

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 1999 through 2010, 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 2010 3.25 years, policy year 2009 4.25 years, and policy year 2008 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 twenty-fourth and the average of the incurred and paid to twenty-fourth methods.

As an illustration, the incurred loss development approach generates an indemnity severity ratio of 0.7588 for policy year 2005. Fitting the loss ratios for policy years 1999 to 2002 using a straight line and projecting that to 2005 yields a severity ratio of 0.7971, which overstates our current estimate for 2005 by 0.0383.

**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-24)
	1999	0.6171	0.6003	0.6340
	2000	0.6726	0.6551	0.6902
	2001	0.6876	0.6671	0.7081
	2002	0.7128	0.7009	0.7246
	2003	0.7265	0.7127	0.7403
	2004	0.7693	0.7623	0.7764
	2005	0.7733	0.7588	0.7879
	2006	0.7885	0.7767	0.8005
	2007	0.8731	0.8501	0.8959
	2008	0.9249	0.8832	0.9665
	2009	0.9237	0.8789	0.9685
	2010	0.9224	0.8750	0.9695

Trend # Years = 3

11b.1

**Indemnity
Linear Fit
Trended Severity Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-24)
99-02 (4)	2005	0.8085	0.7971	0.8196
00-03 (4)	2006	0.7840	0.7769	0.7909
01-04 (4)	2007	0.8405	0.8446	0.8366
02-05 (4)	2008	0.8464	0.8342	0.8590
03-06 (4)	2009	0.8499	0.8375	0.8627
04-07 (4)	2010	0.9480	0.9136	0.9822
99-03 (5)	2006	0.8128	0.8025	0.8229
00-04 (5)	2007	0.8299	0.8296	0.8302
01-05 (5)	2008	0.8479	0.8428	0.8532
02-06 (5)	2009	0.8532	0.8411	0.8656
03-07 (5)	2010	0.9423	0.9167	0.9679
99-04 (6)	2007	0.8466	0.8428	0.8504
00-05 (6)	2008	0.8435	0.8377	0.8493
01-06 (6)	2009	0.8575	0.8510	0.8644
02-07 (6)	2010	0.9297	0.9071	0.9524
99-05 (7)	2008	0.8587	0.8515	0.8659
00-06 (7)	2009	0.8563	0.8497	0.8631
01-07 (7)	2010	0.9233	0.9070	0.9397
99-06 (8)	2009	0.8703	0.8629	0.8778
00-07 (8)	2010	0.9155	0.9008	0.9301
99-07 (9)	2010	0.9223	0.9081	0.9364

11b.2

Indemnity
Linear Fit
Differences: (Actual - Trended)

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-24)
99-02 (4)	2005	-0.0352	-0.0383	-0.0317
00-03 (4)	2006	0.0045	-0.0002	0.0096
01-04 (4)	2007	0.0326	0.0055	0.0593
02-05 (4)	2008	0.0785	0.0490	0.1075
03-06 (4)	2009	0.0738	0.0415	0.1058
04-07 (4)	2010	-0.0256	-0.0386	-0.0127
99-03 (5)	2006	-0.0243	-0.0258	-0.0224
00-04 (5)	2007	0.0432	0.0205	0.0657
01-05 (5)	2008	0.0771	0.0404	0.1133
02-06 (5)	2009	0.0705	0.0378	0.1029
03-07 (5)	2010	-0.0199	-0.0417	0.0017
99-04 (6)	2007	0.0265	0.0073	0.0455
00-05 (6)	2008	0.0814	0.0455	0.1172
01-06 (6)	2009	0.0662	0.0279	0.1041
02-07 (6)	2010	-0.0073	-0.0321	0.0171
99-05 (7)	2008	0.0663	0.0317	0.1007
00-06 (7)	2009	0.0674	0.0292	0.1054
01-07 (7)	2010	-0.0009	-0.0319	0.0298
99-06 (8)	2009	0.0534	0.0160	0.0907
00-07 (8)	2010	0.0069	-0.0258	0.0394
99-07 (9)	2010	0.0001	-0.0331	0.0331

