

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 thirty previous individual policy years. A single aggregate line of experience is reported for all older policy years combined.

The following discussion focuses on data assuming 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 PCRБ 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

VALUATION	MATURITY	<u>INDEMNITY</u> Tail Factor	<u>MEDICAL</u> Tail Factor
17V18	30TH TO ULT.	0.9995	1.0417
16V17	30TH TO ULT.	1.0013	1.0084
15V16	30TH TO ULT.	1.0005	1.0151
14V15	30TH TO ULT.	1.0014	0.9964
AVERAGE OF LATEST 4 VALUATIONS		1.0007	1.0154

INDEMNITY 17 vs 18

Inputs and Notes for Tail Factor Estimation

Latest 12/31 Prior to 1988 PYs Incurred	6,204,997,363
Next Latest 12/31 Prior to 1988 PYs Incurred	6,205,456,624
CY Development of Prior to 1988 PYs	-459,261
Next Latest PY 1988 Incurred	979,131,031
# of 1988 PYs in Prior to 1988 PYs Data	6.34
Selected Decrement Development Factor	0.75
Selected Average PY Deflation Factor	0.95

- 1 PY 1987 Incurred = (Average of 1988, 1989, 1990) x (PY Deflation Factor ^ 2)
- 2 PY 1986 & Prior Incurred = Subsequent Year x PY Deflation
- 3 PY 1987 LDF selected based on balancing Prior to 1988 PYs Total Dollar Dev. to Actual CY Dev.
- 4 PY 1986 & Prior LDFs = (Subsequent Year - 1.0) x Selected Decrement + 1.0

CY Development of Prior to 1988 PYs:	-459,261
Total Dollar Development:	-459,261
Difference:	0

Tail Factor Model - 2020 Loss Cost Filing

Policy Year	(*=Estimate)	Incurred as of 12/31/18	Prior Year LDF	Dollar Development	Cumulative LDF	Policy Year	(*=Estimate)	Incurred as of 12/31/18	Prior Year LDF	Dollar Development	Cumulative LDF	
1947	*	127,104,274	1.000000	0	1.0000	1983	*	805,583,134	0.999958	-34,027	0.9998	34TH TO ULT
1948	*	133,793,973	1.000000	0	1.0000	1984	*	847,982,246	0.999944	-47,757	0.9998	33RD TO ULT
1949	*	140,835,761	1.000000	0	1.0000	1985	*	892,612,891	0.999925	-67,029	0.9997	32ND TO ULT
1950	*	148,248,169	1.000000	0	1.0000	1986	*	939,592,517	0.999900	-94,078	0.9996	31ST TO ULT
1951	*	156,050,705	1.000000	-1	1.0000	1987	*	989,044,754	0.99986651	-132,044	0.9995	30TH TO ULT
1952	*	164,263,900	1.000000	-1	1.0000	1988		978,539,100	0.9994			
1953	*	172,909,368	1.000000	-1	1.0000	1989		1,142,009,745	1.0002			
1954	*	182,009,861	1.000000	-2	1.0000	1990		1,167,134,549	1.0010			
1955	*	191,589,328	1.000000	-3	1.0000	1991		1,011,943,566	1.0000			
1956	*	201,672,976	1.000000	-4	1.0000	1992		857,607,613	1.0030			
1957	*	212,287,344	1.000000	-5	1.0000	1993		746,054,943	0.9992			
1958	*	223,460,362	1.000000	-7	1.0000	1994		690,929,303	0.9999			
1959	*	235,221,433	1.000000	-10	1.0000	1995		587,027,390	1.0002			
1960	*	247,601,509	1.000000	-14	1.0000	1996		505,329,107	0.9996			
1961	*	260,633,167	1.000000	-20	1.0000	1997		514,156,510	1.0006			
1962	*	274,350,702	1.000000	-28	1.0000	1998		514,718,614	1.0011			
1963	*	288,790,213	1.000000	-39	1.0000	1999		587,041,602	1.0005			
1964	*	303,989,698	1.000000	-54	1.0000	2000		622,430,515	1.0000			
1965	*	319,989,156	1.000000	-76	1.0000	2001		632,853,336	1.0009			
1966	*	336,830,690	1.000000	-107	1.0000	2002		665,371,025	1.0011			
1967	*	354,558,621	1.000000	-150	1.0000	2003		650,113,522	0.9992			
1968	*	373,219,601	0.999999	-211	1.0000	2004		684,637,422	1.0005			
1969	*	392,862,738	0.999999	-296	1.0000	2005		690,299,006	1.0019			
1970	*	413,539,724	0.999999	-415	1.0000	2006		711,327,164	1.0025			
1971	*	435,304,973	0.999999	-582	1.0000	2007		748,680,433	1.0027			
1972	*	458,215,761	0.999998	-817	1.0000	2008		696,014,713	1.0001			
1973	*	482,332,380	0.999998	-1,147	1.0000	2009		632,416,122	1.0041			
1974	*	507,718,295	0.999997	-1,610	1.0000	2010		652,754,626	1.0033			
1975	*	534,440,310	0.999996	-2,260	1.0000	2011		626,264,659	1.0009			
1976	*	562,568,748	0.999994	-3,172	1.0000	2012		572,983,318	1.0067			
1977	*	592,177,629	0.999992	-4,452	1.0000	2013		572,417,846	0.9988			
1978	*	623,344,873	0.999990	-6,248	1.0000	2014		569,369,321	1.0184			
1979	*	656,152,498	0.999987	-8,769	0.9999	2015		535,372,445	1.0795			
1980	*	690,686,839	0.999982	-12,307	0.9999	2016		476,728,743	1.3294			
1981	*	727,038,778	0.999976	-17,274	0.9999	2017		383,917,351	3.4003			
1982	*	765,303,977	0.999968	-24,244	0.9999	2018		117,015,800				

