Antitrust Notice

- The Casualty Actuarial Society is committed to adhering strictly to the letter and spirit of the antitrust laws. Seminars conducted under the auspices of the CAS are designed solely to provide a forum for the expression of various points of view on topics described in the programs or agendas for such meetings.

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Aggregate Loss Reserve Analysis by Accounting Date

Prepared for: Casualty Actuarial Society Annual Meeting

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November 5, 2013

Traditional Development Methods

Basic loss reserving methods typically:

- Begin with individual accident year claim experience

- Develop each accident year to estimated ultimate value

- Reduce estimated ultimates by cumulative claim payments to date

- Result in an unpaid claim estimate for each accident year as of that date

- Sum individual accident year unpaid claim estimates to arrive at aggregate unpaid claim estimate as of current accounting date.

Potential Drawbacks

- Indirect; no visible order-of-magnitude sense of aggregate unpaid claim estimate

- Aggregate unpaid claim estimate may be unduly volatile; targets individual years

- Often highly leveraged

Aggregate Loss Reserve Analysis by Accounting Date

How might we estimate aggregate unpaid claims as of current accounting date from historical aggregate emergence of claims unpaid as of prior accounting dates?

Traditional Loss Payments Chain-Ladder Representation

NO NOISE IN PAYMENT PATTERN

CUMULATIVE LOSS PAYMENTS BY ACCIDENT YEAR
($000 Omitted)

Accident Year	As of 1 Year		As of 2 Years		As of 3 Years		As of 4 Years		As of 5 Years		As of 6 Years		As of 7 Years		As of 8 Years		As of 9 Years		As of 10 Years
1995																	57,014	1.032609	58,873
1996															63,795	1.051429	67,075	1.032609	69,263
1997													55,873	1.067073	59,621	1.051429	62,687	1.032609	64,731
1998											51,620	1.093333	56,438	1.067073	60,223	1.051429	63,320	1.032609	65,385
1999									45,210	1.119403	50,608	1.093333	55,331	1.067073	59,042	1.051429	62,079	1.032609	64,103
2000							43,707	1.175439	51,375	1.119403	57,509	1.093333	62,876	1.067073	67,094	1.051429	70,544	1.032609	72,845
2001					39,692	1.295455	51,420	1.175439	60,441	1.119403	67,658	1.093333	73,972	1.067073	78,934	1.051429	82,993	1.032609	85,700
2002			27,900	1.466667	40,920	1.295455	53,010	1.175439	62,310	1.119403	69,750	1.093333	76,260	1.067073	81,375	1.051429	85,560	1.032609	88,350
2003	15,000	2.000000	30,000	1.466667	44,000	1.295455	57,000	1.175439	67,000	1.119403	75,000	1.093333	82,000	1.067073	87,500	1.051429	92,000	1.032609	95,000
2004	15,300	2.000000	30,600	1.466667	44,880	1.295455	58,140	1.175439	68,340	1.119403	76,500	1.093333	83,640	1.067073	89,250	1.051429	93,840		
2005	14,841	2.000000	29,682	1.466667	43,534	1.295455	56,396	1.175439	66,290	1.119403	74,205	1.093333	81,131	1.067073	86,573				
2006	15,731	2.000000	31,463	1.466667	46,146	1.295455	59,780	1.175439	70,267	1.119403	78,657	1.093333	85,999						
2007	15,889	2.000000	31,778	1.466667	46,607	1.295455	60,377	1.175439	70,970	1.119403	79,444								
2008	14,141	2.000000	28,282	1.466667	41,480	1.295455	53,736	1.175439	63,163										
2009	18,383	2.000000	36,767	1.466667	53,924	1.295455	69,857												
2010	22,428	2.000000	44,855	1.466667	65,788														
2011	23,549	2.000000	47,098																
2012	25,904																		

	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
Average LDF	2.000000	1.466667	1.295455	1.175439	1.119403	1.093333	1.067073	1.051429	1.032609
Average CDF	6.333333	3.166667	2.159091	1.666667	1.417910	1.266667	1.158537	1.085714	1.032609
Weighted LDF	2.000000	1.466667	1.295455	1.175439	1.119403	1.093333	1.067073	1.051429	1.032609
Weighted CDF	6.333333	3.166667	2.159091	1.666667	1.417910	1.266667	1.158537	1.085714	1.032609

