

PENNSYLVANIA COMPENSATION RATING BUREAU

Tail Factors for Loss Development

For a given calendar year, the PCRB collects financial loss development data for the current policy year and the twenty-nine previous individual policy years. A single aggregate line of experience is reported for all older policy years combined.

Thus, the 2011 vs. 2012, 2012 vs. 2013, 2013 vs. 2014 and 2014 vs. 2015 valuations in the tail factor calculation will use Policy Year 1986 as the earliest separate policy year and an aggregate line of experience for Policy Years 1985 and prior.

The following discussion focuses on data with an earliest available policy year of 1986 for illustrative purposes. The discussion for data starting with later policy years would, however, be analogous.

The PCRB's tail factor methodology is applied separately for indemnity and medical loss experience and for each calendar year of experience, and outlined as follows:

1. A starting policy year loss amount based on the average reported incurred loss for Policy Years 1986-1988 was computed.
2. An annual loss inflation factor was selected based on observed changes in incurred losses by policy year for the older policy years having separate experience data reported.
3. A historical series of estimated incurred losses by policy year beginning with Policy Year 1985 was computed using the starting point from #1 and the selected inflation factor from #2.
4. A calendar year loss development factor was selected for Policy Year 1985 based on observed developments for the oldest years with actual separate experience available.
5. A rate of decline in calendar year loss development factors by policy year was then computed such that when the resulting series of loss development factors was applied to the historical series of estimated incurred losses in #3, the total implied dollar amount of loss development for the calendar year balanced to the observed amount of development on policy years prior to 1986.
6. The "tail factor" applicable to maturities prior to Policy Year 1986 based on that calendar year of experience was then computed as the cumulative product of the series of loss development factors constructed in #5.

In general, this approach produced policy year incurred losses and loss development factors such that measurable development terminated for policy years in the mid 1940's. Because the amount of calendar year development observed for policy years prior to 1986 varied considerably from year to year, some variations in the application of the initial selected loss development factor were necessary (i.e., whether the initial selection was applied to 1, 2 or 3 prior policy years before beginning the application of the selected rate of decline in loss development). In addition, the selected rates of decline in loss development factors vary from calendar year to calendar year in order to achieve the desired balance with observed calendar year development.

Recognizing the volatility of observed calendar year development for policy years prior to 1986 in the aggregate, the PCRB elected to use an experience period comprising four calendar years of loss development in computing indicated tail factors for this filing.

A summary exhibit on Page 1 presents results of the tail development factor calculations. On the subsequent pages, eight exhibits presenting the derivation of indicated tail factors using the procedure outlined above are attached (four for indemnity and four for medical).

SUMMARY OF LOSS DEVELOPMENT TAIL FACTOR CALCULATIONS

	<u>INDEMNITY</u>	<u>MEDICAL</u>
VALUATION	Tail Factor	Tail Factor
14V15	28TH TO ULT. 1.0028	0.9934
13V14	28TH TO ULT. 1.0011	1.0220
12V13	28TH TO ULT. 1.0008	1.0047
11V12	28TH TO ULT. 1.0006	1.0084
AVERAGE OF LATEST 4 VALUATIONS	1.0013	1.0071

Inputs and Notes for Tail Factor Estimation

Latest 12/31 Prior to 1986 PYs Incurred	4,680,551,171
Next Latest 12/31 Prior to 1986 PYs Incurred	4,679,321,229
CY Development of Prior to 1986 PYs	1,229,942
Next Latest PY 1986 Incurred	714,801,006
# of 1986 PYs in Prior to 1986 PYs Data	6.55
Selected Decrement Development Factor	0.75
Selected Average PY Deflation Factor	0.95

- 1 PY 1985 Incurred = (Average of 1986, 1987, 1988) x (PY Deflation Factor ^ 2)
- 2 PY 1984 & Prior Incurred = Subsequent Year x PY Deflation
- 3 PY 1985 LDF selected based on balancing Prior to 1986 PYs Total Dollar Dev. to Actual CY Dev.
- 4 PY 1984 & Prior LDFs = (Subsequent Year - 1.0) x Selected Decrement + 1.0

CY Development of Prior to 1986 PYs:	1,229,942
Total Dollar Development:	1,229,942
Difference:	0