MEDICAL 17 vs 18

Inputs and Notes for Tail Factor Estimation

Latest 12/31 Prior to 1988 PYs Incurred	2,614,306,665
Next Latest 12/31 Prior to 1988 PYs Incurred	2,596,238,207
CY Development of Prior to 1988 PYs	18,068,458
Next Latest PY 1988 Incurred	531,482,944
# of 1988 PYs in Prior to 1988 PYs Data	4.92
Selected Decrement Development Factor	0.75
Selected Average PY Deflation Factor	0.93

- 1 PY 1987 Incurred = (Average of 1988, 1989, 1990) x (PY Deflation Factor ^ 2)
- 2 PY 1986 & Prior Incurred = Subsequent Year x PY Deflation
- 3 PY 1987 LDF selected based on balancing Prior to 1988 PYs Total Dollar Dev. to Actual CY Dev.
- 4 PY 1986 & Prior LDFs = (Subsequent Year - 1.0) x Selected Decrement + 1.0

CY Development of Prior to 1988 PYs:	18,068,458
Total Dollar Development:	18,068,458
Difference:	0

Tail Factor Model - 2020 Loss Cost Filing

Policy Year	(*=Estimate)	Incurred as of 12/31/18	Prior Year LDF	Dollar Development	Cumulative LDF	Policy Year	(*=Estimate)	Incurred as of 12/31/18	Prior Year LDF	Dollar Development	Cumulative LDF	
1947	*	29,493,528	1.000000	3	1.0000	1983	*	402,106,023	1.003238	1,297,853	1.0130	34TH TO ULT
1948	*	31,713,471	1.000000	4	1.0000	1984	*	432,372,068	1.004317	1,858,721	1.0174	33RD TO ULT
1949	*	34,100,506	1.000000	6	1.0000	1985	*	464,916,202	1.005757	2,661,020	1.0233	32ND TO ULT
1950	*	36,667,211	1.000000	9	1.0000	1986	*	499,909,895	1.007675	3,807,818	1.0311	31ST TO ULT
1951	*	39,427,109	1.000000	13	1.0000	1987	*	537,537,521	1.01023396	5,445,411	1.0417	30TH TO ULT
1952	*	42,394,741	1.000000	18	1.0000	1988		533,169,876	1.0032			
1953	*	45,585,743	1.000001	26	1.0000	1989		655,442,233	1.0050			
1954	*	49,016,928	1.000001	38	1.0000	1990		675,895,422	1.0046			
1955	*	52,706,374	1.000001	54	1.0000	1991		626,111,547	1.0021			
1956	*	56,673,520	1.000001	78	1.0000	1992		553,309,205	1.0027			
1957	*	60,939,269	1.000002	111	1.0000	1993		430,468,373	0.9952			
1958	*	65,526,096	1.000002	160	1.0000	1994		410,498,121	1.0084			
1959	*	70,458,168	1.000003	229	1.0000	1995		376,438,471	1.0048			
1960	*	75,761,470	1.000004	328	1.0000	1996		378,070,875	1.0030			
1961	*	81,463,947	1.000006	471	1.0000	1997		394,997,939	1.0042			
1962	*	87,595,642	1.000008	675	1.0000	1998		428,762,410	1.0108			
1963	*	94,188,862	1.000010	967	1.0000	1999		452,101,414	1.0054			
1964	*	101,278,346	1.000014	1,387	1.0001	2000		486,047,799	1.0084			
1965	*	108,901,448	1.000018	1,988	1.0001	2001		475,076,032	1.0013			
1966	*	117,098,331	1.000024	2,850	1.0001	2002		547,746,192	1.0196			
1967	*	125,912,184	1.000032	4,086	1.0001	2003		558,262,465	1.0068			
1968	*	135,389,445	1.000043	5,858	1.0002	2004		610,813,669	1.0099			
1969	*	145,580,048	1.000058	8,399	1.0002	2005		637,851,522	1.0050			
1970	*	156,537,686	1.000077	12,041	1.0003	2006		649,736,195	1.0075			
1971	*	168,320,092	1.000103	17,263	1.0004	2007		694,608,512	1.0028			
1972	*	180,989,347	1.000137	24,749	1.0005	2008		626,473,421	1.0037			
1973	*	194,612,201	1.000182	35,481	1.0007	2009		553,416,792	0.9998			
1974	*	209,260,431	1.000243	50,865	1.0010	2010		608,100,125	1.0094			
1975	*	225,011,216	1.000324	72,919	1.0013	2011		595,081,557	1.0018			
1976	*	241,947,544	1.000432	104,532	1.0017	2012		554,288,333	1.0015			
1977	*	260,158,650	1.000576	149,846	1.0023	2013		568,165,286	0.9876			
1978	*	279,740,484	1.000768	214,791	1.0031	2014		576,071,825	1.0022			
1979	*	300,796,219	1.001025	307,866	1.0041	2015		533,185,215	0.9998			
1980	*	323,436,794	1.001366	441,234	1.0055	2016		513,349,672	1.0468			
1981	*	347,781,499	1.001821	632,306	1.0073	2017		543,900,463	2.1946			
1982	*	373,958,602	1.002429	905,984	1.0098	2018		289,986,378				