Traditional Payment Development Method

Exhibit 1
Table 3

NO NOISE IN PAYMENT PATTERN

TRADITIONAL PAYMENT DEVELOPMENT METHOD BY ACCIDENT YEAR
($000 Omitted)

(1)	(2)	(3)	(4)= (2)x(3)	(5)= (4)-(2)
	Cumulative	Cumulative	Payment Development	Unpaid
Accident	Loss Payments	Loss Development	Method Estimated	Loss Estimate
Year	as of 12/31/12	Factor to Ultimate	Ultimate Losses	as of 12/31/12
2003	95,000	1.000000	95,000	0
2004	93,840	1.032609	96,900	3,060
2005	86,573	1.085714	93,993	7,421
2006	85,999	1.158537	99,633	13,634
2007	79,444	1.266667	100,629	21,185
2008	63,163	1.417910	89,560	26,397
2009	69,857	1.666667	116,428	46,571
2010	65,788	2.159091	142,042	76,254
2011	47,098	3.166667	149,144	102,046
2012	25,904	6.333333	164,058	138,154
Total	712,665		1,147,386	**434,721**

Derive Accounting Date Loss Payments Emerged Representation

Exhibit 1
Table 1

NO NOISE IN PAYMENT PATTERN

CUMULATIVE LOSS PAYMENTS BY ACCIDENT YEAR
($000 Omitted)

Accident Year	As of 1 Year	As of 2 Years	As of 3 Years	As of 4 Years	As of 5 Years	As of 6 Years	As of 7 Years	As of 8 Years	As of 9 Years	As of 10 Years
1995									57,014	58,873
1996								63,795	67,075	69,263
1997							55,873	59,621	62,687	64,731
1998						51,620	56,438	60,223	63,320	65,385
1999					45,210	50,608	55,331	59,042	62,079	64,103
2000				43,707	51,375	57,509	62,876	67,094	70,544	72,845
2001			39,692	51,420	60,441	67,658	73,972	78,934	82,993	85,700
2002		27,900	40,920	53,010	62,310	69,750	76,260	81,375	85,560	88,350
2003	15,000	30,000	44,000	57,000	67,000	75,000	82,000	87,500	92,000	95,000
2004	15,300	30,600	44,880	58,140	68,340	76,500	83,640	89,250	93,840	
2005	14,841	29,682	43,534	56,396	66,290	74,205	81,131	86,573		
2006	15,731	31,463	46,146	59,780	70,267	78,657	85,999			
2007	15,889	31,778	46,607	60,377	70,970	79,444				
2008	14,141	28,282	41,480	53,736	63,163					
2009	18,383	36,767	53,924	69,857						
2010	22,428	44,855	65,788							
2011	23,549	47,098								
2012	25,904									

Year-End Accounting Date 2009 Cumulative Loss Payments Emerged as of 12/31/12:

Cumulative Payments as of 12/31/12	Cumulative Payments as of 12/31/09	Payments during 2010-12
85,700 -	82,993 =	2,707
88,350 -	81,375 =	6,975
95,000 -	82,000 =	13,000
93,840 -	76,500 =	17,340
86,573 -	66,290 =	20,283
85,999 -	59,780 =	26,219
79,444 -	46,607 =	32,837
63,163 -	28,282 =	34,881
69,857 -	18,383 =	51,474
		205,714

Accounting Date Loss Payments Representation

Exhibit 1
Table 4

NO NOISE IN PAYMENT PATTERN

CUMULATIVE LOSS PAYMENTS EMERGED BY YEAR-END ACCOUNTING DATE
 ($000 Omitted)

Cumulative Emerged Payments of Losses which were Unpaid as of Year-End Accounting Date
Derived by appropriate accumulation of Cumulative Loss Payments of Exhibit 1, Table 1

