

DELAWARE COMPENSATION RATING BUREAU, INC.

Retrospective Test of Trend Projections for Severity Ratios – Limited Losses

Attached is a retrospective test of the predictive accuracy of various trend procedures using severity ratios, i.e., ultimate loss ratios adjusted by dividing out the frequency component. The analysis is limited to Policy Years 1998 through 2010, the years for which frequency data is available.

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 loss ratio three years hence, were used. Our current review trends 2.9167 years beyond the midpoint of the latest available completed policy year (1/1/2011 to 12/1/2013).

Current estimates of policy year ultimate loss ratios are compared with predicted values based on trending through earlier years. The results are available for each of three loss development approaches: incurred, paid-to-22nd and the average of the incurred and paid-to-22nd methods.

As an illustration, the incurred loss development approach generated an indemnity severity ratio of 0.5907 for policy year 2005 (page 6.1). Fitting the severity ratios for policy years 1999 to 2002 using a straight line and projecting that to 2005 yielded a severity ratio of 0.6714 (page 6.2) which overstates our current estimate for 2005 by 0.0807 points (page 6.3).

**Indemnity**  
**Actual Ultimate Limited Severity Ratios**

INDEMNITY	Policy Year	Ult Limited Severity Ratio (Avg Pd & Inc)	Ult Limited Severity Ratio (Incur)	Ult Limited Severity Ratio (Pd-22)
	1998	0.4586	0.4550	0.4623
	1999	0.4718	0.4628	0.4808
	2000	0.6545	0.6552	0.6537
	2001	0.5848	0.5801	0.5894
	2002	0.5760	0.5659	0.5862
	2003	0.5830	0.5759	0.5902
	2004	0.5562	0.5367	0.5758
	2005	0.6000	0.5907	0.6093
	2006	0.5998	0.5955	0.6041
	2007	0.6295	0.6231	0.6358
	2008	0.6335	0.6129	0.6542
	2009	0.6649	0.6711	0.6586
	2010	0.7201	0.7104	0.7298

Trend # Years = 3

**Indemnity  
Linear Fit  
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-22)
1998-2001 (4)	2004	0.7950	0.7937	0.7959
1999-2002 (4)	2005	0.6811	0.6714	0.6909
2000-2003 (4)	2006	0.4991	0.4808	0.5177
2001-2004 (4)	2007	0.5395	0.5106	0.5688
2002-2005 (4)	2008	0.5991	0.5831	0.6151
2003-2006 (4)	2009	0.6271	0.6255	0.6287
2004-2007 (4)	2010	0.6952	0.7053	0.6849
1998-2002 (5)	2005	0.7230	0.7134	0.7327
1999-2003 (5)	2006	0.6460	0.6364	0.6557
2000-2004 (5)	2007	0.4917	0.4622	0.5216
2001-2005 (5)	2008	0.5853	0.5659	0.6049
2002-2006 (5)	2009	0.6153	0.6099	0.6206
2003-2007 (5)	2010	0.6620	0.6610	0.6628
1998-2003 (6)	2006	0.6907	0.6809	0.7005
1999-2004 (6)	2007	0.6023	0.5812	0.6236
2000-2005 (6)	2008	0.5372	0.5145	0.5601
2001-2006 (6)	2009	0.6022	0.5918	0.6127
2002-2007 (6)	2010	0.6476	0.6440	0.6510
1998-2004 (7)	2007	0.6486	0.6292	0.6680
1999-2005 (7)	2008	0.6151	0.5973	0.6330
2000-2006 (7)	2009	0.5606	0.5456	0.5757
2001-2007 (7)	2010	0.6325	0.6246	0.6403
1998-2005 (8)	2008	0.6526	0.6354	0.6699
1999-2006 (8)	2009	0.6204	0.6080	0.6329
2000-2007 (8)	2010	0.5937	0.5817	0.6058
1998-2006 (9)	2009	0.6526	0.6397	0.6655
1999-2007 (9)	2010	0.6396	0.6292	0.6501
1998-2007 (10)	2010	0.6661	0.6550	0.6772