INDEMNITY 16 vs 17

Inputs and Notes for Tail Factor Estimation

Latest 12/31 Prior to 1987 PYs Incurred	5,205,124,304	1 PY 1986 Incurred = (Average of 1987, 1988, 1989) x (PY Deflation Factor ^ 2)
Next Latest 12/31 Prior to 1987 PYs Incurred	5,204,123,749	2 PY 1985 & Prior Incurred = Subsequent Year x PY Deflation
CY Development of Prior to 1987 PYs	1,000,555	3 PY 1986 LDF selected based on balancing Prior to 1987 PYs Total Dollar Dev. to Actual CY Dev.
Next Latest PY 1987 Incurred	854,651,029	4 PY 1985 & Prior LDFs = (Subsequent Year - 1.0) x Selected Decrement + 1.0
# of 1987 PYs in Prior to 1987 PYs Data	6.09	
Selected Decrement Development Factor	0.75	CY Development of Prior to 1987 PYs:
Selected Average PY Deflation Factor	0.95	Total Dollar Development:
		Difference:
		0

Tail Factor Model - 2020 Loss Cost Filing

Policy Year	(*=Estimate)	Incurred as of 12/31/17	Prior Year LDF	Dollar Development	Cumulative LDF	Policy Year	(*=Estimate)	Incurred as of 12/31/17	Prior Year LDF	Dollar Development	Cumulative LDF	
1946	*	113,863,252	1.000000	0	1.0000	1982	*	721,661,925	1.000103	74,142	1.0004	34TH TO ULT
1947	*	119,856,055	1.000000	1	1.0000	1983	*	759,644,132	1.000137	104,055	1.0005	33RD TO ULT
1948	*	126,164,268	1.000000	1	1.0000	1984	*	799,625,402	1.000183	146,035	1.0007	32ND TO ULT
1949	*	132,804,493	1.000000	1	1.0000	1985	*	841,710,949	1.000244	204,949	1.0010	31ST TO ULT
1950	*	139,794,203	1.000000	1	1.0000	1986	*	886,011,525	1.000325	287,624	1.0013	30TH TO ULT
1951	*	147,151,792	1.000000	2	1.0000	1987		854,988,791	1.0004			
1952	*	154,896,624	1.000000	3	1.0000	1988		965,158,022	0.9995			
1953	*	163,049,077	1.000000	4	1.0000	1989		1,125,043,853	1.0003			
1954	*	171,630,608	1.000000	6	1.0000	1990		1,146,907,858	1.0003			
1955	*	180,663,798	1.000000	8	1.0000	1991		990,497,475	0.9995			
1956	*	190,172,419	1.000000	11	1.0000	1992		830,182,289	1.0000			
1957	*	200,181,493	1.000000	15	1.0000	1993		724,742,596	0.9999			
1958	*	210,717,361	1.000000	22	1.0000	1994		675,746,986	0.9998			
1959	*	221,807,749	1.000000	30	1.0000	1995		571,505,271	1.0009			
1960	*	233,481,841	1.000000	43	1.0000	1996		489,577,214	0.9998			
1961	*	245,770,359	1.000000	60	1.0000	1997		496,596,269	1.0004			
1962	*	258,705,641	1.000000	84	1.0000	1998		491,348,242	0.9999			
1963	*	272,321,727	1.000000	118	1.0000	1999		554,895,802	1.0006			
1964	*	286,654,450	1.000001	166	1.0000	2000		588,591,255	1.0012			
1965	*	301,741,526	1.000001	233	1.0000	2001		618,124,971	1.0001			
1966	*	317,622,659	1.000001	327	1.0000	2002		663,486,560	1.0014			
1967	*	334,339,641	1.000001	459	1.0000	2003		648,154,254	1.0016			
1968	*	351,936,464	1.000002	644	1.0000	2004		684,984,762	1.0009			
1969	*	370,459,436	1.000002	904	1.0000	2005		688,986,696	1.0011			
1970	*	389,957,301	1.000003	1,269	1.0000	2006		708,913,315	1.0011			
1971	*	410,481,370	1.000004	1,781	1.0000	2007		746,254,979	1.0033			
1972	*	432,085,652	1.000006	2,500	1.0000	2008		695,407,566	1.0015			
1973	*	454,827,002	1.000008	3,509	1.0000	2009		629,224,730	1.0043			
1974	*	478,765,266	1.000010	4,925	1.0000	2010		649,867,794	1.0068			
1975	*	503,963,437	1.000014	6,912	1.0001	2011		625,598,381	1.0078			
1976	*	530,487,829	1.000018	9,701	1.0001	2012		568,874,281	1.0050			
1977	*	558,408,241	1.000024	13,615	1.0001	2013		572,054,009	1.0105			
1978	*	587,798,148	1.000033	19,109	1.0001	2014		548,072,299	1.0864			
1979	*	618,734,893	1.000043	26,819	1.0002	2015		490,226,637	1.3372			
1980	*	651,299,887	1.000058	37,640	1.0002	2016		358,903,441	3.3664			
1981	*	685,578,829	1.000077	52,827	1.0003	2017		112,945,050				