Year-End Accounting Date	As of 1 Year		As of 2 Years		As of 3 Years		As of 4 Years		As of 5 Years		As of 6 Years		As of 7 Years		As of 8 Years		As of 9 Years
2003	66,519	1.826948	121,526	1.359896	165,263	1.200125	198,337	1.125778	223,283	1.082742	241,758	1.051255	254,149	1.028684	261,439	1.011475	264,439
2004	70,308	1.825186	128,324	1.361063	174,658	1.201230	209,804	1.126951	236,439	1.082606	255,970	1.050396	268,870	1.028229	276,460		
2005	72,858	1.826059	133,043	1.360851	181,051	1.201759	217,580	1.126144	245,027	1.080913	264,852	1.049204	277,884				
2006	75,916	1.825794	138,608	1.361905	188,770	1.200954	226,705	1.124461	254,920	1.079919	275,293						
2007	78,580	1.827083	143,572	1.360128	195,277	1.198736	234,085	1.123233	262,932								
2008	79,133	1.820169	144,036	1.354522	195,100	1.196178	233,374										
2009	83,286	1.819126	151,508	1.357781	205,714												
2010	90,649	1.828898	165,788														
2011	98,688																
2012																	?

different accident year exposures result in unequal LDFs within columns

Recast Accounting Date Actuarial Assumptions

➢ A1: Requisite claim and exposure experience is available.

➢ A2: Accident year payments subsequent to first year of development follow same payment pattern.

➢ A3: When case reserves are used as loss experience, there has been no change in adequacy of case reserves.

➢ A4: Exposure metric at each stage of development provides reasonable measure of relative accident year exposure to remaining development.

➢ A5: Historical experience statistically credible.

➢ A6: Historical experience homogeneous.

➢ A7: Presence or absence of large claims does not distort historical experience.

Case Reserves as Exposure Measure

Exhibit 1
Table 2

NO NOISE IN PAYMENT PATTERN

CASE RESERVES BY ACCIDENT YEAR
($000 Omitted)

Accident Year	As of 1 Year	As of 2 Years	As of 3 Years	As of 4 Years	As of 5 Years	As of 6 Years	As of 7 Years	As of 8 Years	As of 9 Years
1995									1,239
1996								2,916	1,458
1997							4,088	2,726	1,363
1998						6,194	4,130	2,753	1,377
1999					7,422	6,073	4,049	2,699	1,350
2000				9,968	8,435	6,901	4,601	3,067	1,534
2001			15,336	11,727	9,923	8,119	5,413	3,608	1,804
2002		18,600	15,810	12,090	10,230	8,370	5,580	3,720	1,860
2003	25,000	20,000	17,000	13,000	11,000	9,000	6,000	4,000	2,000
2004	25,500	20,400	17,340	13,260	11,220	9,180	6,120	4,080	2,040
2005	24,735	19,788	16,820	12,862	10,883	8,905	5,936	3,958	
2006	26,219	20,975	17,829	13,634	11,536	9,439	6,293		
2007	26,481	21,185	18,007	13,770	11,652	9,533			
2008	23,568	18,855	16,026	12,256	10,370				
2009	30,639	24,511	20,834	15,932					
2010	37,379	29,904	25,418						
2011	39,248	31,399							
2012	43,173								

Year-End Accounting Date 2009
Cumulative Loss Payments Emerged as of 12/31/12
Recast at Year-End 2012 Exposure Level:

Year-End 2012 Accounting Date Exposure	Year-End 2009 Accounting Date Exposure		Actual Payments during 2010-12		Recast Payments during 2010-12
2,040 /	1,804	x	2,707	=	3,061
3,958 /	3,720	x	6,975	=	7,421
6,293 /	6,000	x	13,000	=	13,635
9,533 /	9,180	x	17,340	=	18,007
10,370 /	10,883	x	20,283	=	19,327
15,932 /	13,634	x	26,219	=	30,638
25,418 /	18,007	x	32,837	=	46,351
31,399 /	18,855	x	34,881	=	58,087
43,173 /	30,639	x	51,474	=	72,531
			205,714		269,056

Recast Accounting Date Loss Payments Emerged Representation

Exhibit 1
Table 5

NO NOISE IN PAYMENT PATTERN OR CASE RESERVES

LOSS PAYMENTS EMERGED BY YEAR-END ACCOUNTING DATE RECAST AT 2012 YEAR-END ACCOUNTING DATE EXPOSURE LEVEL
USING CASE RESERVES AS EXPOSURE MEASURE
($000 Omitted)

Cumulative Emerged Payments of Losses which were Unpaid as of Year-End Accounting Date
Derived by appropriate accumulation of Cumulative Loss Payments of Exhibit 1, Table 1 Exposure Adjusted to 2012 Year-End Accounting Date Exposure Level

> Same as traditional Payment Development Method!