11b.3

**Indemnity
Exponential Fit
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Incur)	Severity Ratio (Incur)	Severity Ratio (Pd-24)
99-02 (4)	2005	0.8240	0.8138	0.8339
00-03 (4)	2006	0.7890	0.7831	0.7947
01-04 (4)	2007	0.8491	0.8564	0.8426
02-05 (4)	2008	0.8533	0.8412	0.8658
03-06 (4)	2009	0.8554	0.8431	0.8680
04-07 (4)	2010	0.9574	0.9204	0.9944
99-03 (5)	2006	0.8268	0.8179	0.8356
00-04 (5)	2007	0.8382	0.8403	0.8366
01-05 (5)	2008	0.8566	0.8534	0.8602
02-06 (5)	2009	0.8600	0.8480	0.8723
03-07 (5)	2010	0.9548	0.9281	0.9813
99-04 (6)	2007	0.8632	0.8618	0.8647
00-05 (6)	2008	0.8528	0.8488	0.8571
01-06 (6)	2009	0.8665	0.8616	0.8720
02-07 (6)	2010	0.9421	0.9188	0.9654
99-05 (7)	2008	0.8755	0.8704	0.8808
00-06 (7)	2009	0.8664	0.8615	0.8716
01-07 (7)	2010	0.9372	0.9220	0.9525
99-06 (8)	2009	0.8875	0.8822	0.8932
00-07 (8)	2010	0.9300	0.9167	0.9432
99-07 (9)	2010	0.9439	0.9315	0.9563

11b.4

**Indemnity
Exponential Fit
Differences: (Actual - Trended)**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-24)
99-02 (4)	2005	-0.0507	-0.0550	-0.0460
00-03 (4)	2006	-0.0005	-0.0064	0.0058
01-04 (4)	2007	0.0240	-0.0063	0.0533
02-05 (4)	2008	0.0716	0.0420	0.1007
03-06 (4)	2009	0.0683	0.0358	0.1005
04-07 (4)	2010	-0.0350	-0.0454	-0.0249
99-03 (5)	2006	-0.0383	-0.0412	-0.0351
00-04 (5)	2007	0.0349	0.0098	0.0593
01-05 (5)	2008	0.0683	0.0298	0.1063
02-06 (5)	2009	0.0637	0.0309	0.0962
03-07 (5)	2010	-0.0324	-0.0531	-0.0118
99-04 (6)	2007	0.0099	-0.0117	0.0312
00-05 (6)	2008	0.0721	0.0344	0.1094
01-06 (6)	2009	0.0572	0.0173	0.0965
02-07 (6)	2010	-0.0197	-0.0438	0.0041
99-05 (7)	2008	0.0494	0.0128	0.0857
00-06 (7)	2009	0.0573	0.0174	0.0969
01-07 (7)	2010	-0.0148	-0.0470	0.0170
99-06 (8)	2009	0.0362	-0.0033	0.0753
00-07 (8)	2010	-0.0076	-0.0417	0.0263
99-07 (9)	2010	-0.0215	-0.0565	0.0132

11b.5

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-24)
	1999	0.5663	0.5609	0.5717
	2000	0.6009	0.5880	0.6136
	2001	0.6091	0.5886	0.6296
	2002	0.6481	0.6332	0.6629
	2003	0.7027	0.6821	0.7235
	2004	0.7725	0.7514	0.7935
	2005	0.7820	0.7652	0.7990
	2006	0.7871	0.7655	0.8087
	2007	0.8878	0.8714	0.9043
	2008	0.9113	0.8834	0.9390
	2009	0.9178	0.8869	0.9485
	2010	0.9812	0.9598	1.0026

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-24)
99-02 (4)	2005	0.7202	0.6906	0.7498
00-03 (4)	2006	0.7952	0.7701	0.8208
01-04 (4)	2007	0.9283	0.9056	0.9509
02-05 (4)	2008	0.9385	0.9174	0.9600
03-06 (4)	2009	0.8793	0.8599	0.8987
04-07 (4)	2010	0.9653	0.9505	0.9803
99-03 (5)	2006	0.7854	0.7544	0.8167
00-04 (5)	2007	0.8851	0.8588	0.9115
01-05 (5)	2008	0.9380	0.9198	0.9564
02-06 (5)	2009	0.9171	0.8933	0.9411
03-07 (5)	2010	0.9788	0.9635	0.9942
99-04 (6)	2007	0.8661	0.8351	0.8971
00-05 (6)	2008	0.9138	0.8917	0.9361
01-06 (6)	2009	0.9309	0.9098	0.9521
02-07 (6)	2010	0.9930	0.9734	1.0127
99-05 (7)	2008	0.9011	0.8742	0.9282
00-06 (7)	2009	0.9208	0.8971	0.9447
01-07 (7)	2010	0.9971	0.9788	1.0155
99-06 (8)	2009	0.9154	0.8878	0.9432
00-07 (8)	2010	0.9845	0.9636	1.0057
99-07 (9)	2010	0.9763	0.9516	1.0012