Tail Factor Model - 2017 Loss Cost Filing

Policy Year	(*=Estimate)	Incurred as of 12/31/15	Prior Year LDF	Dollar Development	Cumulative LDF	Policy Year	(*=Estimate)	Incurred as of 12/31/15	Prior Year LDF	Dollar Development	Cumulative LDF	
1944	*	94,180,373	1.000000	0	1.0000	1980	*	596,912,418	1.000109	64,942	1.0004	34TH TO ULT
1945	*	99,137,234	1.000000	0	1.0000	1981	*	628,328,861	1.000145	91,143	1.0006	33RD TO ULT
1946	*	104,354,983	1.000000	1	1.0000	1982	*	661,398,801	1.000193	127,913	1.0008	32ND TO ULT
1947	*	109,847,351	1.000000	1	1.0000	1983	*	696,209,264	1.000258	179,516	1.0010	31ST TO ULT
1948	*	115,628,791	1.000000	1	1.0000	1984	*	732,851,857	1.000344	251,931	1.0014	30TH TO ULT
1949	*	121,714,516	1.000000	2	1.0000	1985	*	771,423,007	1.00045851	353,546	1.0018	29TH TO ULT
1950	*	128,120,543	1.000000	2	1.0000	1986		715,510,562	1.0010		1.0028	28TH TO ULT
1951	*	134,863,730	1.000000	3	1.0000	1987		866,734,307	1.0005			
1952	*	141,961,821	1.000000	5	1.0000	1988		982,042,135	0.9996			
1953	*	149,433,496	1.000000	7	1.0000	1989		1,142,902,544	1.0019			
1954	*	157,298,417	1.000000	10	1.0000	1990		1,168,287,167	1.0002			
1955	*	165,577,281	1.000000	14	1.0000	1991		1,016,383,416	1.0006			
1956	*	174,291,874	1.000000	19	1.0000	1992		861,793,648	0.9989			
1957	*	183,465,131	1.000000	27	1.0000	1993		753,779,445	1.0003			
1958	*	193,121,191	1.000000	37	1.0000	1994		693,044,106	1.0008			
1959	*	203,285,464	1.000000	53	1.0000	1995		589,525,879	1.0004			
1960	*	213,984,699	1.000000	74	1.0000	1996		506,626,359	0.9970			
1961	*	225,247,051	1.000000	104	1.0000	1997		514,667,789	0.9996			
1962	*	237,102,159	1.000001	145	1.0000	1998		516,844,526	0.9996			
1963	*	249,581,220	1.000001	204	1.0000	1999		588,207,224	0.9994			
1964	*	262,717,074	1.000001	287	1.0000	2000		630,650,107	0.9998			
1965	*	276,544,288	1.000001	402	1.0000	2001		642,313,352	0.9996			
1966	*	291,099,251	1.000002	564	1.0000	2002		672,714,757	0.9985			
1967	*	306,420,264	1.000003	792	1.0000	2003		664,073,542	1.0000			
1968	*	322,547,646	1.000003	1,112	1.0000	2004		702,956,741	0.9995			
1969	*	339,523,838	1.000005	1,560	1.0000	2005		710,941,538	1.0013			
1970	*	357,393,514	1.000006	2,190	1.0000	2006		733,546,671	0.9988			
1971	*	376,203,699	1.000008	3,073	1.0000	2007		766,567,526	0.9994			
1972	*	396,003,894	1.000011	4,314	1.0000	2008		717,647,285	1.0028			
1973	*	416,846,204	1.000015	6,054	1.0001	2009		649,677,302	1.0110			
1974	*	438,785,478	1.000019	8,497	1.0001	2010		681,221,007	1.0067			
1975	*	461,879,450	1.000026	11,926	1.0001	2011		655,837,843	1.0235			
1976	*	486,188,895	1.000034	16,738	1.0001	2012		597,235,441	1.1073			
1977	*	511,777,784	1.000046	23,491	1.0002	2013		567,781,572	1.3914			
1978	*	538,713,457	1.000061	32,970	1.0002	2014		407,365,553	3.3621			
1979	*	567,066,797	1.000082	46,272	1.0003	2015		116,824,922				

Inputs and Notes for Tail Factor Estimation

Latest 12/31 Prior to 1986 PYs Incurred	1,498,353,687
Next Latest 12/31 Prior to 1986 PYs Incurred	1,499,878,723
CY Development of Prior to 1986 PYs	-1,525,036
Next Latest PY 1986 Incurred	327,475,833
# of 1986 PYs in Prior to 1986 PYs Data	4.58
Selected Decrement Development Factor	0.75
Selected Average PY Deflation Factor	0.93

- 1 PY 1985 Incurred = (Average of 1986, 1987, 1988) x (PY Deflation Factor ^ 2)
- 2 PY 1984 & Prior Incurred = Subsequent Year x PY Deflation
- 3 PY 1985 LDF selected based on balancing Prior to 1986 PYs Total Dollar Dev. to Actual CY Dev.
- 4 PY 1984 & Prior LDFs = (Subsequent Year - 1.0) x Selected Decrement + 1.0

CY Development of Prior to 1986 PYs:	-1,525,036
Total Dollar Development:	-1,525,036
Difference:	0

