

PENNSYLVANIA COMPENSATION RATING BUREAU

Retrospective Test of Trend Projections for Severity Ratios

Attached is a retrospective test of the predictive accuracy of various trend procedures. Please note that instead of using ultimate loss ratios, as in Exhibit 11a, Exhibit 11b uses ultimate severity ratios, i.e., ultimate loss ratios adjusted by dividing out the frequency component. Please note that our analysis is limited to Policy Years 1994 through 2005, the years shown on Exhibit 6, page 6.

Results for both indemnity and medical are shown using both linear and exponential fits. All possible combinations of from four to ten data points, which permitted a test of the projected severity ratio three years hence, were used. Our current review trends policy year 2005 3.25 years, policy year 2004 4.25 years, and policy year 2003 5.25 years. An average of those three values is then calculated.

Current estimates of policy year ultimate severity ratios are compared with predicted values based on trending through earlier years. The results are shown for three loss development approaches: incurred, paid to twentieth and the average of the incurred and paid to twentieth methods.

As an illustration, the incurred loss development approach generated an indemnity severity ratio of 0.8226 for policy year 2000. Fitting the loss ratios for policy years 1994 to 1997 using a straight line and projecting that to 2000 yielded a severity ratio of 0.5839, which understates our current estimate for 2000 by 0.2387 points.

Indemnity
Actual Ultimate Severity Ratios
Including Average of Paid and Incurred

INDEMNITY	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
	1994	0.6449	0.6413	0.6484
	1995	0.6654	0.6560	0.6747
	1996	0.5936	0.5816	0.6055
	1997	0.6553	0.6334	0.6771
	1998	0.6898	0.6664	0.7133
	1999	0.7813	0.7498	0.8128
	2000	0.8613	0.8226	0.8997
	2001	0.8703	0.8223	0.9185
	2002	0.8849	0.8390	0.9311
	2003	0.9005	0.8373	0.9635
	2004	0.9804	0.9204	1.0403
	2005	0.9593	0.8864	1.0323

Trend # Years = 3

**Indemnity
Linear Fit
Trended Severity Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
94-97 (4)	2000	0.6215	0.5839	0.6590
95-98 (4)	2001	0.7117	0.6717	0.7520
96-99 (4)	2002	0.9489	0.8997	0.9983
97-00 (4)	2003	1.0662	1.0110	1.1210
98-01 (4)	2004	1.0804	1.0085	1.1522
99-02 (4)	2005	0.9934	0.9287	1.0587
94-98 (5)	2001	0.6897	0.6495	0.7299
95-99 (5)	2002	0.8411	0.7936	0.8887
96-00 (5)	2003	1.0470	0.9900	1.1037
97-01 (5)	2004	1.0724	1.0059	1.1389
98-02 (5)	2005	1.0571	0.9889	1.1257
94-99 (6)	2002	0.8001	0.7530	0.8473
95-00 (6)	2003	0.9556	0.9003	1.0107
96-01 (6)	2004	1.0708	1.0041	1.1377
97-02 (6)	2005	1.0685	1.0021	1.1354
94-00 (7)	2003	0.9082	0.8537	0.9626
95-01 (7)	2004	1.0045	0.9397	1.0693
96-02 (7)	2005	1.0785	1.0106	1.1467
94-01 (8)	2004	0.9644	0.9008	1.0280
95-02 (8)	2005	1.0311	0.9640	1.0984
94-02 (9)	2005	0.9994	0.9328	1.0663

Indemnity
Linear Fit
Differences: (Actual - Trended)

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
94-97 (4)	2000	0.2398	0.2387	0.2407
95-98 (4)	2001	0.1586	0.1506	0.1665
96-99 (4)	2002	-0.0640	-0.0607	-0.0672
97-00 (4)	2003	-0.1657	-0.1737	-0.1575
98-01 (4)	2004	-0.0999	-0.0881	-0.1119
99-02 (4)	2005	-0.0341	-0.0423	-0.0264
94-98 (5)	2001	0.1807	0.1728	0.1886
95-99 (5)	2002	0.0438	0.0454	0.0424
96-00 (5)	2003	-0.1465	-0.1527	-0.1402
97-01 (5)	2004	-0.0919	-0.0855	-0.0986
98-02 (5)	2005	-0.0978	-0.1025	-0.0934
94-99 (6)	2002	0.0848	0.0860	0.0838
95-00 (6)	2003	-0.0551	-0.0630	-0.0472
96-01 (6)	2004	-0.0904	-0.0837	-0.0974
97-02 (6)	2005	-0.1092	-0.1157	-0.1031
94-00 (7)	2003	-0.0077	-0.0164	0.0009
95-01 (7)	2004	-0.0240	-0.0193	-0.0290
96-02 (7)	2005	-0.1192	-0.1242	-0.1144
94-01 (8)	2004	0.0160	0.0196	0.0123
95-02 (8)	2005	-0.0718	-0.0776	-0.0661
94-02 (9)	2005	-0.0401	-0.0464	-0.0340