Year-End Accounting Date	As of 1 Year		As of 2 Years		As of 3 Years		As of 4 Years		As of 5 Years		As of 6 Years		As of 7 Years		As of 8 Years		As of 9 Years
2003	107,813	1.829724	197,268	1.363909	269,056	1.202395	323,511	1.127883	364,883	1.085310	396,011	1.053151	417,059	1.029926	429,540	1.012061	434,721
2004	107,813	1.829724	197,268	1.363909	269,056	1.202395	323,511	1.127883	364,883	1.085310	396,011	1.053151	417,059	1.029926	429,540		
2005	107,813	1.829724	197,268	1.363909	269,056	1.202395	323,511	1.127883	364,883	1.085310	396,011	1.053151	417,059				
2006	107,813	1.829724	197,268	1.363909	269,056	1.202395	323,511	1.127883	364,883	1.085310	396,011						
2007	107,813	1.829724	197,268	1.363909	269,056	1.202395	323,511	1.127883	364,883								
2008	107,813	1.829724	197,268	1.363909	269,056	1.202395	323,511										
2009	107,813	1.829724	197,268	1.363909	269,056												
2010	107,813	1.829724	197,268														
2011	107,813																
2012																	434,721

all LDFs identical within each column

	As of 1 Year	As of 2 Years	As of 3 Years	As of 4 Years	As of 5 Years	As of 6 Years	As of 7 Years	As of 8 Years	As of 9 Years
Average LDF	1.829724	1.363909	1.202395	1.127883	1.085310	1.053151	1.029926	1.012061	
Average CDF	4.032178	2.203708	1.615729	1.343759	1.191399	1.097750	1.042348	1.012061	
Weighted LDF	1.829724	1.363909	1.202395	1.127883	1.085310	1.053151	1.029926	1.012061	
Weighted CDF	4.032178	2.203708	1.615729	1.343759	1.191399	1.097750	1.042348	1.012061	

Accounting Date Payment Development Unpaid Loss Estimate

Exhibit 1
Table 6

NO NOISE IN PAYMENT PATTERN OR CASE RESERVES

unwinding exposure adjustment results in same accident year unpaid loss estimates as traditional payment development method

ACCOUNTING DATE PAYMENT DEVELOPMENT INDICATED AGGREGATE UNPAID LOSS AS OF 12/31/12;
ALLOCATION OF TOTAL UNPAID CLAIM ESTIMATE TO ACCIDENT YEAR
($000 Omitted)

(1) Year-End Accounting Date	(2) Recast Cumulative Loss Payments As of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(3) Weighted Cumulative Development Factor	(4)= (2)x(3) Indicated Total Emergence at 2012 Year-End Accounting Date Exposure Level	(5)= (4)-(2) Payment Development Indicated Unpaid Loss as of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(6) Accident Year	(7) Accident Year Allocation of Aggregate Accounting Date Payment Development Indicated Unpaid Loss as of 12/31/12
2003	434,721	1.000000	434,721		2003	
2004	429,540	1.012061	434,721	5,181	2004	3,060
2005	417,059	1.042348	434,721	17,662	2005	7,421
2006	396,011	1.097750	434,721	38,710	2006	13,634
2007	364,883	1.191399	434,721	69,838	2007	21,185
2008	323,511	1.343759	434,721	111,210	2008	26,397
2009	269,056	1.615729	434,721	165,665	2009	46,571
2010	197,268	2.203708	434,721	237,453	2010	76,254
2011	107,813	4.032178	434,721	326,908	2011	102,046
2012			434,721 *	434,721	2012	138,154
					Total	**434,721**

