

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 1999 through 2011, 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 (1/1/2012 to 12/1/2014).

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-23rd and the average of the incurred and paid-to-23rd methods.

As an illustration, the incurred loss development approach generated an indemnity severity ratio of 0.5202 for policy year 2006 (page 6.1). Fitting the severity ratios for policy years 2000 to 2003 using a straight line and projecting that to 2006 yielded a severity ratio of 0.4130 (page 6.2) which understates our current estimate for 2006 by 0.1072 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-23)
	1999	0.4121	0.4103	0.4139
	2000	0.5513	0.5516	0.5508
	2001	0.4901	0.4892	0.4911
	2002	0.4753	0.4718	0.4790
	2003	0.4913	0.4921	0.4907
	2004	0.4691	0.4608	0.4773
	2005	0.5064	0.5080	0.5047
	2006	0.5195	0.5202	0.5186
	2007	0.5394	0.5311	0.5478
	2008	0.5422	0.5198	0.5644
	2009	0.5789	0.5806	0.5772
	2010	0.5513	0.5496	0.5530
	2011	0.7285	0.7040	0.7533

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-23)
1999-2002 (4)	2005	0.5400	0.5357	0.5447
2000-2003 (4)	2006	0.4143	0.4130	0.4163
2001-2004 (4)	2007	0.4603	0.4493	0.4712
2002-2005 (4)	2008	0.5175	0.5180	0.5166
2003-2006 (4)	2009	0.5514	0.5545	0.5478
2004-2007 (4)	2010	0.6094	0.6054	0.6135
2005-2008 (4)	2011	0.5842	0.5406	0.6276
1999-2003 (5)	2006	0.5252	0.5249	0.5260
2000-2004 (5)	2007	0.4138	0.4038	0.4241
2001-2005 (5)	2008	0.4996	0.4977	0.5013
2002-2006 (5)	2009	0.5441	0.5469	0.5407
2003-2007 (5)	2010	0.5784	0.5711	0.5856
2004-2008 (5)	2011	0.6049	0.5785	0.6312
1999-2004 (6)	2007	0.4957	0.4882	0.5034
2000-2005 (6)	2008	0.4546	0.4511	0.4580
2001-2006 (6)	2009	0.5262	0.5269	0.5252
2002-2007 (6)	2010	0.5697	0.5646	0.5745
2003-2008 (6)	2011	0.5865	0.5622	0.6106
1999-2005 (7)	2008	0.5107	0.5079	0.5136
2000-2006 (7)	2009	0.4856	0.4846	0.4865
2001-2007 (7)	2010	0.5526	0.5473	0.5577
2002-2008 (7)	2011	0.5806	0.5608	0.6000
1999-2006 (8)	2009	0.5266	0.5256	0.5273
2000-2007 (8)	2010	0.5157	0.5100	0.5214
2001-2008 (8)	2011	0.5666	0.5488	0.5841
1999-2007 (9)	2010	0.5463	0.5413	0.5513
2000-2008 (9)	2011	0.5345	0.5179	0.5509
1999-2008 (10)	2011	0.5590	0.5443	0.5736

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

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
1999-2002 (4)	2005	-0.0336	-0.0277	-0.0400
2000-2003 (4)	2006	0.1052	0.1072	0.1023
2001-2004 (4)	2007	0.0791	0.0818	0.0766
2002-2005 (4)	2008	0.0247	0.0018	0.0478
2003-2006 (4)	2009	0.0275	0.0262	0.0294
2004-2007 (4)	2010	-0.0581	-0.0558	-0.0605
2005-2008 (4)	2011	0.1443	0.1634	0.1257
1999-2003 (5)	2006	-0.0057	-0.0047	-0.0074
2000-2004 (5)	2007	0.1256	0.1274	0.1237
2001-2005 (5)	2008	0.0426	0.0221	0.0631
2002-2006 (5)	2009	0.0348	0.0337	0.0365
2003-2007 (5)	2010	-0.0271	-0.0215	-0.0326
2004-2008 (5)	2011	0.1236	0.1255	0.1221
1999-2004 (6)	2007	0.0437	0.0429	0.0444
2000-2005 (6)	2008	0.0876	0.0687	0.1064
2001-2006 (6)	2009	0.0527	0.0537	0.0520
2002-2007 (6)	2010	-0.0184	-0.0150	-0.0215
2003-2008 (6)	2011	0.1420	0.1418	0.1427
1999-2005 (7)	2008	0.0315	0.0119	0.0508
2000-2006 (7)	2009	0.0933	0.0960	0.0907
2001-2007 (7)	2010	-0.0013	0.0023	-0.0047
2002-2008 (7)	2011	0.1479	0.1432	0.1533
1999-2006 (8)	2009	0.0523	0.0550	0.0499
2000-2007 (8)	2010	0.0356	0.0396	0.0316
2001-2008 (8)	2011	0.1619	0.1552	0.1692
1999-2007 (9)	2010	0.0050	0.0083	0.0017
2000-2008 (9)	2011	0.1940	0.1861	0.2024
1999-2008 (10)	2011	0.1695	0.1597	0.1797