**Indemnity
Exponential Fit
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Incur)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
94-97 (4)	2000	0.6204	0.5845	0.6572
95-98 (4)	2001	0.7135	0.6724	0.7555
96-99 (4)	2002	1.0034	0.9443	1.0637
97-00 (4)	2003	1.1360	1.0719	1.2000
98-01 (4)	2004	1.1400	1.0558	1.2252
99-02 (4)	2005	1.0085	0.9399	1.0783
94-98 (5)	2001	0.6889	0.6484	0.7305
95-99 (5)	2002	0.8536	0.8016	0.9067
96-00 (5)	2003	1.1251	1.0550	1.1958
97-01 (5)	2004	1.1376	1.0597	1.2163
98-02 (5)	2005	1.1022	1.0247	1.1807
94-99 (6)	2002	0.8040	0.7537	0.8556
95-00 (6)	2003	0.9873	0.9237	1.0517
96-01 (6)	2004	1.1510	1.0689	1.2345
97-02 (6)	2005	1.1264	1.0496	1.2043
94-00 (7)	2003	0.9246	0.8634	0.9871
95-01 (7)	2004	1.0484	0.9725	1.1258
96-02 (7)	2005	1.1549	1.0723	1.2391
94-01 (8)	2004	0.9929	0.9199	1.0678
95-02 (8)	2005	1.0812	1.0020	1.1621
94-02 (9)	2005	1.0364	0.9587	1.1162

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Indemnity
Exponential Fit
Differences: (Actual - Trended)

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
94-97 (4)	2000	0.2409	0.2381	0.2425
95-98 (4)	2001	0.1568	0.1499	0.1630
96-99 (4)	2002	-0.1185	-0.1053	-0.1326
97-00 (4)	2003	-0.2355	-0.2346	-0.2365
98-01 (4)	2004	-0.1596	-0.1354	-0.1849
99-02 (4)	2005	-0.0492	-0.0535	-0.0460
94-98 (5)	2001	0.1814	0.1739	0.1880
95-99 (5)	2002	0.0313	0.0374	0.0244
96-00 (5)	2003	-0.2246	-0.2177	-0.2323
97-01 (5)	2004	-0.1572	-0.1393	-0.1760
98-02 (5)	2005	-0.1429	-0.1383	-0.1484
94-99 (6)	2002	0.0809	0.0853	0.0755
95-00 (6)	2003	-0.0868	-0.0864	-0.0882
96-01 (6)	2004	-0.1706	-0.1485	-0.1942
97-02 (6)	2005	-0.1671	-0.1632	-0.1720
94-00 (7)	2003	-0.0241	-0.0261	-0.0236
95-01 (7)	2004	-0.0680	-0.0521	-0.0855
96-02 (7)	2005	-0.1956	-0.1859	-0.2068
94-01 (8)	2004	-0.0125	0.0005	-0.0275
95-02 (8)	2005	-0.1219	-0.1156	-0.1298
94-02 (9)	2005	-0.0771	-0.0723	-0.0839

Medical
Actual Ultimate Severity Ratios
Including Average of Paid and Incurred

MEDICAL	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
	1994	0.4707	0.4670	0.4745
	1995	0.5256	0.5240	0.5272
	1996	0.5309	0.5312	0.5307
	1997	0.5993	0.5969	0.6020
	1998	0.6653	0.6786	0.6522
	1999	0.7272	0.7362	0.7180
	2000	0.7889	0.7968	0.7809
	2001	0.7910	0.7794	0.8025
	2002	0.8475	0.8475	0.8475
	2003	0.9145	0.9075	0.9217
	2004	1.0579	1.0593	1.0562
	2005	1.0831	1.0961	1.0698

Trend # Years = 3

Medical
Linear Fit
Trended Severity Ratios

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
94-97 (4)	2000	0.7076	0.7084	0.7073
95-98 (4)	2001	0.7997	0.8210	0.7789
96-99 (4)	2002	0.9254	0.9492	0.9012
97-00 (4)	2003	0.9790	0.9979	0.9594
98-01 (4)	2004	0.9406	0.9111	0.9696
99-02 (4)	2005	0.9520	0.9324	0.9718
94-98 (5)	2001	0.7898	0.8076	0.7724
95-99 (5)	2002	0.8785	0.8993	0.8576
96-00 (5)	2003	0.9843	1.0032	0.9650
97-01 (5)	2004	0.9678	0.9592	0.9760
98-02 (5)	2005	0.9781	0.9582	0.9978
94-99 (6)	2002	0.8646	0.8837	0.8456
95-00 (6)	2003	0.9493	0.9678	0.9307
96-01 (6)	2004	0.9872	0.9848	0.9893
97-02 (6)	2005	1.0005	0.9932	1.0075
94-00 (7)	2003	0.9352	0.9532	0.9170
95-01 (7)	2004	0.9698	0.9712	0.9681
96-02 (7)	2005	1.0193	1.0164	1.0220
94-01 (8)	2004	0.9634	0.9674	0.9592
95-02 (8)	2005	1.0083	1.0084	1.0079
94-02 (9)	2005	1.0046	1.0071	1.0018