MEDICAL 16 vs 17

Inputs and Notes for Tail Factor Estimation

Latest 12/31 Prior to 1987 PYs Incurred	2,095,988,490
Next Latest 12/31 Prior to 1987 PYs Incurred	2,092,785,573
CY Development of Prior to 1987 PYs	3,202,917
Next Latest PY 1987 Incurred	437,638,844
# of 1987 PYs in Prior to 1987 PYs Data	4.79
Selected Decrement Development Factor	0.75
Selected Average PY Deflation Factor	0.93

- 1 PY 1986 Incurred = (Average of 1987, 1988, 1989) x (PY Deflation Factor ^ 2)
- 2 PY 1985 & Prior Incurred = Subsequent Year x PY Deflation
- 3 PY 1986 LDF selected based on balancing Prior to 1987 PYs Total Dollar Dev. to Actual CY Dev.
- 4 PY 1985 & Prior LDFs = (Subsequent Year - 1.0) x Selected Decrement + 1.0

CY Development of Prior to 1987 PYs:	3,202,917
Total Dollar Development:	3,202,917
Difference:	0

Tail Factor Model - 2020 Loss Cost Filing

Policy Year	(*=Estimate)	Incurred as of 12/31/17	Prior Year LDF	Dollar Development	Cumulative LDF	Policy Year	(*=Estimate)	Incurred as of 12/31/17	Prior Year LDF	Dollar Development	Cumulative LDF	
1946	*	25,521,630	1.000000	1	1.0000	1982	*	347,954,337	1.000660	229,475	1.0026	34TH TO ULT
1947	*	27,442,613	1.000000	1	1.0000	1983	*	374,144,448	1.000880	328,924	1.0035	33RD TO ULT
1948	*	29,508,185	1.000000	1	1.0000	1984	*	402,305,858	1.001173	471,438	1.0047	32ND TO ULT
1949	*	31,729,232	1.000000	2	1.0000	1985	*	432,586,945	1.001564	675,632	1.0063	31ST TO ULT
1950	*	34,117,453	1.000000	2	1.0000	1986	*	465,147,252	1.00208571	968,144	1.0084	30TH TO ULT
1951	*	36,685,434	1.000000	3	1.0000	1987		445,607,513	1.0182			
1952	*	39,446,703	1.000000	5	1.0000	1988		524,711,194	0.9981			
1953	*	42,415,810	1.000000	7	1.0000	1989		643,095,279	1.0015			
1954	*	45,608,398	1.000000	10	1.0000	1990		663,442,072	1.0018			
1955	*	49,041,288	1.000000	14	1.0000	1991		610,953,160	1.0021			
1956	*	52,732,567	1.000000	20	1.0000	1992		536,685,035	1.0007			
1957	*	56,701,685	1.000000	28	1.0000	1993		419,832,793	1.0035			
1958	*	60,969,554	1.000001	40	1.0000	1994		398,732,142	1.0028			
1959	*	65,558,660	1.000001	58	1.0000	1995		366,032,892	1.0016			
1960	*	70,493,183	1.000001	83	1.0000	1996		367,707,346	1.0079			
1961	*	75,799,122	1.000002	119	1.0000	1997		382,301,878	0.9982			
1962	*	81,504,432	1.000002	171	1.0000	1998		402,951,814	1.0153			
1963	*	87,639,174	1.000003	245	1.0000	1999		432,265,047	0.9984			
1964	*	94,235,671	1.000004	351	1.0000	2000		462,045,801	1.0026			
1965	*	101,328,679	1.000005	503	1.0000	2001		466,305,560	1.0017			
1966	*	108,955,568	1.000007	721	1.0000	2002		536,277,184	1.0057			
1967	*	117,156,525	1.000009	1,033	1.0000	2003		552,047,850	1.0046			
1968	*	125,974,758	1.000012	1,481	1.0000	2004		605,522,820	1.0032			
1969	*	135,456,729	1.000016	2,124	1.0001	2005		634,622,287	1.0073			
1970	*	145,652,397	1.000021	3,045	1.0001	2006		644,541,197	1.0046			
1971	*	156,615,481	1.000028	4,365	1.0001	2007		692,152,336	1.0022			
1972	*	168,403,743	1.000037	6,258	1.0001	2008		623,411,445	0.9978			
1973	*	181,079,293	1.000050	8,972	1.0002	2009		552,881,259	0.9971			
1974	*	194,708,918	1.000066	12,863	1.0003	2010		601,930,105	1.0082			
1975	*	209,364,427	1.000088	18,441	1.0004	2011		593,729,286	1.0084			
1976	*	225,123,040	1.000117	26,438	1.0005	2012		553,227,436	1.0309			
1977	*	242,067,785	1.000157	37,903	1.0006	2013		574,658,775	0.9973			
1978	*	260,287,941	1.000209	54,339	1.0008	2014		565,563,887	1.0202			
1979	*	279,879,507	1.000278	77,899	1.0011	2015		528,855,104	1.0478			
1980	*	300,945,706	1.000371	111,673	1.0015	2016		490,693,171	2.1990			
1981	*	323,597,533	1.000495	160,085	1.0020	2017		248,019,525				

