400
			<i>Industry development &amp; associated grade</i>								
			-2.6%	-4.5%	-10.6%	-12.1%	-10.0%	-7.1%	-3.9%	-1.6%	-1.4%
			A	A	C-	C-	B-	B-	A	A	A

Source: SNL, 2013, Individual Company Statutory Statements

# ***Distribution of Company Reserve Development Workers' Compensation***

			2004	2005	2006	2007	2008	2009	2010	2011	2012
			Reserve Development								
<u>low</u>	<u>high</u>	<u>grade</u>	<i>Distribution of companies to grade ranges</i>								
-100%	-25%	F-	63	101	123	104	86	68	45	32	8
-25%	-20%	E-	28	19	39	25	30	24	21	9	7
-20%	-15%	D-	22	27	29	37	32	29	41	29	8
-15%	-10%	C-	34	54	32	30	30	45	28	42	30
-10%	-5%	B-	34	40	56	118	78	74	58	59	73
-5%	5%	A	129	120	107	84	130	139	188	244	332
5%	10%	B	14	33	30	17	22	38	31	25	31
10%	15%	C	44	13	15	17	21	22	46	43	10
15%	20%	D	17	13	9	14	23	17	8	12	22
20%	25%	E	10	10	14	2	5	8	13	5	2
25%	100%	F	62	45	37	43	40	31	27	17	5
			457	475	491	491	497	495	506	517	528
			<i>Industry development &amp; associated grade</i>								
			10.0%	2.0%	-0.7%	-1.0%	-0.3%	-0.4%	-0.5%	-0.2%	-0.4%
			C	A	A	A	A	A	A	A	A

Source: SNL, 2013, Individual Company Statutory Statements



# ***Distribution of Company Reserve Development***

## ***Private Passenger Auto Liability***

			2004	2005	2006	2007	2008	2009	2010	2011	2012
			Reserve Development								
<u>low</u>	<u>high</u>	<u>grade</u>	<i>Distribution of companies to grade ranges</i>								
-100%	-25%	F-	78	91	72	57	51	31	28	15	8
-25%	-20%	E-	26	27	44	21	26	24	9	5	4
-20%	-15%	D-	47	59	63	67	33	49	35	33	11
-15%	-10%	C-	106	89	91	72	101	70	65	42	20
-10%	-5%	B-	78	82	73	88	93	90	69	62	61
-5%	5%	A	84	85	95	117	126	138	181	217	254
5%	10%	B	24	19	16	22	10	34	44	32	64
10%	15%	C	23	20	12	21	18	10	21	17	30
15%	20%	D	7	5	10	7	12	15	17	28	21
20%	25%	E	4	12	5	7	9	5	13	17	5
25%	100%	F	22	14	24	22	20	28	26	26	11
			499	503	505	501	499	494	508	494	489
			<i>Industry development &amp; associated grade</i>								
			-4.9%	-6.4%	-5.6%	-5.2%	-6.4%	-6.7%	-5.7%	-3.8%	-1.3%
			A	B-	B-	B-	B-	B-	B-	A	A

Source: SNL, 2013, Individual Company Statutory Statements



## ***Accident year hindsight (redundancy)/deficiency***

**Emerged (redundancy)/deficiency as a % of initial booked reserves**

<b>Accident Year</b>	<b>All</b>	<b>Other Liab</b>	<b>Med Mal</b>	<b>CMP</b>	<b>WC</b>	<b>PP AL</b>
1998	11% C	26% F	19% D	15% C	23% E	-4% A
1999	18% D	47% F	24% E	17% D	32% F	0% A
2000	21% E	44% F	28% F	23% E	34% F	2% A
2001	9% B	27% F	16% D	4% A	21% E	-1% A
2002	2% A	24% E	6% B	-5% A	13% C	-3% A
2003	-12% C-	-8% B-	-18% D-	-14% C-	-9% B-	-9% B-
2004	-19% D-	-28% F-	-32% F-	-16% D-	-23% E-	-11% C-
2005	-16% D-	-25% E-	-32% F-	-13% C-	-25% E-	-10% B-
2006	-15% C-	-22% E-	-35% F-	-17% D-	-15% D-	-6% B-
2007	-11% C-	-14% C-	-30% F-	-14% C-	-6% B-	-5% A
2008	-10% C-	-8% B-	-23% E-	-9% B-	2% A	-6% B-
2009	-6% B-	-5% A	-18% D-	-2% A	1% A	-6% B-
2010	-2% A	-3% A	-13% C-	-1% A	6% B	-4% A
2011	-3% A	0% A	-6% B-	-1% A	2% A	-3% A
2012	-4% A	0% A	-5% B-	-2% A	-2% A	-2% A

Source: SNL, 2013, Individual Company Statutory Statements

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## *Grading the industry development*

- Distribution of companies to grade ranges varies by line of business
- Note that more recent calendar year reserve development appears to get better grades – why?
  - Are reserves now more adequate than they were 10 years ago?
  - Is it too early to know?
- Underlying accident year reserve development reveals poor grades

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## *What are the drivers of reserve development?*

1. Classic uncertainty
2. Emergence of unknowables
3. Effective monitoring of knowables?
4. Estimation of pricing impacts?
5. Responsiveness to emerging experience?
6. Other considerations?



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***Thank you***