Medical
Linear Fit
Differences: (Actual - Trended)

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
94-97 (4)	2000	0.0813	0.0884	0.0736
95-98 (4)	2001	-0.0087	-0.0416	0.0236
96-99 (4)	2002	-0.0779	-0.1017	-0.0537
97-00 (4)	2003	-0.0645	-0.0904	-0.0377
98-01 (4)	2004	0.1173	0.1482	0.0866
99-02 (4)	2005	0.1311	0.1637	0.0980
94-98 (5)	2001	0.0012	-0.0282	0.0301
95-99 (5)	2002	-0.0310	-0.0518	-0.0101
96-00 (5)	2003	-0.0698	-0.0957	-0.0433
97-01 (5)	2004	0.0901	0.1001	0.0802
98-02 (5)	2005	0.1050	0.1379	0.0720
94-99 (6)	2002	-0.0171	-0.0362	0.0019
95-00 (6)	2003	-0.0348	-0.0603	-0.0090
96-01 (6)	2004	0.0707	0.0745	0.0669
97-02 (6)	2005	0.0826	0.1029	0.0623
94-00 (7)	2003	-0.0207	-0.0457	0.0047
95-01 (7)	2004	0.0881	0.0881	0.0881
96-02 (7)	2005	0.0638	0.0797	0.0478
94-01 (8)	2004	0.0945	0.0919	0.0970
95-02 (8)	2005	0.0748	0.0877	0.0619
94-02 (9)	2005	0.0785	0.0890	0.0680

**Medical
Exponential Fit
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
94-97 (4)	2000	0.7372	0.7396	0.7353
95-98 (4)	2001	0.8384	0.8658	0.8121
96-99 (4)	2002	1.0040	1.0384	0.9696
97-00 (4)	2003	1.0432	1.0696	1.0163
98-01 (4)	2004	0.9713	0.9324	1.0113
99-02 (4)	2005	0.9694	0.9447	0.9951
94-98 (5)	2001	0.8367	0.8607	0.8135
95-99 (5)	2002	0.9367	0.9653	0.9084
96-00 (5)	2003	1.0737	1.1012	1.0460
97-01 (5)	2004	1.0210	1.0098	1.0313
98-02 (5)	2005	1.0115	0.9837	1.0401
94-99 (6)	2002	0.9298	0.9571	0.9030
95-00 (6)	2003	1.0255	1.0520	0.9992
96-01 (6)	2004	1.0686	1.0658	1.0706
97-02 (6)	2005	1.0556	1.0455	1.0652
94-00 (7)	2003	1.0189	1.0459	0.9922
95-01 (7)	2004	1.0485	1.0516	1.0448
96-02 (7)	2005	1.1028	1.0987	1.1062
94-01 (8)	2004	1.0533	1.0613	1.0449
95-02 (8)	2005	1.0940	1.0950	1.0924
94-02 (9)	2005	1.1036	1.1093	1.0975

Medical
Exponential Fit
Differences: (Actual - Trended)

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
94-97 (4)	2000	0.0517	0.0572	0.0456
95-98 (4)	2001	-0.0474	-0.0864	-0.0096
96-99 (4)	2002	-0.1565	-0.1909	-0.1221
97-00 (4)	2003	-0.1287	-0.1621	-0.0946
98-01 (4)	2004	0.0866	0.1269	0.0449
99-02 (4)	2005	0.1137	0.1514	0.0747
94-98 (5)	2001	-0.0457	-0.0813	-0.0110
95-99 (5)	2002	-0.0892	-0.1178	-0.0609
96-00 (5)	2003	-0.1592	-0.1937	-0.1243
97-01 (5)	2004	0.0369	0.0495	0.0249
98-02 (5)	2005	0.0716	0.1124	0.0297
94-99 (6)	2002	-0.0823	-0.1096	-0.0555
95-00 (6)	2003	-0.1110	-0.1445	-0.0775
96-01 (6)	2004	-0.0107	-0.0065	-0.0144
97-02 (6)	2005	0.0275	0.0506	0.0046
94-00 (7)	2003	-0.1044	-0.1384	-0.0705
95-01 (7)	2004	0.0094	0.0077	0.0114
96-02 (7)	2005	-0.0197	-0.0026	-0.0364
94-01 (8)	2004	0.0046	-0.0020	0.0113
95-02 (8)	2005	-0.0109	0.0011	-0.0226
94-02 (9)	2005	-0.0205	-0.0132	-0.0277

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