

DELAWARE COMPENSATION RATING BUREAU, INC.

Retrospective Test of Trend Projections for Severity Ratios – Unlimited 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 2001 through 2013, 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 (1/1/2014 to 12/1/2016).

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-25th and the average of the incurred and paid-to-25th methods.

As an illustration, the incurred loss development approach generated an indemnity severity ratio of 0.4167 for policy year 2008 (page 6.1). Fitting the severity ratios for policy years 2002 to 2005 using a straight line and projecting that to 2008 yielded a severity ratio of 0.4166 (page 6.2) which understates our current estimate for 2008 by 0.0001 points (page 6.3).

Indemnity
Actual Ultimate Severity Ratios

INDEMNITY	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
	2001	0.3685	0.3569	0.3802
	2002	0.3950	0.3855	0.4046
	2003	0.4014	0.3923	0.4105
	2004	0.3994	0.3850	0.4140
	2005	0.4206	0.4060	0.4350
	2006	0.4300	0.4186	0.4414
	2007	0.4431	0.4334	0.4530
	2008	0.4377	0.4167	0.4586
	2009	0.4997	0.5039	0.4954
	2010	0.4857	0.4635	0.5080
	2011	0.5291	0.4777	0.5807
	2012	0.5901	0.5678	0.6126
	2013	0.6901	0.6137	0.7665

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-25)
2001-2004 (4)	2007	0.4357	0.4209	0.4506
2002-2005 (4)	2008	0.4378	0.4166	0.4586
2003-2006 (4)	2009	0.4610	0.4454	0.4764
2004-2007 (4)	2010	0.4865	0.4818	0.4914
2005-2008 (4)	2011	0.4618	0.4398	0.4841
2006-2009 (4)	2012	0.5443	0.5508	0.5375
2007-2010 (4)	2013	0.5520	0.5343	0.5696
2001-2005 (5)	2008	0.4513	0.4340	0.4684
2002-2006 (5)	2009	0.4539	0.4374	0.4702
2003-2007 (5)	2010	0.4759	0.4650	0.4870
2004-2008 (5)	2011	0.4757	0.4573	0.4940
2005-2009 (5)	2012	0.5292	0.5327	0.5257
2006-2010 (5)	2013	0.5432	0.5274	0.5591
2001-2006 (6)	2009	0.4626	0.4477	0.4773
2002-2007 (6)	2010	0.4695	0.4568	0.4823
2003-2008 (6)	2011	0.4726	0.4526	0.4926
2004-2009 (6)	2012	0.5273	0.5281	0.5265
2005-2010 (6)	2013	0.5360	0.5231	0.5489
2001-2007 (7)	2010	0.4754	0.4631	0.4876
2002-2008 (7)	2011	0.4701	0.4502	0.4898
2003-2009 (7)	2012	0.5176	0.5135	0.5215
2004-2010 (7)	2013	0.5362	0.5245	0.5479
2001-2008 (8)	2011	0.4763	0.4580	0.4947
2002-2009 (8)	2012	0.5100	0.5035	0.5164
2003-2010 (8)	2013	0.5292	0.5156	0.5427
2001-2009 (9)	2012	0.5112	0.5040	0.5183
2002-2010 (9)	2013	0.5230	0.5088	0.5372
2001-2010 (10)	2013	0.5240	0.5102	0.5378

Indemnity
Linear Fit
Differences: (Actual - Trended)

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
2001-2004 (4)	2007	0.0074	0.0125	0.0024
2002-2005 (4)	2008	-0.0001	0.0001	0.0000
2003-2006 (4)	2009	0.0387	0.0585	0.0190
2004-2007 (4)	2010	-0.0008	-0.0183	0.0166
2005-2008 (4)	2011	0.0673	0.0379	0.0966
2006-2009 (4)	2012	0.0458	0.0170	0.0751
2007-2010 (4)	2013	0.1381	0.0794	0.1969
2001-2005 (5)	2008	-0.0136	-0.0173	-0.0098
2002-2006 (5)	2009	0.0458	0.0665	0.0252
2003-2007 (5)	2010	0.0098	-0.0015	0.0210
2004-2008 (5)	2011	0.0534	0.0204	0.0867
2005-2009 (5)	2012	0.0609	0.0351	0.0869
2006-2010 (5)	2013	0.1469	0.0863	0.2074
2001-2006 (6)	2009	0.0371	0.0562	0.0181
2002-2007 (6)	2010	0.0162	0.0067	0.0257
2003-2008 (6)	2011	0.0565	0.0251	0.0881
2004-2009 (6)	2012	0.0628	0.0397	0.0861
2005-2010 (6)	2013	0.1541	0.0906	0.2176
2001-2007 (7)	2010	0.0103	0.0004	0.0204
2002-2008 (7)	2011	0.0591	0.0275	0.0909
2003-2009 (7)	2012	0.0725	0.0543	0.0911
2004-2010 (7)	2013	0.1539	0.0892	0.2186
2001-2008 (8)	2011	0.0528	0.0197	0.0860
2002-2009 (8)	2012	0.0801	0.0643	0.0962
2003-2010 (8)	2013	0.1609	0.0981	0.2238
2001-2009 (9)	2012	0.0789	0.0638	0.0943
2002-2010 (9)	2013	0.1671	0.1049	0.2293
2001-2010 (10)	2013	0.1661	0.1035	0.2287