Tail Factor Model - 2017 Loss Cost Filing

Policy Year	(*=Estimate)	Incurred as of 12/31/15	Prior Year LDF	Dollar Development	Cumulative LDF	Policy Year	(*=Estimate)	Incurred as of 12/31/15	Prior Year LDF	Dollar Development	Cumulative LDF	
1944	*	19,040,626	1.000000	0	1.0000	1980	*	259,594,255	0.999707	-76,123	0.9988	34TH TO ULT
1945	*	20,473,791	1.000000	0	1.0000	1981	*	279,133,607	0.999609	-109,147	0.9984	33RD TO ULT
1946	*	22,014,830	1.000000	0	1.0000	1982	*	300,143,663	0.999479	-156,503	0.9979	32ND TO ULT
1947	*	23,671,860	1.000000	-1	1.0000	1983	*	322,735,122	0.999305	-224,417	0.9972	31ST TO ULT
1948	*	25,453,613	1.000000	-1	1.0000	1984	*	347,027,013	0.999073	-321,819	0.9963	30TH TO ULT
1949	*	27,369,476	1.000000	-1	1.0000	1985	*	373,147,326	0.99876467	-461,532	0.9951	29TH TO ULT
1950	*	29,429,544	1.000000	-2	1.0000	1986		326,924,621	0.9983		0.9934	28TH TO ULT
1951	*	31,644,671	1.000000	-2	1.0000	1987		438,309,228	1.0022			
1952	*	34,026,528	1.000000	-3	1.0000	1988		529,068,356	0.9993			
1953	*	36,587,664	1.000000	-5	1.0000	1989		646,608,387	1.0096			
1954	*	39,341,575	1.000000	-7	1.0000	1990		671,537,257	1.0037			
1955	*	42,302,768	1.000000	-9	1.0000	1991		625,507,096	1.0042			
1956	*	45,486,848	1.000000	-13	1.0000	1992		569,707,870	1.0016			
1957	*	48,910,589	1.000000	-19	1.0000	1993		484,917,351	1.0058			
1958	*	52,592,031	0.999999	-28	1.0000	1994		458,481,094	1.0067			
1959	*	56,550,571	0.999999	-39	1.0000	1995		418,149,565	1.0103			
1960	*	60,807,066	0.999999	-57	1.0000	1996		407,129,198	0.9936			
1961	*	65,383,942	0.999999	-81	1.0000	1997		423,433,118	1.0022			
1962	*	70,305,314	0.999998	-116	1.0000	1998		447,245,329	0.9999			
1963	*	75,597,111	0.999998	-167	1.0000	1999		473,218,995	0.9997			
1964	*	81,287,217	0.999997	-239	1.0000	2000		504,504,665	1.0051			
1965	*	87,405,609	0.999996	-342	1.0000	2001		494,040,620	1.0030			
1966	*	93,984,526	0.999995	-491	1.0000	2002		542,763,654	1.0092			
1967	*	101,058,630	0.999993	-704	1.0000	2003		556,252,822	1.0059			
1968	*	108,665,194	0.999991	-1,009	1.0000	2004		609,782,465	1.0006			
1969	*	116,844,294	0.999988	-1,447	1.0000	2005		627,794,079	1.0026			
1970	*	125,639,026	0.999983	-2,074	0.9999	2006		641,015,474	1.0070			
1971	*	135,095,727	0.999978	-2,974	0.9999	2007		684,263,405	0.9983			
1972	*	145,264,223	0.999971	-4,263	0.9999	2008		624,621,203	1.0083			
1973	*	156,198,089	0.999961	-6,112	0.9998	2009		572,972,975	0.9981			
1974	*	167,954,934	0.999948	-8,763	0.9998	2010		642,386,488	1.0060			
1975	*	180,596,704	0.999930	-12,564	0.9997	2011		630,167,412	0.9937			
1976	*	194,190,004	0.999907	-18,014	0.9996	2012		588,088,132	1.0246			
1977	*	208,806,456	0.999876	-25,827	0.9995	2013		628,821,943	1.0868			
1978	*	224,523,071	0.999835	-37,029	0.9993	2014		574,498,944	2.2181			
1979	*	241,422,657	0.999780	-53,092	0.9991	2015		250,464,411				

Inputs and Notes for Tail Factor Estimation

Latest 12/31 Prior to 1986 PYs Incurred	4,786,919,665	1 PY 1985 Incurred = (Average of 1986, 1987, 1988) x (PY Deflation Factor ^ 2)
Next Latest 12/31 Prior to 1986 PYs Incurred	4,786,182,375	2 PY 1984 & Prior Incurred = Subsequent Year x PY Deflation
CY Development of Prior to 1986 PYs	737,290	3 PY 1985 LDF selected based on balancing Prior to 1986 PYs Total Dollar Dev. to Actual CY Dev.
Next Latest PY 1986 Incurred	725,101,800	4 PY 1984 & Prior LDFs = (Subsequent Year - 1.0) x Selected Decrement + 1.0
# of 1986 PYs in Prior to 1986 PYs Data	6.60	
Selected Decrement Development Factor	0.75	CY Development of Prior to 1986 PYs: 737,290
Selected Average PY Deflation Factor	0.95	Total Dollar Development: 737,290
		Difference: 0

Tail Factor Model - 2017 Loss Cost Filing

Policy Year	(*=Estimate)	Incurred as of 12/31/14	Prior Year LDF	Dollar Development	Cumulative LDF	Policy Year	(*=Estimate)	Incurred as of 12/31/14	Prior Year LDF	Dollar Development	Cumulative LDF	
1943	*	90,715,332	1.000000	0	1.0000	1979	*	574,951,094	1.000048	27,736	1.0002	34TH TO ULT
1944	*	95,489,823	1.000000	0	1.0000	1980	*	605,211,678	1.000064	38,927	1.0003	33RD TO ULT
1945	*	100,515,603	1.000000	0	1.0000	1981	*	637,064,924	1.000086	54,633	1.0003	32ND TO ULT
1946	*	105,805,898	1.000000	0	1.0000	1982	*	670,594,657	1.000114	76,675	1.0005	31ST TO ULT
1947	*	111,374,630	1.000000	1	1.0000	1983	*	705,889,112	1.000152	107,610	1.0006	30TH TO ULT
1948	*	117,236,452	1.000000	1	1.0000	1984	*	743,041,171	1.000203	151,024	1.0008	29TH TO ULT
1949	*	123,406,792	1.000000	1	1.0000	1985	*	782,148,601	1.00027106	211,950	1.0011	28TH TO ULT
1950	*	129,901,886	1.000000	1	1.0000	1986		725,185,434	1.0001			
1951	*	136,738,828	1.000000	2	1.0000	1987		877,603,995	1.0006			
1952	*	143,935,608	1.000000	3	1.0000	1988		997,150,518	1.0002			
1953	*	151,511,167	1.000000	4	1.0000	1989		1,158,043,777	0.9996			
1954	*	159,485,438	1.000000	6	1.0000	1990		1,187,075,451	1.0001			
1955	*	167,879,409	1.000000	8	1.0000	1991		1,039,310,399	1.0000			
1956	*	176,715,167	1.000000	11	1.0000	1992		885,410,644	0.9995			
1957	*	186,015,966	1.000000	16	1.0000	1993		767,693,588	1.0017			
1958	*	195,806,279	1.000000	22	1.0000	1994		709,000,472	1.0002			
1959	*	206,111,873	1.000000	32	1.0000	1995		613,761,927	1.0011			
1960	*	216,959,866	1.000000	44	1.0000	1996		535,392,246	1.0002			
1961	*	228,378,807	1.000000	62	1.0000	1997		554,980,072	0.9983			
1962	*	240,398,744	1.000000	87	1.0000	1998		569,318,194	1.0010			
1963	*	253,051,309	1.000000	122	1.0000	1999		639,809,812	1.0004			
1964	*	266,369,799	1.000001	172	1.0000	2000		679,801,883	0.9993			
1965	*	280,389,263	1.000001	241	1.0000	2001		676,510,143	1.0014			
1966	*	295,146,592	1.000001	338	1.0000	2002		699,333,942	1.0007			
1967	*	310,680,623	1.000002	475	1.0000	2003		673,508,608	1.0024			
1968	*	327,032,235	1.000002	666	1.0000	2004		704,174,079	1.0018			
1969	*	344,244,458	1.000003	935	1.0000	2005		709,786,061	1.0026			
1970	*	362,362,587	1.000004	1,313	1.0000	2006		734,030,743	1.0035			
1971	*	381,434,303	1.000005	1,842	1.0000	2007		766,781,282	1.0025			
1972	*	401,509,792	1.000006	2,586	1.0000	2008		715,805,845	1.0034			
1973	*	422,641,886	1.000009	3,629	1.0000	2009		643,201,472	1.0037			
1974	*	444,886,196	1.000011	5,093	1.0000	2010		677,045,260	1.0337			
1975	*	468,301,259	1.000015	7,148	1.0001	2011		642,000,667	1.0992			
1976	*	492,948,694	1.000020	10,032	1.0001	2012		539,269,831	1.3808			
1977	*	518,893,362	1.000027	14,080	1.0001	2013		406,227,129	3.4334			
1978	*	546,203,539	1.000036	19,762	1.0001	2014		121,301,791				

