

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 1996 through 2007, 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 2007 3.25 years, policy year 2006 4.25 years, and policy year 2005 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 twenty-first methods.

As an illustration, the incurred loss development approach generated an indemnity severity ratio of 0.7966 for policy year 2002. Fitting the loss ratios for policy years 1996 to 1999 using a straight line and projecting that to 2002 yielded a severity ratio of 0.8085, which overstates our current estimate for 2002 by 0.0119.

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)
	1996	0.5632	0.5547	0.5717
	1997	0.6238	0.6052	0.6425
	1998	0.6430	0.6202	0.6660
	1999	0.7216	0.6910	0.7520
	2000	0.7954	0.7605	0.8302
	2001	0.8111	0.7669	0.8554
	2002	0.8335	0.7966	0.8704
	2003	0.8553	0.8095	0.9011
	2004	0.9341	0.8909	0.9774
	2005	0.9508	0.8976	1.0040
	2006	0.9968	0.9370	1.0565
	2007	1.1222	1.0709	1.1734

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)
96-99 (4)	2002	0.8604	0.8085	0.9120
97-00 (4)	2003	0.9630	0.9107	1.0148
98-01 (4)	2004	1.0029	0.9390	1.0668
99-02 (4)	2005	0.9485	0.8992	0.9982
00-03 (4)	2006	0.9148	0.8629	0.9667
01-04 (4)	2007	1.0344	0.9892	1.0796
96-00 (5)	2003	0.9505	0.8950	1.0057
97-01(5)	2004	0.9825	0.9206	1.0442
98-02 (5)	2005	0.9962	0.9414	1.0509
99-03 (5)	2006	0.9561	0.9015	1.0110
00-04 (5)	2007	1.0067	0.9566	1.0570
96-01 (6)	2004	0.9810	0.9175	1.0445
97-02 (6)	2005	0.9937	0.9372	1.0501
98-03 (6)	2006	0.9987	0.9403	1.0570
99-04 (6)	2007	1.0239	0.9707	1.0773
96-02 (7)	2005	0.9998	0.9399	1.0596
97-03 (7)	2006	1.0045	0.9446	1.0642
98-04 (7)	2007	1.0517	0.9948	1.1088
96-03 (8)	2006	1.0150	0.9521	1.0778
97-04 (8)	2007	1.0546	0.9956	1.1137
96-04 (9)	2007	1.0624	1.0001	1.1248

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)
96-99 (4)	2002	-0.0269	-0.0119	-0.0416
97-00 (4)	2003	-0.1077	-0.1012	-0.1137
98-01 (4)	2004	-0.0688	-0.0481	-0.0894
99-02 (4)	2005	0.0023	-0.0016	0.0058
00-03 (4)	2006	0.0820	0.0741	0.0898
01-04 (4)	2007	0.0878	0.0817	0.0938
96-00 (5)	2003	-0.0952	-0.0855	-0.1046
97-01(5)	2004	-0.0484	-0.0297	-0.0668
98-02 (5)	2005	-0.0454	-0.0438	-0.0469
99-03 (5)	2006	0.0407	0.0356	0.0455
00-04 (5)	2007	0.1155	0.1143	0.1165
96-01 (6)	2004	-0.0469	-0.0266	-0.0671
97-02 (6)	2005	-0.0429	-0.0396	-0.0461
98-03 (6)	2006	-0.0019	-0.0033	-0.0005
99-04 (6)	2007	0.0983	0.1002	0.0961
96-02 (7)	2005	-0.0490	-0.0423	-0.0556
97-03 (7)	2006	-0.0077	-0.0076	-0.0077
98-04 (7)	2007	0.0705	0.0761	0.0646
96-03 (8)	2006	-0.0182	-0.0151	-0.0213
97-04 (8)	2007	0.0676	0.0753	0.0597
96-04 (9)	2007	0.0598	0.0708	0.0486