**Indemnity
Exponential Fit
Trended Severity Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
2001-2004 (4)	2007	0.4389	0.4239	0.4540
2002-2005 (4)	2008	0.4387	0.4170	0.4604
2003-2006 (4)	2009	0.4635	0.4475	0.4793
2004-2007 (4)	2010	0.4915	0.4882	0.4952
2005-2008 (4)	2011	0.4629	0.4404	0.4856
2006-2009 (4)	2012	0.5504	0.5575	0.5425
2007-2010 (4)	2013	0.5596	0.5405	0.5779
2001-2005 (5)	2008	0.4552	0.4375	0.4728
2002-2006 (5)	2009	0.4558	0.4388	0.4726
2003-2007 (5)	2010	0.4794	0.4685	0.4905
2004-2008 (5)	2011	0.4790	0.4603	0.4975
2005-2009 (5)	2012	0.5339	0.5379	0.5296
2006-2010 (5)	2013	0.5499	0.5325	0.5664
2001-2006 (6)	2009	0.4671	0.4519	0.4821
2002-2007 (6)	2010	0.4725	0.4595	0.4856
2003-2008 (6)	2011	0.4757	0.4549	0.4963
2004-2009 (6)	2012	0.5340	0.5354	0.5321
2005-2010 (6)	2013	0.5421	0.5285	0.5551
2001-2007 (7)	2010	0.4807	0.4684	0.4931
2002-2008 (7)	2011	0.4730	0.4524	0.4935
2003-2009 (7)	2012	0.5231	0.5185	0.5271
2004-2010 (7)	2013	0.5441	0.5321	0.5555
2001-2008 (8)	2011	0.4815	0.4624	0.5004
2002-2009 (8)	2012	0.5149	0.5075	0.5217
2003-2010 (8)	2013	0.5363	0.5219	0.5502
2001-2009 (9)	2012	0.5183	0.5105	0.5257
2002-2010 (9)	2013	0.5296	0.5143	0.5444
2001-2010 (10)	2013	0.5327	0.5180	0.5469

Indemnity
Exponential Fit
Differences: (Actual - Trended)

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
2001-2004 (4)	2007	0.0042	0.0095	-0.0010
2002-2005 (4)	2008	-0.0010	-0.0003	-0.0018
2003-2006 (4)	2009	0.0362	0.0564	0.0161
2004-2007 (4)	2010	-0.0058	-0.0247	0.0128
2005-2008 (4)	2011	0.0662	0.0373	0.0951
2006-2009 (4)	2012	0.0397	0.0103	0.0701
2007-2010 (4)	2013	0.1305	0.0732	0.1886
2001-2005 (5)	2008	-0.0175	-0.0208	-0.0142
2002-2006 (5)	2009	0.0439	0.0651	0.0228
2003-2007 (5)	2010	0.0063	-0.0050	0.0175
2004-2008 (5)	2011	0.0501	0.0174	0.0832
2005-2009 (5)	2012	0.0562	0.0299	0.0830
2006-2010 (5)	2013	0.1402	0.0812	0.2001
2001-2006 (6)	2009	0.0326	0.0520	0.0133
2002-2007 (6)	2010	0.0132	0.0040	0.0224
2003-2008 (6)	2011	0.0534	0.0228	0.0844
2004-2009 (6)	2012	0.0561	0.0324	0.0805
2005-2010 (6)	2013	0.1480	0.0852	0.2114
2001-2007 (7)	2010	0.0050	-0.0049	0.0149
2002-2008 (7)	2011	0.0561	0.0253	0.0872
2003-2009 (7)	2012	0.0670	0.0493	0.0855
2004-2010 (7)	2013	0.1460	0.0816	0.2110
2001-2008 (8)	2011	0.0476	0.0153	0.0803
2002-2009 (8)	2012	0.0752	0.0603	0.0909
2003-2010 (8)	2013	0.1538	0.0918	0.2163
2001-2009 (9)	2012	0.0718	0.0573	0.0869
2002-2010 (9)	2013	0.1605	0.0994	0.2221
2001-2010 (10)	2013	0.1574	0.0957	0.2196