Recast Loss Payments Emerged Accounting Date Representation

Exhibit 2
Table 4

NOISE IN PAYMENT PATTERN AND CASE RESERVES

LOSS PAYMENTS EMERGED BY YEAR-END ACCOUNTING DATE RECAST AT 2012 YEAR-END ACCOUNTING DATE EXPOSURE LEVEL
 USING CASE RESERVES AS EXPOSURE MEASURE
 ($000 Omitted)

Cumulative Emerged Payments of Losses which were Unpaid as of Year-End Accounting Date
 Derived by appropriate accumulation of Cumulative Loss Payments of Exhibit 2, Table 1 Exposure Adjusted to 2012 Year-End Accounting Date Exposure Level

Year-End Accounting Date	As of 1 Year		As of 2 Years		As of 3 Years		As of 4 Years		As of 5 Years		As of 6 Years		As of 7 Years		As of 8 Years		As of 9 Years
2003	110,337	1.793203	197,857	1.346831	266,480	1.206838	321,598	1.127627	362,643	1.088906	394,884	1.052614	415,660	1.028032	427,312	1.011532	432,240
2004	104,450	1.831614	191,313	1.396273	267,125	1.205181	321,934	1.137304	366,137	1.085009	397,262	1.056637	419,762	1.028778	431,841		
2005	105,407	1.863660	196,442	1.385869	272,243	1.212790	330,174	1.131679	373,651	1.087079	406,188	1.050341	426,636				
2006	107,687	1.854530	199,709	1.371618	273,924	1.201549	329,133	1.127578	371,123	1.079253	400,536						
2007	111,076	1.844031	204,827	1.356930	277,936	1.199481	333,378	1.121370	373,841								
2008	112,354	1.808011	203,136	1.354758	275,201	1.195522	329,009										
2009	108,263	1.815070	196,504	1.359876	267,222												
2010	106,421	1.827327	194,466														
2011	107,469																
2012																	?

LDFs within each
column on same basis

Hmmm…

somewhere in the low to mid $400 million range

	As of 1 Year	As of 2 Years	As of 3 Years	As of 4 Years	As of 5 Years	As of 6 Years	As of 7 Years	As of 8 Years
Average LDF	1.829681	1.367451	1.203560	1.129112	1.085062	1.053198	1.028405	1.011532
Average CDF	4.042031	2.209145	1.615521	1.342285	1.188798	1.095604	1.040264	1.011532
Weighted LDF	1.829531	1.366944	1.203286	1.128899	1.084878	1.053156	1.028416	1.011532
Weighted CDF	4.037726	2.206973	1.614531	1.341768	1.188563	1.095573	1.040275	1.011532

Accounting Date Payment Development Unpaid Loss Estimate

Exhibit 2

Table 5

NOISE IN PAYMENT PATTERN AND CASE RESERVES

ACCOUNTING DATE PAYMENT DEVELOPMENT INDICATED AGGREGATE UNPAID LOSS AS OF 12/31/12;
ALLOCATION OF TOTAL UNPAID CLAIM ESTIMATE TO ACCIDENT YEAR
($000 Omitted)

(1) Year-End Accounting Date	(2) Recast Cumulative Loss Payments As of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(3) Weighted Cumulative Development Factor	(4)= (2)x(3) Indicated Total Emergence at 2012 Year-End Accounting Date Exposure Level	(5)= (4)-(2) Payment Development Indicated Unpaid Loss as of 12/31/12 at 2012 Year-End Accounting Date Exposure Level	(6) Accident Year	(7) Accident Year Allocation of Aggregate Accounting Date Payment Development Indicated Unpaid Loss as of 12/31/12
2003	432,240	1.000000	432,240		2003	
2004	431,841	1.011532	436,821	4,980	2004	2,924
2005	426,636	1.040275	443,819	17,183	2005	7,107
2006	400,536	1.095573	438,816	38,280	2006	13,814
2007	373,841	1.188563	444,333	70,492	2007	21,790
2008	329,009	1.341768	441,453	112,444	2008	26,195
2009	267,222	1.614531	431,437	164,216	2009	46,535
2010	194,466	2.206973	429,180	234,715	2010	75,706
2011	107,469	4.037726	433,929	326,460	2011	99,442
2012			433,929 *	433,929	2012	140,416
					Total	**433,929**

