

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 0.5378 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 0.4659 (page 6.2) which overstates our current estimate for 2006 by 0.0720 points (page 6.3).

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

INDEMNITY	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
	1999	0.4377	0.4345	0.4408
	2000	0.5769	0.5754	0.5782
	2001	0.5101	0.5055	0.5146
	2002	0.5427	0.5443	0.5410
	2003	0.5152	0.5118	0.5187
	2004	0.5143	0.5073	0.5214
	2005	0.5377	0.5330	0.5423
	2006	0.5426	0.5378	0.5475
	2007	0.5633	0.5497	0.5770
	2008	0.5708	0.5413	0.6002
	2009	0.6158	0.6228	0.6090
	2010	0.5849	0.5874	0.5821
	2011	0.7662	0.7354	0.7967

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-23)
1999-2002 (4)	2005	0.6285	0.6317	0.6253
2000-2003 (4)	2006	0.4676	0.4659	0.4697
2001-2004 (4)	2007	0.5139	0.5050	0.5231
2002-2005 (4)	2008	0.5203	0.5068	0.5338
2003-2006 (4)	2009	0.5750	0.5691	0.5808
2004-2007 (4)	2010	0.6078	0.5914	0.6245
2005-2008 (4)	2011	0.6076	0.5570	0.6582
1999-2003 (5)	2006	0.5769	0.5761	0.5780
2000-2004 (5)	2007	0.4718	0.4639	0.4800
2001-2005 (5)	2008	0.5374	0.5294	0.5455
2002-2006 (5)	2009	0.5417	0.5309	0.5525
2003-2007 (5)	2010	0.5969	0.5811	0.6127
2004-2008 (5)	2011	0.6150	0.5762	0.6538
1999-2004 (6)	2007	0.5524	0.5464	0.5585
2000-2005 (6)	2008	0.4997	0.4920	0.5075
2001-2006 (6)	2009	0.5501	0.5426	0.5578
2002-2007 (6)	2010	0.5687	0.5512	0.5865
2003-2008 (6)	2011	0.6082	0.5741	0.6422
1999-2005 (7)	2008	0.5578	0.5515	0.5642
2000-2006 (7)	2009	0.5179	0.5104	0.5256
2001-2007 (7)	2010	0.5713	0.5572	0.5855
2002-2008 (7)	2011	0.5857	0.5530	0.6184
1999-2006 (8)	2009	0.5627	0.5562	0.5693
2000-2007 (8)	2010	0.5418	0.5287	0.5552
2001-2008 (8)	2011	0.5861	0.5583	0.6139
1999-2007 (9)	2010	0.5765	0.5648	0.5883
2000-2008 (9)	2011	0.5599	0.5345	0.5854
1999-2008 (10)	2011	0.5879	0.5652	0.6108

**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	-0.0908	-0.0987	-0.0830
2000-2003 (4)	2006	0.0750	0.0720	0.0778
2001-2004 (4)	2007	0.0494	0.0447	0.0539
2002-2005 (4)	2008	0.0505	0.0345	0.0664
2003-2006 (4)	2009	0.0408	0.0537	0.0282
2004-2007 (4)	2010	-0.0229	-0.0040	-0.0424
2005-2008 (4)	2011	0.1586	0.1784	0.1385
1999-2003 (5)	2006	-0.0343	-0.0383	-0.0305
2000-2004 (5)	2007	0.0915	0.0858	0.0970
2001-2005 (5)	2008	0.0334	0.0119	0.0547
2002-2006 (5)	2009	0.0742	0.0919	0.0565
2003-2007 (5)	2010	-0.0120	0.0063	-0.0306
2004-2008 (5)	2011	0.1512	0.1592	0.1429
1999-2004 (6)	2007	0.0109	0.0033	0.0185
2000-2005 (6)	2008	0.0711	0.0493	0.0927
2001-2006 (6)	2009	0.0657	0.0802	0.0512
2002-2007 (6)	2010	0.0162	0.0362	-0.0044
2003-2008 (6)	2011	0.1580	0.1613	0.1545
1999-2005 (7)	2008	0.0130	-0.0102	0.0360
2000-2006 (7)	2009	0.0979	0.1124	0.0834
2001-2007 (7)	2010	0.0136	0.0302	-0.0034
2002-2008 (7)	2011	0.1805	0.1824	0.1783
1999-2006 (8)	2009	0.0531	0.0666	0.0397
2000-2007 (8)	2010	0.0431	0.0587	0.0269
2001-2008 (8)	2011	0.1801	0.1771	0.1828
1999-2007 (9)	2010	0.0084	0.0226	-0.0062
2000-2008 (9)	2011	0.2063	0.2009	0.2113
1999-2008 (10)	2011	0.1783	0.1702	0.1859