Inputs and Notes for Tail Factor Estimation

Latest 12/31 Prior to 1986 PYs Incurred	1,535,833,614	1 PY 1985 Incurred = (Average of 1986, 1987, 1988) x (PY Deflation Factor ^ 2)
Next Latest 12/31 Prior to 1986 PYs Incurred	1,529,012,701	2 PY 1984 & Prior Incurred = Subsequent Year x PY Deflation
CY Development of Prior to 1986 PYs	6,820,913	3 PY 1985 LDF selected based on balancing Prior to 1986 PYs Total Dollar Dev. to Actual CY Dev.
Next Latest PY 1986 Incurred	333,235,655	4 PY 1984 & Prior LDFs = (Subsequent Year - 1.0) x Selected Decrement + 1.0
# of 1986 PYs in Prior to 1986 PYs Data	4.61	
Selected Decrement Development Factor	0.75	CY Development of Prior to 1986 PYs: 6,820,913
Selected Average PY Deflation Factor	0.93	Total Dollar Development: 6,820,913
		Difference: 0

Tail Factor Model - 2017 Loss Cost Filing

Policy Year	(*=Estimate)	Incurred as of 12/31/14	Prior Year LDF	Dollar Development	Cumulative LDF	Policy Year	(*=Estimate)	Incurred as of 12/31/14	Prior Year LDF	Dollar Development	Cumulative LDF	
1941	*	15,592,222	1.000000	0	1.0000	1978	*	228,580,356	1.000728	166,173	1.0029	35TH TO ULT
1942	*	16,765,830	1.000000	0	1.0000	1979	*	245,785,329	1.000970	238,182	1.0039	34TH TO ULT
1943	*	18,027,774	1.000000	1	1.0000	1980	*	264,285,300	1.001293	341,370	1.0052	33RD TO ULT
1944	*	19,384,703	1.000000	1	1.0000	1981	*	284,177,742	1.001724	489,209	1.0069	32ND TO ULT
1945	*	20,843,767	1.000000	1	1.0000	1982	*	305,567,465	1.002299	700,972	1.0092	31ST TO ULT
1946	*	22,412,653	1.000000	2	1.0000	1983	*	328,567,166	1.003066	1,004,210	1.0123	30TH TO ULT
1947	*	24,099,626	1.000000	2	1.0000	1984	*	353,298,028	1.004088	1,438,263	1.0165	29TH TO ULT
1948	*	25,913,577	1.000000	3	1.0000	1985	*	379,890,353	1.00545014	2,059,231	1.0220	28TH TO ULT
1949	*	27,864,061	1.000000	5	1.0000	1986		334,437,160	1.0036			
1950	*	29,961,356	1.000000	7	1.0000	1987		443,328,536	1.0056			
1951	*	32,216,512	1.000000	10	1.0000	1988		539,925,435	1.0062			
1952	*	34,641,411	1.000000	14	1.0000	1989		653,842,383	1.0043			
1953	*	37,248,829	1.000001	20	1.0000	1990		683,033,004	1.0089			
1954	*	40,052,504	1.000001	29	1.0000	1991		641,995,830	1.0018			
1955	*	43,067,208	1.000001	42	1.0000	1992		589,216,438	1.0051			
1956	*	46,308,826	1.000001	60	1.0000	1993		494,848,573	1.0097			
1957	*	49,794,437	1.000002	86	1.0000	1994		470,995,174	1.0085			
1958	*	53,542,405	1.000002	124	1.0000	1995		434,300,392	1.0015			
1959	*	57,572,479	1.000003	177	1.0000	1996		436,518,599	1.0120			
1960	*	61,905,891	1.000004	254	1.0000	1997		459,104,367	1.0061			
1961	*	66,565,474	1.000005	364	1.0000	1998		496,754,577	1.0040			
1962	*	71,575,779	1.000007	522	1.0000	1999		536,084,691	1.0135			
1963	*	76,963,203	1.000010	748	1.0000	2000		542,993,485	1.0042			
1964	*	82,756,132	1.000013	1,073	1.0001	2001		521,986,810	1.0044			
1965	*	88,985,088	1.000017	1,538	1.0001	2002		561,451,272	1.0165			
1966	*	95,682,891	1.000023	2,205	1.0001	2003		564,711,064	1.0102			
1967	*	102,884,829	1.000031	3,161	1.0001	2004		610,212,629	1.0118			
1968	*	110,628,848	1.000041	4,532	1.0002	2005		626,188,106	1.0111			
1969	*	118,955,751	1.000055	6,498	1.0002	2006		636,577,050	1.0219			
1970	*	127,909,409	1.000073	9,315	1.0003	2007		685,448,814	1.0063			
1971	*	137,536,999	1.000097	13,355	1.0004	2008		619,623,232	1.0076			
1972	*	147,889,247	1.000129	19,146	1.0005	2009		575,055,060	1.0166			
1973	*	159,020,695	1.000173	27,449	1.0007	2010		638,933,140	1.0139			
1974	*	170,989,995	1.000230	39,351	1.0009	2011		635,066,803	1.0316			
1975	*	183,860,210	1.000307	56,412	1.0012	2012		574,127,831	1.0682			
1976	*	197,699,150	1.000409	80,870	1.0016	2013		576,736,880	2.2140			
1977	*	212,579,731	1.000546	115,926	1.0022	2014		259,714,934				