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

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-22)
1998-2001 (4)	2004	-0.2388	-0.2570	-0.2201
1999-2002 (4)	2005	-0.0811	-0.0807	-0.0816
2000-2003 (4)	2006	0.1007	0.1147	0.0864
2001-2004 (4)	2007	0.0900	0.1125	0.0670
2002-2005 (4)	2008	0.0344	0.0298	0.0391
2003-2006 (4)	2009	0.0378	0.0456	0.0299
2004-2007 (4)	2010	0.0249	0.0051	0.0449
1998-2002 (5)	2005	-0.1230	-0.1227	-0.1234
1999-2003 (5)	2006	-0.0462	-0.0409	-0.0516
2000-2004 (5)	2007	0.1378	0.1609	0.1142
2001-2005 (5)	2008	0.0482	0.0470	0.0493
2002-2006 (5)	2009	0.0496	0.0612	0.0380
2003-2007 (5)	2010	0.0581	0.0494	0.0670
1998-2003 (6)	2006	-0.0909	-0.0854	-0.0964
1999-2004 (6)	2007	0.0272	0.0419	0.0122
2000-2005 (6)	2008	0.0963	0.0984	0.0941
2001-2006 (6)	2009	0.0627	0.0793	0.0459
2002-2007 (6)	2010	0.0725	0.0664	0.0788
1998-2004 (7)	2007	-0.0191	-0.0061	-0.0322
1999-2005 (7)	2008	0.0184	0.0156	0.0212
2000-2006 (7)	2009	0.1043	0.1255	0.0829
2001-2007 (7)	2010	0.0876	0.0858	0.0895
1998-2005 (8)	2008	-0.0191	-0.0225	-0.0157
1999-2006 (8)	2009	0.0445	0.0631	0.0257
2000-2007 (8)	2010	0.1264	0.1287	0.1240
1998-2006 (9)	2009	0.0123	0.0314	-0.0069
1999-2007 (9)	2010	0.0805	0.0812	0.0797
1998-2007 (10)	2010	0.0540	0.0554	0.0526

**Indemnity  
Exponential Fit  
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-22)
1998-2001 (4)	2004	0.8630	0.8633	0.8622
1999-2002 (4)	2005	0.7067	0.6976	0.7160
2000-2003 (4)	2006	0.5087	0.4929	0.5251
2001-2004 (4)	2007	0.5402	0.5122	0.5689
2002-2005 (4)	2008	0.5986	0.5820	0.6150
2003-2006 (4)	2009	0.6284	0.6272	0.6295
2004-2007 (4)	2010	0.7041	0.7190	0.6900
1998-2002 (5)	2005	0.7609	0.7499	0.7718
1999-2003 (5)	2006	0.6618	0.6528	0.6710
2000-2004 (5)	2007	0.5006	0.4746	0.5275
2001-2005 (5)	2008	0.5846	0.5648	0.6046
2002-2006 (5)	2009	0.6156	0.6102	0.6209
2003-2007 (5)	2010	0.6652	0.6652	0.6650
1998-2003 (6)	2006	0.7174	0.7069	0.7280
1999-2004 (6)	2007	0.6111	0.5895	0.6330
2000-2005 (6)	2008	0.5407	0.5195	0.5623
2001-2006 (6)	2009	0.6019	0.5911	0.6127
2002-2007 (6)	2010	0.6492	0.6459	0.6523
1998-2004 (7)	2007	0.6648	0.6432	0.6867
1999-2005 (7)	2008	0.6231	0.6049	0.6415
2000-2006 (7)	2009	0.5624	0.5480	0.5770
2001-2007 (7)	2010	0.6328	0.6247	0.6408
1998-2005 (8)	2008	0.6678	0.6488	0.6869
1999-2006 (8)	2009	0.6277	0.6151	0.6403
2000-2007 (8)	2010	0.5940	0.5821	0.6060
1998-2006 (9)	2009	0.6665	0.6526	0.6804
1999-2007 (9)	2010	0.6468	0.6363	0.6574
1998-2007 (10)	2010	0.6801	0.6682	0.6920

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

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-22)
1998-2001 (4)	2004	-0.3068	-0.3266	-0.2864
1999-2002 (4)	2005	-0.1067	-0.1069	-0.1067
2000-2003 (4)	2006	0.0911	0.1026	0.0790
2001-2004 (4)	2007	0.0893	0.1109	0.0669
2002-2005 (4)	2008	0.0349	0.0309	0.0392
2003-2006 (4)	2009	0.0365	0.0439	0.0291
2004-2007 (4)	2010	0.0160	-0.0086	0.0398
1998-2002 (5)	2005	-0.1609	-0.1592	-0.1625
1999-2003 (5)	2006	-0.0620	-0.0573	-0.0669
2000-2004 (5)	2007	0.1289	0.1485	0.1083
2001-2005 (5)	2008	0.0489	0.0481	0.0496
2002-2006 (5)	2009	0.0493	0.0609	0.0377
2003-2007 (5)	2010	0.0549	0.0452	0.0648
1998-2003 (6)	2006	-0.1176	-0.1114	-0.1239
1999-2004 (6)	2007	0.0184	0.0336	0.0028
2000-2005 (6)	2008	0.0928	0.0934	0.0919
2001-2006 (6)	2009	0.0630	0.0800	0.0459
2002-2007 (6)	2010	0.0709	0.0645	0.0775
1998-2004 (7)	2007	-0.0353	-0.0201	-0.0509
1999-2005 (7)	2008	0.0104	0.0080	0.0127
2000-2006 (7)	2009	0.1025	0.1231	0.0816
2001-2007 (7)	2010	0.0873	0.0857	0.0890
1998-2005 (8)	2008	-0.0343	-0.0359	-0.0327
1999-2006 (8)	2009	0.0372	0.0560	0.0183
2000-2007 (8)	2010	0.1261	0.1283	0.1238
1998-2006 (9)	2009	-0.0016	0.0185	-0.0218
1999-2007 (9)	2010	0.0733	0.0741	0.0724
1998-2007 (10)	2010	0.0400	0.0422	0.0378