INDEMNITY 15 vs 16

Inputs and Notes for Tail Factor Estimation

Latest 12/31 Prior to 1986 PYs Incurred	4,671,353,956	1 PY 1985 Incurred = (Average of 1986, 1987, 1988) x (PY Deflation Factor ^ 2)
Next Latest 12/31 Prior to 1986 PYs Incurred	4,671,047,086	2 PY 1984 & Prior Incurred = Subsequent Year x PY Deflation
CY Development of Prior to 1986 PYs	306,870	3 PY 1985 LDF selected based on balancing Prior to 1986 PYs Total Dollar Dev. to Actual CY Dev.
Next Latest PY 1986 Incurred	709,958,220	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:
Selected Average PY Deflation Factor	0.95	Total Dollar Development:
		Difference:
		0

Tail Factor Model - 2020 Loss Cost Filing

Policy Year	(*=Estimate)	Incurred as of 12/31/16	Prior Year LDF	Dollar Development	Cumulative LDF	Policy Year	(*=Estimate)	Incurred as of 12/31/16	Prior Year LDF	Dollar Development	Cumulative LDF	
1945	*	98,243,111	1.000000	0	1.0000	1981	*	622,661,932	1.000037	22,738	1.0001	34TH TO ULT
1946	*	103,413,801	1.000000	0	1.0000	1982	*	655,433,613	1.000049	31,912	1.0002	33RD TO ULT
1947	*	108,856,632	1.000000	0	1.0000	1983	*	689,930,119	1.000065	44,789	1.0003	32ND TO ULT
1948	*	114,585,929	1.000000	0	1.0000	1984	*	726,242,230	1.000087	62,860	1.0003	31ST TO ULT
1949	*	120,616,767	1.000000	0	1.0000	1985	*	764,465,506	1.00011542	88,222	1.0005	30TH TO ULT
1950	*	126,965,018	1.000000	1	1.0000	1986		710,223,713	1.0004		1.0009	29TH TO ULT
1951	*	133,647,388	1.000000	1	1.0000	1987		858,795,309	0.9992			
1952	*	140,681,461	1.000000	1	1.0000	1988		972,140,554	1.0004			
1953	*	148,085,748	1.000000	2	1.0000	1989		1,130,519,400	1.0005			
1954	*	155,879,735	1.000000	2	1.0000	1990		1,155,458,990	1.0006			
1955	*	164,083,931	1.000000	3	1.0000	1991		997,801,259	1.0008			
1956	*	172,719,928	1.000000	5	1.0000	1992		838,662,162	1.0011			
1957	*	181,810,450	1.000000	7	1.0000	1993		731,646,821	1.0002			
1958	*	191,379,421	1.000000	9	1.0000	1994		668,564,530	1.0017			
1959	*	201,452,022	1.000000	13	1.0000	1995		563,486,707	0.9984			
1960	*	212,054,760	1.000000	18	1.0000	1996		481,377,066	0.9999			
1961	*	223,215,537	1.000000	26	1.0000	1997		491,514,461	1.0021			
1962	*	234,963,723	1.000000	36	1.0000	1998		489,207,206	1.0003			
1963	*	247,330,235	1.000000	51	1.0000	1999		555,308,615	1.0005			
1964	*	260,347,616	1.000000	71	1.0000	2000		590,838,562	0.9999			
1965	*	274,050,122	1.000000	100	1.0000	2001		594,475,158	1.0013			
1966	*	288,473,813	1.000000	141	1.0000	2002		620,062,653	1.0016			
1967	*	303,656,645	1.000001	198	1.0000	2003		603,777,247	1.0007			
1968	*	319,638,574	1.000001	277	1.0000	2004		651,767,703	1.0014			
1969	*	336,461,656	1.000001	389	1.0000	2005		666,303,453	1.0014			
1970	*	354,170,165	1.000002	546	1.0000	2006		692,203,844	1.0025			
1971	*	372,810,700	1.000002	767	1.0000	2007		730,660,505	1.0013			
1972	*	392,432,315	1.000003	1,076	1.0000	2008		675,303,249	0.9999			
1973	*	413,086,648	1.000004	1,510	1.0000	2009		615,292,553	1.0058			
1974	*	434,828,050	1.000005	2,120	1.0000	2010		636,341,190	1.0002			
1975	*	457,713,737	1.000006	2,975	1.0000	2011		609,071,866	1.0040			
1976	*	481,803,934	1.000009	4,175	1.0000	2012		540,493,744	1.0319			
1977	*	507,162,036	1.000012	5,860	1.0000	2013		542,249,780	1.0948			
1978	*	533,854,774	1.000015	8,225	1.0001	2014		483,727,223	1.3303			
1979	*	561,952,394	1.000021	11,543	1.0001	2015		343,601,938	3.2468			
1980	*	591,528,836	1.000027	16,201	1.0001	2016		98,250,325				