**Indemnity
Exponential Fit
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Incur)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
96-99 (4)	2002	0.9001	0.8377	0.9637
97-00 (4)	2003	1.0129	0.9524	1.0732
98-01 (4)	2004	1.0574	0.9833	1.1320
99-02 (4)	2005	0.9673	0.9155	1.0195
00-03 (4)	2006	0.9195	0.8667	0.9725
01-04 (4)	2007	1.0494	1.0047	1.0943
96-00 (5)	2003	1.0095	0.9411	1.0789
97-01(5)	2004	1.0339	0.9618	1.1065
98-02 (5)	2005	1.0411	0.9798	1.1025
99-03 (5)	2006	0.9731	0.9157	1.0309
00-04 (5)	2007	1.0185	0.9671	1.0700
96-01 (6)	2004	1.0449	0.9667	1.1245
97-02 (6)	2005	1.0434	0.9786	1.1084
98-03 (6)	2006	1.0385	0.9738	1.1034
99-04 (6)	2007	1.0472	0.9912	1.1035
96-02 (7)	2005	1.0643	0.9914	1.1383
97-03 (7)	2006	1.0524	0.9842	1.1210
98-04 (7)	2007	1.0970	1.0339	1.1602
96-03 (8)	2006	1.0790	1.0032	1.1559
97-04 (8)	2007	1.1090	1.0416	1.1767
96-04 (9)	2007	1.1335	1.0582	1.2098

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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)
96-99 (4)	2002	-0.0666	-0.0411	-0.0933
97-00 (4)	2003	-0.1576	-0.1429	-0.1721
98-01 (4)	2004	-0.1233	-0.0924	-0.1546
99-02 (4)	2005	-0.0165	-0.0179	-0.0155
00-03 (4)	2006	0.0773	0.0703	0.0840
01-04 (4)	2007	0.0728	0.0662	0.0791
96-00 (5)	2003	-0.1542	-0.1316	-0.1778
97-01(5)	2004	-0.0998	-0.0709	-0.1291
98-02 (5)	2005	-0.0903	-0.0822	-0.0985
99-03 (5)	2006	0.0237	0.0213	0.0256
00-04 (5)	2007	0.1037	0.1038	0.1034
96-01 (6)	2004	-0.1108	-0.0758	-0.1471
97-02 (6)	2005	-0.0926	-0.0810	-0.1044
98-03 (6)	2006	-0.0417	-0.0368	-0.0469
99-04 (6)	2007	0.0750	0.0797	0.0699
96-02 (7)	2005	-0.1135	-0.0938	-0.1343
97-03 (7)	2006	-0.0556	-0.0472	-0.0645
98-04 (7)	2007	0.0252	0.0370	0.0132
96-03 (8)	2006	-0.0822	-0.0662	-0.0994
97-04 (8)	2007	0.0132	0.0293	-0.0033
96-04 (9)	2007	-0.0113	0.0127	-0.0364

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)
	1996	0.4813	0.4792	0.4834
	1997	0.5452	0.5388	0.5514
	1998	0.5998	0.6019	0.5976
	1999	0.6434	0.6372	0.6496
	2000	0.7017	0.6926	0.7108
	2001	0.7082	0.6808	0.7357
	2002	0.7527	0.7328	0.7727
	2003	0.8083	0.7793	0.8372
	2004	0.9068	0.8699	0.9437
	2005	0.9082	0.8761	0.9402
	2006	0.9053	0.8605	0.9502
	2007	1.0236	0.9860	1.0613

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)
96-99 (4)	2002	0.8108	0.8060	0.8157
97-00 (4)	2003	0.8534	0.8411	0.8659
98-01 (4)	2004	0.8359	0.7846	0.8874
99-02 (4)	2005	0.8520	0.8096	0.8946
00-03 (4)	2006	0.9067	0.8618	0.9514
01-04 (4)	2007	1.0871	1.0419	1.1322
96-00 (5)	2003	0.8638	0.8525	0.8751
97-01(5)	2004	0.8536	0.8176	0.8899
98-02 (5)	2005	0.8665	0.8218	0.9114
99-03 (5)	2006	0.9133	0.8667	0.9598
00-04 (5)	2007	1.0307	0.9776	1.0837
96-01 (6)	2004	0.8722	0.8415	0.9030
97-02 (6)	2005	0.8818	0.8457	0.9182
98-03 (6)	2006	0.9187	0.8700	0.9675
99-04 (6)	2007	1.0177	0.9640	1.0714
96-02 (7)	2005	0.8994	0.8667	0.9323
97-03 (7)	2006	0.9285	0.8863	0.9708
98-04 (7)	2007	1.0105	0.9553	1.0658
96-03 (8)	2006	0.9422	0.9030	0.9814
97-04 (8)	2007	1.0107	0.9609	1.0605
96-04 (9)	2007	1.0169	0.9702	1.0637