Medical
Actual Ultimate Severity Ratios

MEDICAL	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
	2001	0.4730	0.4382	0.5079
	2002	0.6373	0.6101	0.6645
	2003	0.6253	0.5942	0.6565
	2004	0.6611	0.6166	0.7058
	2005	0.7019	0.6541	0.7497
	2006	0.7299	0.6964	0.7633
	2007	0.8330	0.7754	0.8908
	2008	0.9382	0.8678	1.0086
	2009	1.0929	1.0674	1.1183
	2010	1.2984	1.1965	1.4002
	2011	1.3813	1.2929	1.4700
	2012	1.4380	1.3394	1.5365
	2013	1.4985	1.3848	1.6120

Medical
Linear Fit
Trended Severity Ratios

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
2001-2004 (4)	2007	0.8477	0.7985	0.8972
2002-2005 (4)	2008	0.7597	0.6882	0.8313
2003-2006 (4)	2009	0.8391	0.7952	0.8828
2004-2007 (4)	2010	0.9761	0.9190	1.0333
2005-2008 (4)	2011	1.1662	1.0725	1.2600
2006-2009 (4)	2012	1.4359	1.3942	1.4775
2007-2010 (4)	2013	1.7385	1.6351	1.8415
2001-2005 (5)	2008	0.8605	0.8018	0.9193
2002-2006 (5)	2009	0.8020	0.7505	0.8534
2003-2007 (5)	2010	0.9523	0.8884	1.0163
2004-2008 (5)	2011	1.1155	1.0339	1.1970
2005-2009 (5)	2012	1.3543	1.3112	1.3974
2006-2010 (5)	2013	1.6769	1.5668	1.7869
2001-2006 (6)	2009	0.8760	0.8287	0.9232
2002-2007 (6)	2010	0.9076	0.8418	0.9735
2003-2008 (6)	2011	1.0795	0.9972	1.1618
2004-2009 (6)	2012	1.2930	1.2470	1.3389
2005-2010 (6)	2013	1.5887	1.4919	1.6855
2001-2007 (7)	2010	0.9535	0.8930	1.0140
2002-2008 (7)	2011	1.0296	0.9482	1.1110
2003-2009 (7)	2012	1.2449	1.1910	1.2987
2004-2010 (7)	2013	1.5155	1.4258	1.6050
2001-2008 (8)	2011	1.0551	0.9799	1.1303
2002-2009 (8)	2012	1.1874	1.1289	1.2457
2003-2010 (8)	2013	1.4546	1.3649	1.5441
2001-2009 (9)	2012	1.1947	1.1377	1.2517
2002-2010 (9)	2013	1.3875	1.2985	1.4763
2001-2010 (10)	2013	1.3776	1.2931	1.4619

Medical
Linear Fit
Differences: (Actual - Trended)

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
2001-2004 (4)	2007	-0.0147	-0.0231	-0.0064
2002-2005 (4)	2008	0.1785	0.1796	0.1773
2003-2006 (4)	2009	0.2538	0.2722	0.2355
2004-2007 (4)	2010	0.3223	0.2775	0.3669
2005-2008 (4)	2011	0.2152	0.2204	0.2100
2006-2009 (4)	2012	0.0021	-0.0548	0.0590
2007-2010 (4)	2013	-0.2400	-0.2503	-0.2295
2001-2005 (5)	2008	0.0777	0.0660	0.0893
2002-2006 (5)	2009	0.2909	0.3169	0.2649
2003-2007 (5)	2010	0.3461	0.3081	0.3839
2004-2008 (5)	2011	0.2658	0.2590	0.2730
2005-2009 (5)	2012	0.0837	0.0282	0.1391
2006-2010 (5)	2013	-0.1784	-0.1820	-0.1749
2001-2006 (6)	2009	0.2169	0.2387	0.1951
2002-2007 (6)	2010	0.3908	0.3547	0.4267
2003-2008 (6)	2011	0.3018	0.2957	0.3082
2004-2009 (6)	2012	0.1450	0.0924	0.1976
2005-2010 (6)	2013	-0.0902	-0.1071	-0.0735
2001-2007 (7)	2010	0.3449	0.3035	0.3862
2002-2008 (7)	2011	0.3517	0.3447	0.3590
2003-2009 (7)	2012	0.1931	0.1484	0.2378
2004-2010 (7)	2013	-0.0170	-0.0410	0.0070
2001-2008 (8)	2011	0.3262	0.3130	0.3397
2002-2009 (8)	2012	0.2506	0.2105	0.2908
2003-2010 (8)	2013	0.0439	0.0199	0.0679
2001-2009 (9)	2012	0.2433	0.2017	0.2848
2002-2010 (9)	2013	0.1110	0.0863	0.1357
2001-2010 (10)	2013	0.1209	0.0917	0.1501