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Inputs and Notes for Tail Factor Estimation

Latest 12/31 Prior to 1986 PYs Incurred	1,819,962,642	1 PY 1985 Incurred = (Average of 1986, 1987, 1988) x (PY Deflation Factor ^ 2)
Next Latest 12/31 Prior to 1986 PYs Incurred	1,815,370,230	2 PY 1984 & Prior Incurred = Subsequent Year x PY Deflation
CY Development of Prior to 1986 PYs	4,592,412	3 PY 1985 LDF selected based on balancing Prior to 1986 PYs Total Dollar Dev. to Actual CY Dev.
Next Latest PY 1986 Incurred	326,407,242	4 PY 1984 & Prior LDFs = (Subsequent Year - 1.0) x Selected Decrement + 1.0
# of 1986 PYs in Prior to 1986 PYs Data	5.58	
Selected Decrement Development Factor	0.75	CY Development of Prior to 1986 PYs:
Selected Average PY Deflation Factor	0.93	Total Dollar Development:
		Difference:
		0

Tail Factor Model - 2020 Loss Cost Filing

Policy Year	(*=Estimate)	Incurred as of 12/31/16	Prior Year LDF	Dollar Development	Cumulative LDF	Policy Year	(*=Estimate)	Incurred as of 12/31/16	Prior Year LDF	Dollar Development	Cumulative LDF	
1945	*	20,371,096	1.000000	1	1.0000	1981	*	277,733,488	1.001187	329,200	1.0048	34TH TO ULT
1946	*	21,904,404	1.000000	1	1.0000	1982	*	298,638,159	1.001582	471,784	1.0063	33RD TO ULT
1947	*	23,553,123	1.000000	2	1.0000	1983	*	321,116,300	1.002110	676,038	1.0085	32ND TO ULT
1948	*	25,325,939	1.000000	2	1.0000	1984	*	345,286,344	1.002813	968,550	1.0113	31ST TO ULT
1949	*	27,232,192	1.000000	3	1.0000	1985	*	371,275,639	1.00375060	1,387,305	1.0151	30TH TO ULT
1950	*	29,281,927	1.000000	5	1.0000	1986		329,204,491	1.0086		1.0238	29TH TO ULT
1951	*	31,485,943	1.000000	7	1.0000	1987		434,790,624	1.0013			
1952	*	33,855,853	1.000000	10	1.0000	1988		523,814,940	1.0017			
1953	*	36,404,143	1.000000	14	1.0000	1989		641,852,652	1.0067			
1954	*	39,144,239	1.000001	20	1.0000	1990		658,820,583	1.0055			
1955	*	42,090,580	1.000001	28	1.0000	1991		609,629,862	0.9988			
1956	*	45,258,688	1.000001	40	1.0000	1992		533,807,203	1.0045			
1957	*	48,665,256	1.000001	58	1.0000	1993		414,664,513	1.0057			
1958	*	52,328,232	1.000002	83	1.0000	1994		388,052,694	1.0053			
1959	*	56,266,917	1.000002	119	1.0000	1995		355,594,197	0.9991			
1960	*	60,502,061	1.000003	171	1.0000	1996		350,304,863	1.0060			
1961	*	65,055,979	1.000004	245	1.0000	1997		375,893,068	1.0052			
1962	*	69,952,666	1.000005	351	1.0000	1998		389,012,659	1.0010			
1963	*	75,217,920	1.000007	503	1.0000	1999		428,114,332	1.0035			
1964	*	80,879,484	1.000009	721	1.0000	2000		449,458,717	1.0048			
1965	*	86,967,187	1.000012	1,034	1.0000	2001		445,555,423	1.0019			
1966	*	93,513,105	1.000016	1,483	1.0001	2002		495,481,741	1.0033			
1967	*	100,551,726	1.000021	2,126	1.0001	2003		508,230,912	1.0069			
1968	*	108,120,135	1.000028	3,048	1.0001	2004		575,481,578	0.9996			
1969	*	116,258,210	1.000038	4,370	1.0002	2005		606,205,127	1.0083			
1970	*	125,008,828	1.000050	6,265	1.0002	2006		623,544,374	1.0041			
1971	*	134,418,094	1.000067	8,982	1.0003	2007		670,684,516	1.0062			
1972	*	144,535,585	1.000089	12,878	1.0004	2008		603,219,591	0.9991			
1973	*	155,414,608	1.000119	18,462	1.0005	2009		541,817,915	1.0162			
1974	*	167,112,481	1.000158	26,468	1.0006	2010		595,748,655	0.9987			
1975	*	179,690,840	1.000211	37,944	1.0008	2011		576,757,464	1.0088			
1976	*	193,215,957	1.000282	54,397	1.0011	2012		510,310,258	1.0047			
1977	*	207,759,094	1.000375	77,981	1.0015	2013		553,994,065	1.0201			
1978	*	223,396,875	1.000501	111,787	1.0020	2014		533,457,070	1.0717			
1979	*	240,211,694	1.000668	160,241	1.0027	2015		468,896,395	2.1736			
1980	*	258,292,144	1.000890	229,685	1.0036	2016		199,538,261				