**Indemnity  
Exponential Fit  
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
1999-2002 (4)	2005	0.5515	0.5469	0.5566
2000-2003 (4)	2006	0.4231	0.4219	0.4248
2001-2004 (4)	2007	0.4605	0.4496	0.4713
2002-2005 (4)	2008	0.5178	0.5180	0.5170
2003-2006 (4)	2009	0.5538	0.5572	0.5498
2004-2007 (4)	2010	0.6204	0.6174	0.6236
2005-2008 (4)	2011	0.5874	0.5411	0.6357
1999-2003 (5)	2006	0.5335	0.5334	0.5341
2000-2004 (5)	2007	0.4214	0.4123	0.4306
2001-2005 (5)	2008	0.4991	0.4968	0.5011
2002-2006 (5)	2009	0.5459	0.5490	0.5422
2003-2007 (5)	2010	0.5830	0.5754	0.5903
2004-2008 (5)	2011	0.6139	0.5852	0.6426
1999-2004 (6)	2007	0.5007	0.4928	0.5087
2000-2005 (6)	2008	0.4574	0.4539	0.4608
2001-2006 (6)	2009	0.5265	0.5269	0.5255
2002-2007 (6)	2010	0.5733	0.5682	0.5781
2003-2008 (6)	2011	0.5917	0.5656	0.6177
1999-2005 (7)	2008	0.5153	0.5122	0.5184
2000-2006 (7)	2009	0.4865	0.4852	0.4875
2001-2007 (7)	2010	0.5540	0.5486	0.5592
2002-2008 (7)	2011	0.5852	0.5642	0.6058
1999-2006 (8)	2009	0.5311	0.5301	0.5320
2000-2007 (8)	2010	0.5157	0.5101	0.5212
2001-2008 (8)	2011	0.5691	0.5505	0.5873
1999-2007 (9)	2010	0.5512	0.5460	0.5563
2000-2008 (9)	2011	0.5347	0.5183	0.5509
1999-2008 (10)	2011	0.5644	0.5490	0.5794

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

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
1999-2002 (4)	2005	-0.0451	-0.0389	-0.0519
2000-2003 (4)	2006	0.0964	0.0983	0.0938
2001-2004 (4)	2007	0.0789	0.0815	0.0765
2002-2005 (4)	2008	0.0244	0.0018	0.0474
2003-2006 (4)	2009	0.0251	0.0234	0.0274
2004-2007 (4)	2010	-0.0691	-0.0678	-0.0706
2005-2008 (4)	2011	0.1411	0.1629	0.1176
1999-2003 (5)	2006	-0.0140	-0.0132	-0.0155
2000-2004 (5)	2007	0.1180	0.1188	0.1172
2001-2005 (5)	2008	0.0431	0.0230	0.0633
2002-2006 (5)	2009	0.0330	0.0316	0.0350
2003-2007 (5)	2010	-0.0317	-0.0258	-0.0373
2004-2008 (5)	2011	0.1146	0.1188	0.1107
1999-2004 (6)	2007	0.0387	0.0383	0.0391
2000-2005 (6)	2008	0.0848	0.0659	0.1036
2001-2006 (6)	2009	0.0524	0.0537	0.0517
2002-2007 (6)	2010	-0.0220	-0.0186	-0.0251
2003-2008 (6)	2011	0.1368	0.1384	0.1356
1999-2005 (7)	2008	0.0269	0.0076	0.0460
2000-2006 (7)	2009	0.0924	0.0954	0.0897
2001-2007 (7)	2010	-0.0027	0.0010	-0.0062
2002-2008 (7)	2011	0.1433	0.1398	0.1475
1999-2006 (8)	2009	0.0478	0.0505	0.0452
2000-2007 (8)	2010	0.0356	0.0395	0.0318
2001-2008 (8)	2011	0.1594	0.1535	0.1660
1999-2007 (9)	2010	0.0001	0.0036	-0.0033
2000-2008 (9)	2011	0.1938	0.1857	0.2024
1999-2008 (10)	2011	0.1641	0.1550	0.1739