**Medical**  
**Actual Ultimate Limited Severity Ratios**

MEDICAL	Policy Year	Ult Limited Severity Ratio (Avg Pd & Inc)	Ult Limited Severity Ratio (Incur)	Ult Limited Severity Ratio (Pd-22)
	1998	0.4983	0.5027	0.4940
	1999	0.5473	0.5595	0.5351
	2000	0.7726	0.8100	0.7353
	2001	0.6811	0.7146	0.6478
	2002	0.7579	0.7837	0.7320
	2003	0.7815	0.8159	0.7472
	2004	0.8540	0.8826	0.8255
	2005	0.9153	0.9672	0.8636
	2006	0.9184	0.9660	0.8708
	2007	1.1270	1.1904	1.0635
	2008	1.1979	1.2484	1.1475
	2009	1.3364	1.4044	1.2682
	2010	1.8167	1.9712	1.6620

**Medical  
Linear Fit  
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-22)
1998-2001 (4)	2004	0.9730	1.0455	0.9008
1999-2002 (4)	2005	0.9329	0.9767	0.8890
2000-2003 (4)	2006	0.7949	0.8201	0.7695
2001-2004 (4)	2007	1.0127	1.0405	0.9849
2002-2005 (4)	2008	1.0723	1.1401	1.0050
2003-2006 (4)	2009	1.0797	1.1486	1.0108
2004-2007 (4)	2010	1.3236	1.4165	1.2304
1998-2002 (5)	2005	0.9779	1.0327	0.9232
1999-2003 (5)	2006	0.9349	0.9800	0.8899
2000-2004 (5)	2007	0.9010	0.9246	0.8775
2001-2005 (5)	2008	1.0802	1.1349	1.0258
2002-2006 (5)	2009	1.0728	1.1410	1.0048
2003-2007 (5)	2010	1.2969	1.3806	1.2131
1998-2003 (6)	2006	0.9805	1.0345	0.9266
1999-2004 (6)	2007	0.9896	1.0286	0.9508
2000-2005 (6)	2008	0.9911	1.0368	0.9455
2001-2006 (6)	2009	1.0901	1.1495	1.0307
2002-2007 (6)	2010	1.2565	1.3379	1.1752
1998-2004 (7)	2007	1.0248	1.0726	0.9771
1999-2005 (7)	2008	1.0515	1.1054	0.9978
2000-2006 (7)	2009	1.0262	1.0783	0.9742
2001-2007 (7)	2010	1.2463	1.3193	1.1732
1998-2005 (8)	2008	1.0785	1.1379	1.0194
1999-2006 (8)	2009	1.0767	1.1349	1.0186
2000-2007 (8)	2010	1.1769	1.2424	1.1114
1998-2006 (9)	2009	1.1029	1.1657	1.0403
1999-2007 (9)	2010	1.2046	1.2739	1.1354
1998-2007 (10)	2010	1.2177	1.2900	1.1454



**Medical****Linear Fit****Differences: (Actual - Trended)**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-22)
1998-2001 (4)	2004	-0.1190	-0.1629	-0.0753
1999-2002 (4)	2005	-0.0176	-0.0095	-0.0254
2000-2003 (4)	2006	0.1236	0.1459	0.1013
2001-2004 (4)	2007	0.1143	0.1499	0.0786
2002-2005 (4)	2008	0.1256	0.1083	0.1425
2003-2006 (4)	2009	0.2567	0.2558	0.2574
2004-2007 (4)	2010	0.4931	0.5547	0.4316
1998-2002 (5)	2005	-0.0626	-0.0654	-0.0596
1999-2003 (5)	2006	-0.0165	-0.0140	-0.0191
2000-2004 (5)	2007	0.2260	0.2658	0.1860
2001-2005 (5)	2008	0.1177	0.1136	0.1217
2002-2006 (5)	2009	0.2636	0.2634	0.2634
2003-2007 (5)	2010	0.5198	0.5906	0.4489
1998-2003 (6)	2006	-0.0621	-0.0685	-0.0558
1999-2004 (6)	2007	0.1374	0.1618	0.1127
2000-2005 (6)	2008	0.2068	0.2116	0.2020
2001-2006 (6)	2009	0.2463	0.2549	0.2375
2002-2007 (6)	2010	0.5602	0.6333	0.4868
1998-2004 (7)	2007	0.1022	0.1178	0.0864
1999-2005 (7)	2008	0.1464	0.1430	0.1497
2000-2006 (7)	2009	0.3102	0.3261	0.2940
2001-2007 (7)	2010	0.5704	0.6519	0.4889
1998-2005 (8)	2008	0.1194	0.1105	0.1281
1999-2006 (8)	2009	0.2597	0.2695	0.2496
2000-2007 (8)	2010	0.6398	0.7288	0.5506
1998-2006 (9)	2009	0.2335	0.2387	0.2279
1999-2007 (9)	2010	0.6121	0.6973	0.5266
1998-2007 (10)	2010	0.5990	0.6812	0.5166