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Inputs and Notes for Tail Factor Estimation

Latest 12/31 Prior to 1986 PYs Incurred	4,681,301,566	1 PY 1985 Incurred = (Average of 1986, 1987, 1988) x (PY Deflation Factor ^ 2)
Next Latest 12/31 Prior to 1986 PYs Incurred	4,680,071,625	2 PY 1984 & Prior Incurred = Subsequent Year x PY Deflation
CY Development of Prior to 1986 PYs	1,229,941	3 PY 1985 LDF selected based on balancing Prior to 1986 PYs Total Dollar Dev. to Actual CY Dev.
Next Latest PY 1986 Incurred	714,807,350	4 PY 1984 & Prior LDFs = (Subsequent Year - 1.0) x Selected Decrement + 1.0
# of 1986 PYs in Prior to 1986 PYs Data	6.55	
Selected Decrement Development Factor	0.75	CY Development of Prior to 1986 PYs:
Selected Average PY Deflation Factor	0.95	Total Dollar Development:
		Difference:
		0

Tail Factor Model - 2020 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	*	94,189,412	1.000000	0	1.0000	1980	*	596,969,712	1.000109	64,941	1.0004	34TH TO ULT
1945	*	99,146,750	1.000000	0	1.0000	1981	*	628,389,171	1.000145	91,143	1.0006	33RD TO ULT
1946	*	104,365,000	1.000000	1	1.0000	1982	*	661,462,285	1.000193	127,913	1.0008	32ND TO ULT
1947	*	109,857,895	1.000000	1	1.0000	1983	*	696,276,090	1.000258	179,516	1.0010	31ST TO ULT
1948	*	115,639,889	1.000000	1	1.0000	1984	*	732,922,200	1.000344	251,931	1.0014	30TH TO ULT
1949	*	121,726,199	1.000000	2	1.0000	1985	*	771,497,052	1.00045847	353,546	1.0018	29TH TO ULT
1950	*	128,132,841	1.000000	2	1.0000	1986		715,516,906	1.0010			
1951	*	134,876,675	1.000000	3	1.0000	1987		866,931,127	1.0005			
1952	*	141,975,447	1.000000	5	1.0000	1988		982,085,105	0.9996			
1953	*	149,447,839	1.000000	7	1.0000	1989		1,142,902,544	1.0019			
1954	*	157,313,515	1.000000	10	1.0000	1990		1,168,287,167	1.0002			
1955	*	165,593,174	1.000000	14	1.0000	1991		1,016,385,928	1.0006			
1956	*	174,308,604	1.000000	19	1.0000	1992		861,793,648	0.9989			
1957	*	183,482,741	1.000000	27	1.0000	1993		753,773,119	1.0003			
1958	*	193,139,727	1.000000	37	1.0000	1994		692,130,367	1.0008			
1959	*	203,304,976	1.000000	53	1.0000	1995		588,598,325	1.0004			
1960	*	214,005,238	1.000000	74	1.0000	1996		506,643,542	0.9970			
1961	*	225,268,672	1.000000	104	1.0000	1997		514,875,882	0.9996			
1962	*	237,124,917	1.000001	145	1.0000	1998		517,111,579	0.9996			
1963	*	249,605,176	1.000001	204	1.0000	1999		588,441,705	0.9995			
1964	*	262,742,291	1.000001	287	1.0000	2000		630,932,722	0.9998			
1965	*	276,570,832	1.000001	402	1.0000	2001		641,302,318	0.9996			
1966	*	291,127,192	1.000002	564	1.0000	2002		670,956,683	0.9986			
1967	*	306,449,676	1.000003	792	1.0000	2003		663,124,433	0.9998			
1968	*	322,578,606	1.000003	1,112	1.0000	2004		702,827,748	0.9996			
1969	*	339,556,428	1.000005	1,560	1.0000	2005		710,682,018	1.0013			
1970	*	357,427,818	1.000006	2,190	1.0000	2006		732,756,067	0.9989			
1971	*	376,239,809	1.000008	3,073	1.0000	2007		762,842,530	1.0003			
1972	*	396,041,904	1.000011	4,314	1.0000	2008		716,095,162	1.0028			
1973	*	416,886,215	1.000015	6,054	1.0001	2009		646,516,614	1.0112			
1974	*	438,827,595	1.000019	8,497	1.0001	2010		674,662,838	1.0060			
1975	*	461,923,784	1.000026	11,926	1.0001	2011		651,348,938	1.0240			
1976	*	486,235,562	1.000034	16,738	1.0001	2012		592,377,519	1.1086			
1977	*	511,826,907	1.000046	23,491	1.0002	2013		567,711,709	1.3936			
1978	*	538,765,165	1.000061	32,970	1.0002	2014		407,476,651	3.3485			
1979	*	567,121,227	1.000082	46,272	1.0003	2015		117,270,981				