Inputs and Notes for Tail Factor Estimation

Latest 12/31 Prior to 1986 PYs Incurred	4,786,422,894
Next Latest 12/31 Prior to 1986 PYs Incurred	4,785,732,069
CY Development of Prior to 1986 PYs	690,825
Next Latest PY 1986 Incurred	724,447,259
# of 1986 PYs in Prior to 1986 PYs Data	6.61
Selected Decrement Development Factor	0.75
Selected Average PY Deflation Factor	0.95

- 1 PY 1985 Incurred = (Average of 1986, 1987, 1988) x (PY Deflation Factor ^ 2)
- 2 PY 1984 & Prior Incurred = Subsequent Year x PY Deflation
- 3 PY 1985 LDF selected based on balancing Prior to 1986 PYs Total Dollar Dev. to Actual CY Dev.
- 4 PY 1984 & Prior LDFs = (Subsequent Year - 1.0) x Selected Decrement + 1.0

CY Development of Prior to 1986 PYs:	690,825
Total Dollar Development:	690,825
Difference:	0

Tail Factor Model - 2017 Loss Cost Filing

Policy Year	(*=Estimate)	Incurred as of 12/31/13	Prior Year LDF	Dollar Development	Cumulative LDF	Policy Year	(*=Estimate)	Incurred as of 12/31/13	Prior Year LDF	Dollar Development	Cumulative LDF	
1942	*	86,154,410	1.000000	0	1.0000	1978	*	546,044,101	1.000034	18,516	1.0001	34TH TO ULT
1943	*	90,688,852	1.000000	0	1.0000	1979	*	574,783,265	1.000045	25,987	1.0002	33RD TO ULT
1944	*	95,461,950	1.000000	0	1.0000	1980	*	605,035,015	1.000060	36,473	1.0002	32ND TO ULT
1945	*	100,486,263	1.000000	0	1.0000	1981	*	636,878,964	1.000080	51,189	1.0003	31ST TO ULT
1946	*	105,775,013	1.000000	0	1.0000	1982	*	670,398,909	1.000107	71,843	1.0004	30TH TO ULT
1947	*	111,342,119	1.000000	1	1.0000	1983	*	705,683,062	1.000143	100,828	1.0006	29TH TO ULT
1948	*	117,202,231	1.000000	1	1.0000	1984	*	742,824,276	1.000191	141,506	1.0008	28TH TO ULT
1949	*	123,370,769	1.000000	1	1.0000	1985	*	781,920,290	1.00025405	198,593	1.0010	27TH TO ULT
1950	*	129,863,968	1.000000	1	1.0000	1986		725,182,614	1.0010			
1951	*	136,698,914	1.000000	2	1.0000	1987		877,078,060	0.9994			
1952	*	143,893,593	1.000000	3	1.0000	1988		996,920,347	0.9999			
1953	*	151,466,940	1.000000	4	1.0000	1989		1,158,437,660	1.0009			
1954	*	159,438,884	1.000000	5	1.0000	1990		1,186,746,571	1.0009			
1955	*	167,830,405	1.000000	8	1.0000	1991		1,039,274,399	0.9990			
1956	*	176,663,584	1.000000	11	1.0000	1992		885,471,978	0.9992			
1957	*	185,961,667	1.000000	15	1.0000	1993		766,415,267	1.0011			
1958	*	195,749,123	1.000000	21	1.0000	1994		708,799,517	1.0025			
1959	*	206,051,709	1.000000	30	1.0000	1995		613,092,228	1.0009			
1960	*	216,896,536	1.000000	41	1.0000	1996		535,289,820	0.9998			
1961	*	228,312,143	1.000000	58	1.0000	1997		556,100,776	1.0014			
1962	*	240,328,571	1.000000	82	1.0000	1998		569,027,758	1.0005			
1963	*	252,977,443	1.000000	115	1.0000	1999		639,401,482	0.9997			
1964	*	266,292,046	1.000001	161	1.0000	2000		681,117,418	1.0015			
1965	*	280,307,417	1.000001	226	1.0000	2001		675,300,456	1.0051			
1966	*	295,060,439	1.000001	317	1.0000	2002		699,285,680	1.0020			
1967	*	310,589,935	1.000001	445	1.0000	2003		672,559,618	1.0022			
1968	*	326,936,774	1.000002	624	1.0000	2004		702,935,309	1.0050			
1969	*	344,143,973	1.000003	876	1.0000	2005		708,118,183	1.0025			
1970	*	362,256,813	1.000003	1,230	1.0000	2006		731,450,002	1.0068			
1971	*	381,322,961	1.000005	1,726	1.0000	2007		764,845,111	1.0000			
1972	*	401,392,591	1.000006	2,423	1.0000	2008		713,326,485	1.0089			
1973	*	422,518,517	1.000008	3,400	1.0000	2009		640,223,240	1.0291			
1974	*	444,756,333	1.000011	4,772	1.0000	2010		652,940,395	1.1100			
1975	*	468,164,561	1.000014	6,698	1.0001	2011		581,366,135	1.3937			
1976	*	492,804,802	1.000019	9,400	1.0001	2012		388,302,639	3.3336			
1977	*	518,741,896	1.000025	13,193	1.0001	2013		118,254,472				