**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-23)
	1999	0.4591	0.4676	0.4507
	2000	0.6470	0.6769	0.6173
	2001	0.5608	0.5881	0.5336
	2002	0.6208	0.6452	0.5964
	2003	0.6620	0.6967	0.6272
	2004	0.6909	0.7076	0.6743
	2005	0.7548	0.7883	0.7216
	2006	0.7643	0.7872	0.7413
	2007	0.9081	0.9306	0.8855
	2008	0.9810	1.0058	0.9563
	2009	1.0928	1.1303	1.0553
	2010	1.3473	1.4056	1.2891
	2011	1.6481	1.7173	1.5790

**Medical  
Linear Fit  
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
1999-2002 (4)	2005	0.7514	0.7943	0.7085
2000-2003 (4)	2006	0.6699	0.7042	0.6353
2001-2004 (4)	2007	0.8278	0.8439	0.8117
2002-2005 (4)	2008	0.8760	0.9075	0.8451
2003-2006 (4)	2009	0.8849	0.9034	0.8664
2004-2007 (4)	2010	1.0770	1.1040	1.0497
2005-2008 (4)	2011	1.2221	1.2361	1.2079
1999-2003 (5)	2006	0.7797	0.8282	0.7311
2000-2004 (5)	2007	0.7308	0.7479	0.7136
2001-2005 (5)	2008	0.8869	0.9166	0.8576
2002-2006 (5)	2009	0.8885	0.9128	0.8643
2003-2007 (5)	2010	1.0388	1.0558	1.0218
2004-2008 (5)	2011	1.1866	1.2133	1.1598
1999-2004 (6)	2007	0.8054	0.8372	0.7735
2000-2005 (6)	2008	0.8086	0.8358	0.7815
2001-2006 (6)	2009	0.9032	0.9278	0.8787
2002-2007 (6)	2010	1.0175	1.0389	0.9961
2003-2008 (6)	2011	1.1480	1.1672	1.1289
1999-2005 (7)	2008	0.8585	0.8955	0.8217
2000-2006 (7)	2009	0.8451	0.8687	0.8215
2001-2007 (7)	2010	1.0135	1.0355	0.9914
2002-2008 (7)	2011	1.1216	1.1436	1.0997
1999-2006 (8)	2009	0.8854	0.9176	0.8531
2000-2007 (8)	2010	0.9546	0.9761	0.9330
2001-2008 (8)	2011	1.1103	1.1326	1.0880
1999-2007 (9)	2010	0.9782	1.0074	0.9490
2000-2008 (9)	2011	1.0539	1.0757	1.0321
1999-2008 (10)	2011	1.0673	1.0956	1.0390



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

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
1999-2002 (4)	2005	0.0034	-0.0059	0.0131
2000-2003 (4)	2006	0.0944	0.0831	0.1061
2001-2004 (4)	2007	0.0803	0.0867	0.0738
2002-2005 (4)	2008	0.1050	0.0983	0.1112
2003-2006 (4)	2009	0.2079	0.2269	0.1889
2004-2007 (4)	2010	0.2703	0.3016	0.2394
2005-2008 (4)	2011	0.4260	0.4812	0.3711
1999-2003 (5)	2006	-0.0154	-0.0409	0.0102
2000-2004 (5)	2007	0.1773	0.1827	0.1719
2001-2005 (5)	2008	0.0941	0.0892	0.0987
2002-2006 (5)	2009	0.2043	0.2175	0.1910
2003-2007 (5)	2010	0.3085	0.3498	0.2673
2004-2008 (5)	2011	0.4615	0.5041	0.4193
1999-2004 (6)	2007	0.1027	0.0934	0.1120
2000-2005 (6)	2008	0.1724	0.1700	0.1748
2001-2006 (6)	2009	0.1896	0.2025	0.1766
2002-2007 (6)	2010	0.3298	0.3667	0.2930
2003-2008 (6)	2011	0.5001	0.5501	0.4501
1999-2005 (7)	2008	0.1225	0.1103	0.1347
2000-2006 (7)	2009	0.2477	0.2617	0.2338
2001-2007 (7)	2010	0.3338	0.3701	0.2977
2002-2008 (7)	2011	0.5265	0.5737	0.4794
1999-2006 (8)	2009	0.2074	0.2127	0.2022
2000-2007 (8)	2010	0.3927	0.4295	0.3561
2001-2008 (8)	2011	0.5378	0.5847	0.4910
1999-2007 (9)	2010	0.3691	0.3982	0.3401
2000-2008 (9)	2011	0.5942	0.6416	0.5469
1999-2008 (10)	2011	0.5808	0.6217	0.5400