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Inputs and Notes for Tail Factor Estimation

Latest 12/31 Prior to 1986 PYs Incurred	1,823,986,695	1 PY 1985 Incurred = (Average of 1986, 1987, 1988) x (PY Deflation Factor ^ 2)
Next Latest 12/31 Prior to 1986 PYs Incurred	1,825,495,580	2 PY 1984 & Prior Incurred = Subsequent Year x PY Deflation
CY Development of Prior to 1986 PYs	-1,508,885	3 PY 1985 LDF selected based on balancing Prior to 1986 PYs Total Dollar Dev. to Actual CY Dev.
Next Latest PY 1986 Incurred	331,110,788	4 PY 1984 & Prior LDFs = (Subsequent Year - 1.0) x Selected Decrement + 1.0
# of 1986 PYs in Prior to 1986 PYs Data	5.51	
Selected Decrement Development Factor	0.75	CY Development of Prior to 1986 PYs: -1,508,885
Selected Average PY Deflation Factor	0.93	Total Dollar Development: -1,508,885
		Difference: 0

Tail Factor Model - 2020 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	*	19,228,820	1.000000	0	1.0000	1980	*	262,160,039	0.999713	-75,317	0.9989	34TH TO ULT
1945	*	20,676,151	1.000000	0	1.0000	1981	*	281,892,515	0.999617	-107,992	0.9985	33RD TO ULT
1946	*	22,232,420	1.000000	0	1.0000	1982	*	303,110,231	0.999489	-154,847	0.9980	32ND TO ULT
1947	*	23,905,828	1.000000	-1	1.0000	1983	*	325,924,979	0.999319	-222,041	0.9973	31ST TO ULT
1948	*	25,705,192	1.000000	-1	1.0000	1984	*	350,456,967	0.999092	-318,411	0.9964	30TH TO ULT
1949	*	27,639,991	1.000000	-1	1.0000	1985	*	376,835,448	0.99878969	-456,641	0.9952	29TH TO ULT
1950	*	29,720,420	1.000000	-2	1.0000	1986		330,564,986	0.9984			
1951	*	31,957,441	1.000000	-2	1.0000	1987		443,661,877	1.0022			
1952	*	34,362,840	1.000000	-3	1.0000	1988		532,867,998	0.9993			
1953	*	36,949,290	1.000000	-4	1.0000	1989		648,527,986	1.0095			
1954	*	39,730,420	1.000000	-6	1.0000	1990		671,190,882	1.0037			
1955	*	42,720,882	1.000000	-9	1.0000	1991		626,980,894	1.0041			
1956	*	45,936,432	1.000000	-13	1.0000	1992		553,811,165	1.0017			
1957	*	49,394,013	1.000000	-19	1.0000	1993		430,807,367	1.0067			
1958	*	53,111,842	0.999999	-27	1.0000	1994		403,996,225	1.0079			
1959	*	57,109,507	0.999999	-39	1.0000	1995		374,691,198	1.0113			
1960	*	61,408,072	0.999999	-56	1.0000	1996		372,248,295	0.9932			
1961	*	66,030,185	0.999999	-80	1.0000	1997		393,506,192	1.0026			
1962	*	71,000,199	0.999998	-115	1.0000	1998		422,156,694	1.0001			
1963	*	76,344,300	0.999998	-165	1.0000	1999		452,888,861	0.9998			
1964	*	82,090,645	0.999997	-236	1.0000	2000		489,409,038	1.0054			
1965	*	88,269,511	0.999996	-339	1.0000	2001		484,381,719	1.0038			
1966	*	94,913,453	0.999995	-486	1.0000	2002		538,151,100	1.0094			
1967	*	102,057,476	0.999993	-696	1.0000	2003		558,198,704	1.0063			
1968	*	109,739,222	0.999991	-998	1.0000	2004		618,915,815	1.0012			
1969	*	117,999,163	0.999988	-1,431	1.0000	2005		642,678,753	1.0032			
1970	*	126,880,820	0.999984	-2,052	0.9999	2006		660,344,669	1.0072			
1971	*	136,430,990	0.999978	-2,942	0.9999	2007		705,993,795	0.9987			
1972	*	146,699,989	0.999971	-4,218	0.9999	2008		643,750,445	1.0082			
1973	*	157,741,923	0.999962	-6,048	0.9998	2009		573,172,405	0.9982			
1974	*	169,614,971	0.999949	-8,671	0.9998	2010		630,706,009	1.0061			
1975	*	182,381,690	0.999932	-12,431	0.9997	2011		621,748,098	0.9925			
1976	*	196,109,344	0.999909	-17,823	0.9996	2012		578,980,071	1.0252			
1977	*	210,870,262	0.999879	-25,554	0.9995	2013		622,530,992	1.0874			
1978	*	226,742,217	0.999838	-36,638	0.9994	2014		569,698,677	2.2152			
1979	*	243,808,836	0.999785	-52,530	0.9991	2015		248,506,154				