**Medical  
Exponential Fit  
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-22)
1998-2001 (4)	2004	1.0960	1.2063	0.9909
1999-2002 (4)	2005	1.0023	1.0573	0.9477
2000-2003 (4)	2006	0.7962	0.8211	0.7714
2001-2004 (4)	2007	1.0542	1.0791	1.0296
2002-2005 (4)	2008	1.1075	1.1830	1.0331
2003-2006 (4)	2009	1.1103	1.1854	1.0355
2004-2007 (4)	2010	1.3813	1.4899	1.2737
1998-2002 (5)	2005	1.0887	1.1672	1.0121
1999-2003 (5)	2006	0.9929	1.0469	0.9395
2000-2004 (5)	2007	0.9086	0.9309	0.8867
2001-2005 (5)	2008	1.1325	1.1898	1.0751
2002-2006 (5)	2009	1.1052	1.1808	1.0304
2003-2007 (5)	2010	1.3645	1.4601	1.2692
1998-2003 (6)	2006	1.0794	1.1533	1.0070
1999-2004 (6)	2007	1.0520	1.0973	1.0071
2000-2005 (6)	2008	1.0093	1.0546	0.9640
2001-2006 (6)	2009	1.1402	1.2041	1.0764
2002-2007 (6)	2010	1.3180	1.4117	1.2251
1998-2004 (7)	2007	1.1277	1.1917	1.0646
1999-2005 (7)	2008	1.1220	1.1847	1.0598
2000-2006 (7)	2009	1.0507	1.1039	0.9975
2001-2007 (7)	2010	1.3231	1.4044	1.2418
1998-2005 (8)	2008	1.1895	1.2675	1.1126
1999-2006 (8)	2009	1.1484	1.2161	1.0811
2000-2007 (8)	2010	1.2197	1.2886	1.1508
1998-2006 (9)	2009	1.2141	1.2957	1.1337
1999-2007 (9)	2010	1.2975	1.3791	1.2163
1998-2007 (10)	2010	1.3521	1.4467	1.2587

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

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-22)
1998-2001 (4)	2004	-0.2420	-0.3237	-0.1654
1999-2002 (4)	2005	-0.0870	-0.0901	-0.0841
2000-2003 (4)	2006	0.1222	0.1449	0.0994
2001-2004 (4)	2007	0.0728	0.1113	0.0339
2002-2005 (4)	2008	0.0904	0.0654	0.1144
2003-2006 (4)	2009	0.2261	0.2190	0.2327
2004-2007 (4)	2010	0.4354	0.4813	0.3883
1998-2002 (5)	2005	-0.1734	-0.2000	-0.1485
1999-2003 (5)	2006	-0.0745	-0.0809	-0.0687
2000-2004 (5)	2007	0.2184	0.2595	0.1768
2001-2005 (5)	2008	0.0654	0.0586	0.0724
2002-2006 (5)	2009	0.2312	0.2236	0.2378
2003-2007 (5)	2010	0.4522	0.5111	0.3928
1998-2003 (6)	2006	-0.1610	-0.1873	-0.1362
1999-2004 (6)	2007	0.0750	0.0931	0.0564
2000-2005 (6)	2008	0.1886	0.1938	0.1835
2001-2006 (6)	2009	0.1962	0.2003	0.1918
2002-2007 (6)	2010	0.4987	0.5595	0.4369
1998-2004 (7)	2007	-0.0007	-0.0013	-0.0011
1999-2005 (7)	2008	0.0759	0.0637	0.0877
2000-2006 (7)	2009	0.2857	0.3005	0.2707
2001-2007 (7)	2010	0.4936	0.5668	0.4202
1998-2005 (8)	2008	0.0084	-0.0191	0.0349
1999-2006 (8)	2009	0.1880	0.1883	0.1871
2000-2007 (8)	2010	0.5970	0.6826	0.5112
1998-2006 (9)	2009	0.1223	0.1087	0.1345
1999-2007 (9)	2010	0.5192	0.5921	0.4457
1998-2007 (10)	2010	0.4646	0.5245	0.4033