Inputs and Notes for Tail Factor Estimation

Latest 12/31 Prior to 1986 PYs Incurred	1,528,379,608
Next Latest 12/31 Prior to 1986 PYs Incurred	1,526,420,124
CY Development of Prior to 1986 PYs	1,959,484
Next Latest PY 1986 Incurred	331,519,451
# of 1986 PYs in Prior to 1986 PYs Data	4.61
Selected Decrement Development Factor	0.75
Selected Average PY Deflation Factor	0.93

- 1 PY 1985 Incurred = (Average of 1986, 1987, 1988) x (PY Deflation Factor ^ 2)
- 2 PY 1984 & Prior Incurred = Subsequent Year x PY Deflation
- 3 PY 1985 LDF selected based on balancing Prior to 1986 PYs Total Dollar Dev. to Actual CY Dev.
- 4 PY 1984 & Prior LDFs = (Subsequent Year - 1.0) x Selected Decrement + 1.0

CY Development of Prior to 1986 PYs:	1,959,484
Total Dollar Development:	1,959,484
Difference:	0

Tail Factor Model - 2017 Loss Cost Filing

Policy Year	(*=Estimate)	Incurred as of 12/31/13	Prior Year LDF	Dollar Development	Cumulative LDF	Policy Year	(*=Estimate)	Incurred as of 12/31/13	Prior Year LDF	Dollar Development	Cumulative LDF	
1942	*	16,677,804	1.000000	0	1.0000	1978	*	227,380,235	1.000210	47,645	1.0008	34TH TO ULT
1943	*	17,933,122	1.000000	0	1.0000	1979	*	244,494,877	1.000279	68,304	1.0011	33RD TO ULT
1944	*	19,282,927	1.000000	0	1.0000	1980	*	262,897,717	1.000373	97,917	1.0015	32ND TO ULT
1945	*	20,734,330	1.000000	0	1.0000	1981	*	282,685,717	1.000497	140,366	1.0020	31ST TO ULT
1946	*	22,294,979	1.000000	0	1.0000	1982	*	303,963,137	1.000662	201,208	1.0027	30TH TO ULT
1947	*	23,973,096	1.000000	1	1.0000	1983	*	326,842,082	1.000883	288,406	1.0035	29TH TO ULT
1948	*	25,777,522	1.000000	1	1.0000	1984	*	351,443,099	1.001178	413,364	1.0047	28TH TO ULT
1949	*	27,717,766	1.000000	1	1.0000	1985	*	377,895,806	1.00157010	592,404	1.0063	27TH TO ULT
1950	*	29,804,049	1.000000	2	1.0000	1986		333,434,609	1.0058			
1951	*	32,047,365	1.000000	3	1.0000	1987		440,861,457	1.0099			
1952	*	34,459,532	1.000000	4	1.0000	1988		536,476,760	1.0109			
1953	*	37,053,260	1.000000	6	1.0000	1989		650,977,336	1.0055			
1954	*	39,842,215	1.000000	8	1.0000	1990		676,887,464	1.0066			
1955	*	42,841,092	1.000000	12	1.0000	1991		640,752,923	1.0101			
1956	*	46,065,690	1.000000	17	1.0000	1992		586,149,650	1.0091			
1957	*	49,533,000	1.000000	25	1.0000	1993		490,017,752	1.0054			
1958	*	53,261,290	1.000001	35	1.0000	1994		466,939,664	1.0051			
1959	*	57,270,205	1.000001	51	1.0000	1995		433,686,738	1.0073			
1960	*	61,580,865	1.000001	73	1.0000	1996		431,311,608	1.0111			
1961	*	66,215,984	1.000002	104	1.0000	1997		456,569,044	1.0092			
1962	*	71,199,983	1.000002	150	1.0000	1998		494,827,392	1.0073			
1963	*	76,559,121	1.000003	214	1.0000	1999		528,718,215	1.0064			
1964	*	82,321,636	1.000004	307	1.0000	2000		541,438,177	1.0079			
1965	*	88,517,888	1.000005	441	1.0000	2001		519,499,955	1.0071			
1966	*	95,180,525	1.000007	632	1.0000	2002		552,365,217	1.0103			
1967	*	102,344,650	1.000009	906	1.0000	2003		559,053,388	1.0026			
1968	*	110,048,011	1.000012	1,299	1.0000	2004		603,230,387	1.0145			
1969	*	118,331,195	1.000016	1,862	1.0001	2005		619,384,306	1.0135			
1970	*	127,237,844	1.000021	2,670	1.0001	2006		622,858,959	1.0067			
1971	*	136,814,886	1.000028	3,827	1.0001	2007		681,134,995	1.0120			
1972	*	147,112,780	1.000037	5,487	1.0001	2008		615,105,189	1.0130			
1973	*	158,185,785	1.000050	7,867	1.0002	2009		564,865,755	1.0146			
1974	*	170,092,242	1.000066	11,279	1.0003	2010		626,486,592	1.0340			
1975	*	182,894,884	1.000088	16,170	1.0004	2011		614,544,405	1.0904			
1976	*	196,661,166	1.000118	23,182	1.0005	2012		535,491,700	2.1620			
1977	*	211,463,619	1.000157	33,234	1.0006	2013		261,026,434				