Medical
Exponential Fit
Trended Severity Ratios

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
2001-2004 (4)	2007	0.9257	0.8767	0.9752
2002-2005 (4)	2008	0.7660	0.6907	0.8428
2003-2006 (4)	2009	0.8587	0.8132	0.9037
2004-2007 (4)	2010	1.0134	0.9574	1.0691
2005-2008 (4)	2011	1.2490	1.1438	1.3548
2006-2009 (4)	2012	1.6167	1.5746	1.6572
2007-2010 (4)	2013	2.0012	1.8981	2.1008
2001-2005 (5)	2008	0.9284	0.8662	0.9909
2002-2006 (5)	2009	0.8129	0.7584	0.8674
2003-2007 (5)	2010	0.9894	0.9213	1.0573
2004-2008 (5)	2011	1.1851	1.0981	1.2719
2005-2009 (5)	2012	1.4963	1.4569	1.5350
2006-2010 (5)	2013	1.9532	1.8191	2.0848
2001-2006 (6)	2009	0.9385	0.8908	0.9861
2002-2007 (6)	2010	0.9310	0.8601	1.0022
2003-2008 (6)	2011	1.1435	1.0524	1.2347
2004-2009 (6)	2012	1.4131	1.3696	1.4556
2005-2010 (6)	2013	1.8186	1.7112	1.9237
2001-2007 (7)	2010	1.0280	0.9642	1.0917
2002-2008 (7)	2011	1.0740	0.9838	1.1648
2003-2009 (7)	2012	1.3517	1.2923	1.4097
2004-2010 (7)	2013	1.7119	1.6163	1.8053
2001-2008 (8)	2011	1.1507	1.0683	1.2331
2002-2009 (8)	2012	1.2659	1.1980	1.3325
2003-2010 (8)	2013	1.6270	1.5260	1.7262
2001-2009 (9)	2012	1.3250	1.2621	1.3869
2002-2010 (9)	2013	1.5192	1.4166	1.6204
2001-2010 (10)	2013	1.5612	1.4666	1.6543

Medical
Exponential Fit
Differences: (Actual - Trended)

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
2001-2004 (4)	2007	-0.0927	-0.1013	-0.0844
2002-2005 (4)	2008	0.1722	0.1771	0.1658
2003-2006 (4)	2009	0.2342	0.2542	0.2146
2004-2007 (4)	2010	0.2850	0.2391	0.3311
2005-2008 (4)	2011	0.1323	0.1491	0.1152
2006-2009 (4)	2012	-0.1787	-0.2352	-0.1207
2007-2010 (4)	2013	-0.5027	-0.5133	-0.4888
2001-2005 (5)	2008	0.0098	0.0016	0.0177
2002-2006 (5)	2009	0.2800	0.3090	0.2509
2003-2007 (5)	2010	0.3090	0.2752	0.3429
2004-2008 (5)	2011	0.1962	0.1948	0.1981
2005-2009 (5)	2012	-0.0583	-0.1175	0.0015
2006-2010 (5)	2013	-0.4547	-0.4343	-0.4728
2001-2006 (6)	2009	0.1544	0.1766	0.1322
2002-2007 (6)	2010	0.3674	0.3364	0.3980
2003-2008 (6)	2011	0.2378	0.2405	0.2353
2004-2009 (6)	2012	0.0249	-0.0302	0.0809
2005-2010 (6)	2013	-0.3201	-0.3264	-0.3117
2001-2007 (7)	2010	0.2704	0.2323	0.3085
2002-2008 (7)	2011	0.3073	0.3091	0.3052
2003-2009 (7)	2012	0.0863	0.0471	0.1268
2004-2010 (7)	2013	-0.2134	-0.2315	-0.1933
2001-2008 (8)	2011	0.2306	0.2246	0.2369
2002-2009 (8)	2012	0.1721	0.1414	0.2040
2003-2010 (8)	2013	-0.1285	-0.1412	-0.1142
2001-2009 (9)	2012	0.1130	0.0773	0.1496
2002-2010 (9)	2013	-0.0207	-0.0318	-0.0084
2001-2010 (10)	2013	-0.0627	-0.0818	-0.0423