Recast Reported Losses Emerged Accounting Date Representation

Exhibit 4
Table 3

NOISE IN PAYMENT PATTERN AND CASE RESERVES

CUMULATIVE REPORTED LOSSES EMERGED BY YEAR-END ACCOUNTING DATE RECAST AT 2012 YEAR-END ACCOUNTING DATE EXPOSURE LEVEL

USING CASE RESERVES AS EXPOSURE MEASURE

($000 Omitted)

Cumulative Emerged Reported Losses which were Unpaid as of Year-End Accounting Date
Derived as Exhibit 2, Table 4 plus Case Reserves of Exhibit 2, Table 2 Adjusted to 2012 Year-End Accounting Date Exposure Level

equals recast aggregate case reserves

Year-End Accounting Date	After 0 Years		After 1 Year		After 2 Years		After 3 Years		After 4 Years		After 5 Years		After 6 Years		After 7 Years		After 8 Years		After 9 Years
2003	148,006	1.520684	225,070	1.276014	287,193	1.168440	335,568	1.099595	368,988	1.072108	395,595	1.047466	414,373	1.026993	425,558	1.011864	430,607	1.003791	432,240
2004	148,006	1.489210	220,412	1.289541	284,230	1.171306	332,921	1.115211	371,277	1.076982	399,858	1.042366	416,799	1.030754	429,617	1.012999	435,201		
2005	148,006	1.515247	224,266	1.277923	286,594	1.185282	339,695	1.118295	379,879	1.072197	407,305	1.045425	425,807	1.026139	436,938				
2006	148,006	1.490966	220,672	1.303327	287,608	1.179673	339,283	1.111792	377,212	1.070882	403,950	1.040086	420,142						
2007	148,006	1.536145	227,359	1.294217	294,252	1.171426	344,694	1.105837	381,175	1.068106	407,135								
2008	148,006	1.542578	228,311	1.283167	292,961	1.163355	340,817	1.109798	378,238										
2009	148,006	1.506422	222,960	1.274553	284,174	1.173655	333,522												
2010	148,006	1.476909	218,591	1.293966	282,850														
2011	148,006	1.513372	223,988																
2012	148,006																			?

must equal actual current aggregate case reserves

Hmmm...

somewhere in the low to mid $400 million range

	After 0 Years	After 1 Year	After 2 Years	After 3 Years	After 4 Years	After 5 Years	After 6 Years	After 7 Years	After 8 Years
Average LDF	1.510170	1.286589	1.173305	1.110088	1.072055	1.043836	1.027962	1.012432	1.003791
Average CDF	2.958485	1.959041	1.522663	1.297755	1.169056	1.090482	1.044687	1.016270	1.003791
Weighted LDF	1.509636	1.286796	1.173275	1.110150	1.071929	1.043710	1.027948	1.012448	1.003791
Weighted CDF	2.957307	1.958953	1.522349	1.297521	1.168780	1.090352	1.044689	1.016286	1.003791

Accounting Date Incurred Development Unpaid Loss Estimate

Exhibit 4

Table 4

NOISE IN PAYMENT PATTERN AND CASE RESERVES

ACCOUNTING DATE INCURRED DEVELOPMENT INDICATED AGGREGATE UNPAID LOSS AS OF 12/31/12;
ALLOCATION OF TOTAL UNPAID CLAIM ESTIMATE TO ACCIDENT YEAR
  ($000 Omitted)