Inputs and Notes for Tail Factor Estimation

Latest 12/31 Prior to 1986 PYs Incurred	4,712,949,899	1 PY 1985 Incurred = (Average of 1986, 1987, 1988) x (PY Deflation Factor ^ 2)
Next Latest 12/31 Prior to 1986 PYs Incurred	4,712,288,420	2 PY 1984 & Prior Incurred = Subsequent Year x PY Deflation
CY Development of Prior to 1986 PYs	661,479	3 PY 1985 LDF selected based on balancing Prior to 1986 PYs Total Dollar Dev. to Actual CY Dev.
Next Latest PY 1986 Incurred	715,759,664	4 PY 1984 & Prior LDFs = (Subsequent Year - 1.0) x Selected Decrement + 1.0
# of 1986 PYs in Prior to 1986 PYs Data	6.58	
Selected Decrement Development Factor	0.75	CY Development of Prior to 1986 PYs: 661,479
Selected Average PY Deflation Factor	0.95	Total Dollar Development: 661,479
		Difference: 0

Tail Factor Model - 2017 Loss Cost Filing

Policy Year	(*=Estimate)	Incurred as of 12/31/12	Prior Year LDF	Dollar Development	Cumulative LDF	Policy Year	(*=Estimate)	Incurred as of 12/31/12	Prior Year LDF	Dollar Development	Cumulative LDF	
1941	*	81,113,660	1.000000	0	1.0000	1977	*	514,095,982	1.000025	12,632	1.0001	34TH TO ULT
1942	*	85,382,800	1.000000	0	1.0000	1978	*	541,153,666	1.000033	17,730	1.0001	33RD TO ULT
1943	*	89,876,632	1.000000	0	1.0000	1979	*	569,635,437	1.000044	24,883	1.0002	32ND TO ULT
1944	*	94,606,981	1.000000	0	1.0000	1980	*	599,616,250	1.000058	34,924	1.0002	31ST TO ULT
1945	*	99,586,296	1.000000	0	1.0000	1981	*	631,175,000	1.000078	49,015	1.0003	30TH TO ULT
1946	*	104,827,680	1.000000	0	1.0000	1982	*	664,394,737	1.000104	68,791	1.0004	29TH TO ULT
1947	*	110,344,926	1.000000	0	1.0000	1983	*	699,362,881	1.000138	96,545	1.0006	28TH TO ULT
1948	*	116,152,554	1.000000	1	1.0000	1984	*	736,171,453	1.000184	135,496	1.0007	27TH TO ULT
1949	*	122,265,846	1.000000	1	1.0000	1985	*	774,917,319	1.00024545	190,157	1.0010	26TH TO ULT
1950	*	128,700,891	1.000000	1	1.0000	1986		716,125,836	1.0005			
1951	*	135,474,622	1.000000	2	1.0000	1987		869,689,099	1.0010			
1952	*	142,604,865	1.000000	3	1.0000	1988		990,087,512	0.9975			
1953	*	150,110,384	1.000000	4	1.0000	1989		1,146,110,037	1.0022			
1954	*	158,010,931	1.000000	5	1.0000	1990		1,172,030,143	1.0001			
1955	*	166,327,296	1.000000	7	1.0000	1991		1,027,029,414	1.0013			
1956	*	175,081,364	1.000000	10	1.0000	1992		877,936,473	1.0025			
1957	*	184,296,172	1.000000	14	1.0000	1993		761,012,996	0.9999			
1958	*	193,995,971	1.000000	20	1.0000	1994		702,559,300	1.0011			
1959	*	204,206,285	1.000000	28	1.0000	1995		609,052,885	1.0012			
1960	*	214,953,984	1.000000	40	1.0000	1996		533,500,202	1.0028			
1961	*	226,267,352	1.000000	56	1.0000	1997		556,832,201	1.0021			
1962	*	238,176,160	1.000000	78	1.0000	1998		564,507,461	0.9975			
1963	*	250,711,747	1.000000	110	1.0000	1999		640,519,550	1.0009			
1964	*	263,907,103	1.000001	154	1.0000	2000		681,462,452	1.0017			
1965	*	277,796,950	1.000001	216	1.0000	2001		675,044,549	1.0028			
1966	*	292,417,842	1.000001	303	1.0000	2002		700,614,570	0.9996			
1967	*	307,808,255	1.000001	426	1.0000	2003		671,320,667	1.0032			
1968	*	324,008,689	1.000002	598	1.0000	2004		697,416,463	1.0041			
1969	*	341,061,778	1.000002	839	1.0000	2005		703,798,318	1.0016			
1970	*	359,012,398	1.000003	1,178	1.0000	2006		724,845,522	1.0016			
1971	*	377,907,788	1.000004	1,653	1.0000	2007		763,181,268	1.0017			
1972	*	397,797,671	1.000006	2,320	1.0000	2008		704,314,518	1.0212			
1973	*	418,734,391	1.000008	3,256	1.0000	2009		620,606,688	1.0957			
1974	*	440,773,043	1.000010	4,569	1.0000	2010		587,695,761	1.4141			
1975	*	463,971,624	1.000014	6,413	1.0001	2011		418,580,947	3.3468			
1976	*	488,391,183	1.000018	9,001	1.0001	2012		116,152,750				