**Medical  
Exponential Fit  
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
1999-2002 (4)	2005	0.7991	0.8534	0.7457
2000-2003 (4)	2006	0.6709	0.7050	0.6364
2001-2004 (4)	2007	0.8618	0.8739	0.8498
2002-2005 (4)	2008	0.9030	0.9339	0.8728
2003-2006 (4)	2009	0.9055	0.9207	0.8910
2004-2007 (4)	2010	1.1282	1.1566	1.0993
2005-2008 (4)	2011	1.3035	1.3079	1.2997
1999-2003 (5)	2006	0.8262	0.8857	0.7673
2000-2004 (5)	2007	0.7364	0.7526	0.7200
2001-2005 (5)	2008	0.9295	0.9572	0.9020
2002-2006 (5)	2009	0.9155	0.9382	0.8931
2003-2007 (5)	2010	1.0842	1.0958	1.0732
2004-2008 (5)	2011	1.2661	1.2928	1.2393
1999-2004 (6)	2007	0.8516	0.8892	0.8139
2000-2005 (6)	2008	0.8219	0.8478	0.7960
2001-2006 (6)	2009	0.9457	0.9676	0.9240
2002-2007 (6)	2010	1.0649	1.0832	1.0470
2003-2008 (6)	2011	1.2196	1.2324	1.2077
1999-2005 (7)	2008	0.9114	0.9543	0.8686
2000-2006 (7)	2009	0.8642	0.8860	0.8424
2001-2007 (7)	2010	1.0749	1.0929	1.0572
2002-2008 (7)	2011	1.1928	1.2105	1.1755
1999-2006 (8)	2009	0.9408	0.9773	0.9042
2000-2007 (8)	2010	0.9873	1.0060	0.9686
2001-2008 (8)	2011	1.1941	1.2112	1.1774
1999-2007 (9)	2010	1.0487	1.0812	1.0161
2000-2008 (9)	2011	1.1055	1.1233	1.0879
1999-2008 (10)	2011	1.1569	1.1876	1.1262

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

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
1999-2002 (4)	2005	-0.0443	-0.0651	-0.0241
2000-2003 (4)	2006	0.0934	0.0822	0.1049
2001-2004 (4)	2007	0.0463	0.0567	0.0357
2002-2005 (4)	2008	0.0780	0.0719	0.0835
2003-2006 (4)	2009	0.1873	0.2096	0.1643
2004-2007 (4)	2010	0.2191	0.2490	0.1898
2005-2008 (4)	2011	0.3446	0.4094	0.2793
1999-2003 (5)	2006	-0.0619	-0.0985	-0.0260
2000-2004 (5)	2007	0.1717	0.1780	0.1655
2001-2005 (5)	2008	0.0515	0.0486	0.0543
2002-2006 (5)	2009	0.1773	0.1921	0.1622
2003-2007 (5)	2010	0.2631	0.3098	0.2159
2004-2008 (5)	2011	0.3820	0.4245	0.3397
1999-2004 (6)	2007	0.0565	0.0414	0.0716
2000-2005 (6)	2008	0.1591	0.1580	0.1603
2001-2006 (6)	2009	0.1471	0.1627	0.1313
2002-2007 (6)	2010	0.2824	0.3224	0.2421
2003-2008 (6)	2011	0.4285	0.4849	0.3713
1999-2005 (7)	2008	0.0696	0.0515	0.0877
2000-2006 (7)	2009	0.2286	0.2443	0.2129
2001-2007 (7)	2010	0.2724	0.3127	0.2319
2002-2008 (7)	2011	0.4553	0.5068	0.4035
1999-2006 (8)	2009	0.1520	0.1530	0.1511
2000-2007 (8)	2010	0.3600	0.3996	0.3205
2001-2008 (8)	2011	0.4540	0.5061	0.4016
1999-2007 (9)	2010	0.2986	0.3244	0.2730
2000-2008 (9)	2011	0.5426	0.5940	0.4911
1999-2008 (10)	2011	0.4912	0.5297	0.4528