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)
96-99 (4)	2002	-0.0581	-0.0732	-0.0430
97-00 (4)	2003	-0.0451	-0.0618	-0.0287
98-01 (4)	2004	0.0710	0.0853	0.0563
99-02 (4)	2005	0.0562	0.0665	0.0456
00-03 (4)	2006	-0.0014	-0.0013	-0.0012
01-04 (4)	2007	-0.0635	-0.0559	-0.0708
96-00 (5)	2003	-0.0555	-0.0732	-0.0379
97-01(5)	2004	0.0532	0.0523	0.0538
98-02 (5)	2005	0.0417	0.0543	0.0288
99-03 (5)	2006	-0.0080	-0.0062	-0.0096
00-04 (5)	2007	-0.0071	0.0084	-0.0224
96-01 (6)	2004	0.0346	0.0284	0.0407
97-02 (6)	2005	0.0264	0.0304	0.0220
98-03 (6)	2006	-0.0134	-0.0095	-0.0173
99-04 (6)	2007	0.0059	0.0220	-0.0101
96-02 (7)	2005	0.0088	0.0095	0.0080
97-03 (7)	2006	-0.0232	-0.0257	-0.0206
98-04 (7)	2007	0.0131	0.0307	-0.0045
96-03 (8)	2006	-0.0369	-0.0425	-0.0312
97-04 (8)	2007	0.0129	0.0251	0.0008
96-04 (9)	2007	0.0067	0.0158	-0.0024

**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)
96-99 (4)	2002	0.8714	0.8663	0.8764
97-00 (4)	2003	0.8994	0.8857	0.9136
98-01 (4)	2004	0.8611	0.7995	0.9255
99-02 (4)	2005	0.8693	0.8209	0.9189
00-03 (4)	2006	0.9225	0.8731	0.9725
01-04 (4)	2007	1.1398	1.0915	1.1878
96-00 (5)	2003	0.9333	0.9197	0.9470
97-01(5)	2004	0.8944	0.8508	0.9391
98-02 (5)	2005	0.8940	0.8400	0.9500
99-03 (5)	2006	0.9378	0.8842	0.9924
00-04 (5)	2007	1.0658	1.0052	1.1271
96-01 (6)	2004	0.9373	0.8981	0.9770
97-02 (6)	2005	0.9247	0.8806	0.9698
98-03 (6)	2006	0.9529	0.8938	1.0139
99-04 (6)	2007	1.0583	0.9948	1.1231
96-02 (7)	2005	0.9662	0.9243	1.0088
97-03 (7)	2006	0.9777	0.9260	1.0307
98-04 (7)	2007	1.0593	0.9909	1.1298
96-03 (8)	2006	1.0152	0.9650	1.0663
97-04 (8)	2007	1.0742	1.0121	1.1377
96-04 (9)	2007	1.1045	1.0438	1.1664

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)
96-99 (4)	2002	-0.1187	-0.1335	-0.1037
97-00 (4)	2003	-0.0911	-0.1064	-0.0764
98-01 (4)	2004	0.0457	0.0704	0.0182
99-02 (4)	2005	0.0389	0.0552	0.0213
00-03 (4)	2006	-0.0172	-0.0126	-0.0223
01-04 (4)	2007	-0.1162	-0.1055	-0.1265
96-00 (5)	2003	-0.1250	-0.1404	-0.1098
97-01(5)	2004	0.0124	0.0191	0.0046
98-02 (5)	2005	0.0142	0.0361	-0.0098
99-03 (5)	2006	-0.0325	-0.0237	-0.0422
00-04 (5)	2007	-0.0422	-0.0192	-0.0658
96-01 (6)	2004	-0.0305	-0.0282	-0.0333
97-02 (6)	2005	-0.0165	-0.0045	-0.0296
98-03 (6)	2006	-0.0476	-0.0333	-0.0637
99-04 (6)	2007	-0.0347	-0.0088	-0.0618
96-02 (7)	2005	-0.0580	-0.0482	-0.0686
97-03 (7)	2006	-0.0724	-0.0655	-0.0805
98-04 (7)	2007	-0.0357	-0.0049	-0.0685
96-03 (8)	2006	-0.1099	-0.1045	-0.1161
97-04 (8)	2007	-0.0506	-0.0261	-0.0764
96-04 (9)	2007	-0.0809	-0.0578	-0.1051

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