Inputs and Notes for Tail Factor Estimation

Latest 12/31 Prior to 1986 PYs Incurred	1,504,651,636	1 PY 1985 Incurred = (Average of 1986, 1987, 1988) x (PY Deflation Factor ^ 2)
Next Latest 12/31 Prior to 1986 PYs Incurred	1,500,119,871	2 PY 1984 & Prior Incurred = Subsequent Year x PY Deflation
CY Development of Prior to 1986 PYs	4,531,765	3 PY 1985 LDF selected based on balancing Prior to 1986 PYs Total Dollar Dev. to Actual CY Dev.
Next Latest PY 1986 Incurred	325,642,139	4 PY 1984 & Prior LDFs = (Subsequent Year - 1.0) x Selected Decrement + 1.0
# of 1986 PYs in Prior to 1986 PYs Data	4.62	
Selected Decrement Development Factor	0.75	CY Development of Prior to 1986 PYs: 4,531,765
Selected Average PY Deflation Factor	0.93	Total Dollar Development: 4,531,765
		Difference: 0

Tail Factor Model - 2017 Loss Cost Filing

Policy Year	(*=Estimate)	Incurred as of 12/31/12	Prior Year LDF	Dollar Development	Cumulative LDF	Policy Year	(*=Estimate)	Incurred as of 12/31/12	Prior Year LDF	Dollar Development	Cumulative LDF	
1941	*	15,242,919	1.000000	0	1.0000	1977	*	207,817,442	1.000370	76,949	1.0015	34TH TO ULT
1942	*	16,390,236	1.000000	0	1.0000	1978	*	223,459,616	1.000494	110,308	1.0020	33RD TO ULT
1943	*	17,623,909	1.000000	0	1.0000	1979	*	240,279,157	1.000659	158,121	1.0026	32ND TO ULT
1944	*	18,950,440	1.000000	1	1.0000	1980	*	258,364,684	1.000878	226,647	1.0035	31ST TO ULT
1945	*	20,376,817	1.000000	1	1.0000	1981	*	277,811,489	1.001171	324,847	1.0047	30TH TO ULT
1946	*	21,910,556	1.000000	1	1.0000	1982	*	298,722,031	1.001561	465,549	1.0063	29TH TO ULT
1947	*	23,559,738	1.000000	2	1.0000	1983	*	321,206,485	1.002081	667,107	1.0084	28TH TO ULT
1948	*	25,333,051	1.000000	2	1.0000	1984	*	345,383,317	1.002775	955,765	1.0112	27TH TO ULT
1949	*	27,239,840	1.000000	3	1.0000	1985	*	371,379,911	1.00369992	1,369,009	1.0149	26TH TO ULT
1950	*	29,290,151	1.000000	5	1.0000	1986		328,761,623	1.0096			
1951	*	31,494,786	1.000000	7	1.0000	1987		432,071,173	1.0050			
1952	*	33,865,361	1.000000	9	1.0000	1988		527,338,937	1.0037			
1953	*	36,414,367	1.000000	14	1.0000	1989		641,859,353	1.0075			
1954	*	39,155,233	1.000000	19	1.0000	1990		664,252,678	1.0029			
1955	*	42,102,401	1.000001	28	1.0000	1991		627,278,869	1.0090			
1956	*	45,271,399	1.000001	40	1.0000	1992		575,902,892	1.0098			
1957	*	48,678,924	1.000001	57	1.0000	1993		485,061,348	1.0083			
1958	*	52,342,929	1.000002	82	1.0000	1994		462,108,749	1.0197			
1959	*	56,282,719	1.000002	118	1.0000	1995		427,503,796	1.0122			
1960	*	60,519,053	1.000003	169	1.0000	1996		424,627,519	1.0083			
1961	*	65,074,250	1.000004	242	1.0000	1997		454,681,294	1.0087			
1962	*	69,972,312	1.000005	346	1.0000	1998		487,424,316	1.0080			
1963	*	75,239,045	1.000007	497	1.0000	1999		526,205,898	1.0023			
1964	*	80,902,199	1.000009	712	1.0000	2000		536,035,395	1.0034			
1965	*	86,991,612	1.000012	1,021	1.0000	2001		518,043,083	1.0051			
1966	*	93,539,368	1.000016	1,463	1.0001	2002		549,525,682	1.0031			
1967	*	100,579,965	1.000021	2,098	1.0001	2003		556,435,460	1.0121			
1968	*	108,150,500	1.000028	3,008	1.0001	2004		592,378,853	1.0051			
1969	*	116,290,861	1.000037	4,312	1.0001	2005		608,403,314	0.9970			
1970	*	125,043,936	1.000049	6,182	1.0002	2006		616,348,411	1.0077			
1971	*	134,455,845	1.000066	8,863	1.0003	2007		671,182,229	0.9960			
1972	*	144,576,178	1.000088	12,707	1.0004	2008		603,609,815	0.9998			
1973	*	155,458,256	1.000117	18,218	1.0005	2009		554,956,470	1.0267			
1974	*	167,159,415	1.000156	26,117	1.0006	2010		606,562,364	1.0825			
1975	*	179,741,306	1.000208	37,442	1.0008	2011		565,089,941	2.1094			
1976	*	193,270,221	1.000278	53,677	1.0011	2012		246,572,981				