unwinding exposure adjustment results in IBNR estimates by accident year

(1)	(2)	(3)	(4)= (2)x(3)	(5)= (4)-(2)	(6)	(7)	(8)	(9)= (7)+(8)
	Recast Reported Losses As of 12/31/12 at 2012 Year-End	Weighted	Indicated Total Emergence at 2012 Year-End	Indicated IBNR as of 12/31/12 at 2012 Year-End		Accident Year Allocation of Aggregate Accounting Date Incurred Development	Case	Accident Year Allocation of Aggregate Incurred Development
Year-End Accounting Date	Accounting Date Exposure Level	Cumulative Development Factor	Accounting Date Exposure Level	Accounting Date Exposure Level	Accident Year	Indicated IBNR as of 12/31/12	Reserves as of 12/31/12	Aggregate Unpaid Loss as of 12/31/12
2003	432,240	1.000000	432,240		2003			
2004	435,201	1.003791	436,851	1,650	2004	969	1,973	2,941
2005	436,938	1.016286	444,054	7,116	2005	3,155	4,068	7,224
2006	420,142	1.044689	438,918	18,776	2006	7,493	6,255	13,748
2007	407,135	1.090352	443,921	36,786	2007	12,007	9,476	21,483
2008	378,238	1.168780	442,078	63,839	2008	16,341	10,391	26,731
2009	333,522	1.297521	432,752	99,230	2009	30,801	16,315	47,116
2010	282,850	1.522349	430,597	147,747	2010	50,893	24,910	75,803
2011	223,988	1.958953	438,782	214,794	2011	71,103	31,618	102,721
2012	148,006	2.957307	437,699	289,693	2012	96,931	43,001	139,932
					Total	289,693	148,006	**437,699**

Two Important Accounting Date Results

- Accounting Data Incurred Development Method:

  Aggregate Unpaid Claim Estimate = Aggregate Case Reserves x CDF

- Accounting Date Bornhuetter-Ferguson Method:

  Aggregate Unpaid Claim Estimate = Aggregate Case Reserves
  $$+ (1-1/CDF)\times(\text{Aggregate Expected Unpaid Losses})$$

Exposure Measures (A4) to Recast Accounting Date Experience

- Case Reserves
- Earned Premium
- Claim Counts; Averages and Counts (Frequency/Severity)- adjust for severity trend
- Other Exposure Measures- adjust for severity trend
- Broad Applicability

Accounting Date Implementation Challenges

- Data Availability
- Supplementary Experience
- Tail Development Factors
- Pseudo-Data
- Actuarial Consistency Assumptions Initially Unsatisfied

Accounting Date Reserving Analogues to Basic Reserving Methods

- Payment Development
- Incurred Development
- Bornhuetter-Ferguson
- Cape Cod
- Averages & Counts (Frequency/Severity)

Accounting Date Paradigm Consistent with Improved Accuracy

- Forward-Looking - future exposure
- Aggregation - Law of Large Numbers

Candidates for Improved Accuracy – Accounting Date Incurred Methods

- Forward-Looking
- Aggregation
- Forray's [1] two criteria
  "…best-performing methods…observed to satisfy…
    1. Each relies at least in part on case reserves
    2. Amounts paid to date do not directly influence the indicated unpaid loss"

Areas for Future Research

- Hindsight measures
- Impact of changing environments
- Modifications to more completely satisfy assumptions A1-A7
- Optimal weighting scheme(s) to recast experience at current accounting date exposure level
- Tail development factor and expected unpaid loss procedures
- Trade-offs, interactions and sensitivities associated with the use of supplementary data, tail factors and pseudo-data; appropriate stability/responsiveness balance
- Most effective exposure measures
- Stochastic analysis and estimation of loss variability

Aggregate Accounting Date Reserving Summary

General Principle Always Same:

• Recast aggregate emergence of unpaid claims of prior year-end accounting dates at current accounting date exposure level
• Use recast emergence as basis to estimate current accounting date aggregate unpaid claims
• Allocate aggregate unpaid claim estimate to accident year

Paper Introduces Accounting Date Reserving Paradigm; Appropriate Application:

• Provides practical, powerful additions to available loss reserving methodologies
• Reveals visibly apparent aggregate unpaid claim estimates
• Structure suggests improved accuracy over corresponding accident year development methods

General

- This set of slides/document/presentation is incomplete alone and intended to be viewed and read in conjunction with the accompanying complete paper "Aggregate Loss Reserve Analysis by Accounting Date" authored by Bertram A. Horowitz, President of Bertram Horowitz, Inc.

- This set of slides/document/presentation is not to be distributed, disclosed or otherwise provided, in whole or in part, without express written consent of Bertram Horowitz, Inc.

[1] Forray, Susan J., "Looking Back to See Ahead: A Hindsight Analysis of Actuarial Reserving Methods",
                    CAS E-Forum, Summer 2012