11b.7

Medical
Linear Fit
Differences: (Actual - Trended)

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-24)
99-02 (4)	2005	0.0618	0.0747	0.0492
00-03 (4)	2006	-0.0081	-0.0046	-0.0121
01-04 (4)	2007	-0.0405	-0.0342	-0.0466
02-05 (4)	2008	-0.0272	-0.0340	-0.0210
03-06 (4)	2009	0.0385	0.0271	0.0498
04-07 (4)	2010	0.0159	0.0093	0.0223
99-03 (5)	2006	0.0017	0.0111	-0.0080
00-04 (5)	2007	0.0027	0.0126	-0.0072
01-05 (5)	2008	-0.0267	-0.0364	-0.0174
02-06 (5)	2009	0.0007	-0.0064	0.0074
03-07 (5)	2010	0.0024	-0.0037	0.0084
99-04 (6)	2007	0.0217	0.0363	0.0072
00-05 (6)	2008	-0.0025	-0.0083	0.0029
01-06 (6)	2009	-0.0131	-0.0229	-0.0036
02-07 (6)	2010	-0.0118	-0.0136	-0.0101
99-05 (7)	2008	0.0102	0.0092	0.0108
00-06 (7)	2009	-0.0030	-0.0102	0.0038
01-07 (7)	2010	-0.0159	-0.0190	-0.0129
99-06 (8)	2009	0.0024	-0.0009	0.0053
00-07 (8)	2010	-0.0033	-0.0038	-0.0031
99-07 (9)	2010	0.0049	0.0082	0.0014

11b.8

**Medical
Exponential Fit
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-24)
99-02 (4)	2005	0.7308	0.6977	0.7642
00-03 (4)	2006	0.8116	0.7852	0.8387
01-04 (4)	2007	0.9725	0.9506	0.9945
02-05 (4)	2008	0.9739	0.9521	0.9960
03-06 (4)	2009	0.8910	0.8721	0.9098
04-07 (4)	2010	0.9754	0.9614	0.9898
99-03 (5)	2006	0.8038	0.7687	0.8396
00-04 (5)	2007	0.9164	0.8884	0.9448
01-05 (5)	2008	0.9806	0.9640	0.9976
02-06 (5)	2009	0.9434	0.9187	0.9684
03-07 (5)	2010	1.0001	0.9861	1.0142
99-04 (6)	2007	0.8968	0.8611	0.9330
00-05 (6)	2008	0.9504	0.9275	0.9737
01-06 (6)	2009	0.9678	0.9473	0.9884
02-07 (6)	2010	1.0282	1.0085	1.0481
99-05 (7)	2008	0.9385	0.9077	0.9698
00-06 (7)	2009	0.9570	0.9324	0.9820
01-07 (7)	2010	1.0429	1.0260	1.0601
99-06 (8)	2009	0.9548	0.9235	0.9865
00-07 (8)	2010	1.0302	1.0089	1.0519
99-07 (9)	2010	1.0253	0.9972	1.0537

11b.9

Medical
Exponential Fit
Differences: (Actual - Trended)

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-24)
99-02 (4)	2005	0.0512	0.0675	0.0348
00-03 (4)	2006	-0.0245	-0.0197	-0.0300
01-04 (4)	2007	-0.0847	-0.0792	-0.0902
02-05 (4)	2008	-0.0626	-0.0687	-0.0570
03-06 (4)	2009	0.0268	0.0148	0.0387
04-07 (4)	2010	0.0058	-0.0016	0.0128
99-03 (5)	2006	-0.0167	-0.0032	-0.0309
00-04 (5)	2007	-0.0286	-0.0170	-0.0405
01-05 (5)	2008	-0.0693	-0.0806	-0.0586
02-06 (5)	2009	-0.0256	-0.0318	-0.0199
03-07 (5)	2010	-0.0189	-0.0263	-0.0116
99-04 (6)	2007	-0.0090	0.0103	-0.0287
00-05 (6)	2008	-0.0391	-0.0441	-0.0347
01-06 (6)	2009	-0.0500	-0.0604	-0.0399
02-07 (6)	2010	-0.0470	-0.0487	-0.0455
99-05 (7)	2008	-0.0272	-0.0243	-0.0308
00-06 (7)	2009	-0.0392	-0.0455	-0.0335
01-07 (7)	2010	-0.0617	-0.0662	-0.0575
99-06 (8)	2009	-0.0370	-0.0366	-0.0380
00-07 (8)	2010	-0.0490	-0.0491	-0.0493
99-07 (9)	2010	-0.0441	-0.0374	-0.0511