**Indemnity  
Exponential Fit  
Trended Severity Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
1999-2002 (4)	2005	0.6503	0.6549	0.6457
2000-2003 (4)	2006	0.4727	0.4709	0.4748
2001-2004 (4)	2007	0.5140	0.5053	0.5232
2002-2005 (4)	2008	0.5204	0.5072	0.5337
2003-2006 (4)	2009	0.5769	0.5710	0.5828
2004-2007 (4)	2010	0.6122	0.5950	0.6295
2005-2008 (4)	2011	0.6101	0.5573	0.6649
1999-2003 (5)	2006	0.5872	0.5866	0.5881
2000-2004 (5)	2007	0.4760	0.4686	0.4837
2001-2005 (5)	2008	0.5375	0.5295	0.5457
2002-2006 (5)	2009	0.5417	0.5310	0.5526
2003-2007 (5)	2010	0.6000	0.5835	0.6167
2004-2008 (5)	2011	0.6195	0.5782	0.6614
1999-2004 (6)	2007	0.5590	0.5528	0.5654
2000-2005 (6)	2008	0.5015	0.4941	0.5091
2001-2006 (6)	2009	0.5506	0.5430	0.5583
2002-2007 (6)	2010	0.5692	0.5514	0.5874
2003-2008 (6)	2011	0.6121	0.5759	0.6485
1999-2005 (7)	2008	0.5637	0.5572	0.5703
2000-2006 (7)	2009	0.5189	0.5116	0.5264
2001-2007 (7)	2010	0.5722	0.5579	0.5867
2002-2008 (7)	2011	0.5869	0.5534	0.6209
1999-2006 (8)	2009	0.5680	0.5614	0.5749
2000-2007 (8)	2010	0.5421	0.5293	0.5552
2001-2008 (8)	2011	0.5877	0.5591	0.6164
1999-2007 (9)	2010	0.5819	0.5699	0.5940
2000-2008 (9)	2011	0.5601	0.5351	0.5854
1999-2008 (10)	2011	0.5934	0.5698	0.6172

**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	-0.1126	-0.1219	-0.1034
2000-2003 (4)	2006	0.0699	0.0669	0.0727
2001-2004 (4)	2007	0.0493	0.0444	0.0538
2002-2005 (4)	2008	0.0504	0.0341	0.0665
2003-2006 (4)	2009	0.0389	0.0518	0.0262
2004-2007 (4)	2010	-0.0273	-0.0076	-0.0474
2005-2008 (4)	2011	0.1561	0.1781	0.1318
1999-2003 (5)	2006	-0.0446	-0.0488	-0.0406
2000-2004 (5)	2007	0.0873	0.0811	0.0933
2001-2005 (5)	2008	0.0333	0.0118	0.0545
2002-2006 (5)	2009	0.0741	0.0918	0.0564
2003-2007 (5)	2010	-0.0151	0.0039	-0.0346
2004-2008 (5)	2011	0.1467	0.1572	0.1353
1999-2004 (6)	2007	0.0043	-0.0031	0.0116
2000-2005 (6)	2008	0.0693	0.0472	0.0911
2001-2006 (6)	2009	0.0652	0.0798	0.0507
2002-2007 (6)	2010	0.0157	0.0360	-0.0053
2003-2008 (6)	2011	0.1541	0.1595	0.1482
1999-2005 (7)	2008	0.0071	-0.0159	0.0299
2000-2006 (7)	2009	0.0969	0.1112	0.0826
2001-2007 (7)	2010	0.0127	0.0295	-0.0046
2002-2008 (7)	2011	0.1793	0.1820	0.1758
1999-2006 (8)	2009	0.0478	0.0614	0.0341
2000-2007 (8)	2010	0.0428	0.0581	0.0269
2001-2008 (8)	2011	0.1785	0.1763	0.1803
1999-2007 (9)	2010	0.0030	0.0175	-0.0119
2000-2008 (9)	2011	0.2061	0.2003	0.2113
1999-2008 (10)	2011	0.1728	0.1656	0.1795

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

MEDICAL	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
	1999	0.6015	0.6033	0.5997
	2000	0.8167	0.8565	0.7770
	2001	0.6954	0.7238	0.6671
	2002	0.8849	0.9438	0.8259
	2003	0.8353	0.8739	0.7967
	2004	0.9170	0.9573	0.8768
	2005	0.9674	1.0010	0.9336
	2006	0.9555	0.9763	0.9348
	2007	1.1556	1.1850	1.1264
	2008	1.2528	1.2621	1.2434
	2009	1.4408	1.5334	1.3482
	2010	1.7620	1.8846	1.6396
	2011	2.1144	2.2150	2.0140

**Medical  
Linear Fit  
Trended Severity Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
1999-2002 (4)	2005	1.0776	1.1818	0.9733
2000-2003 (4)	2006	0.9185	0.9720	0.8647
2001-2004 (4)	2007	1.1100	1.1585	1.0616
2002-2005 (4)	2008	1.0493	1.0588	1.0397
2003-2006 (4)	2009	1.1038	1.1100	1.0975
2004-2007 (4)	2010	1.3156	1.3262	1.3054
2005-2008 (4)	2011	1.5582	1.5525	1.5640
1999-2003 (5)	2006	1.0347	1.1145	0.9547
2000-2004 (5)	2007	1.0001	1.0469	0.9533
2001-2005 (5)	2008	1.1481	1.1839	1.1120
2002-2006 (5)	2009	1.0487	1.0465	1.0509
2003-2007 (5)	2010	1.3057	1.3193	1.2924
2004-2008 (5)	2011	1.4796	1.4731	1.4860
1999-2004 (6)	2007	1.0782	1.1474	1.0092
2000-2005 (6)	2008	1.0679	1.1053	1.0302
2001-2006 (6)	2009	1.1320	1.1511	1.1128
2002-2007 (6)	2010	1.2299	1.2342	1.2258
2003-2008 (6)	2011	1.4526	1.4511	1.4541
1999-2005 (7)	2008	1.1251	1.1824	1.0676
2000-2006 (7)	2009	1.0801	1.1034	1.0568
2001-2007 (7)	2010	1.2703	1.2892	1.2515
2002-2008 (7)	2011	1.3775	1.3705	1.3846
1999-2006 (8)	2009	1.1319	1.1737	1.0900
2000-2007 (8)	2010	1.2132	1.2351	1.1913
2001-2008 (8)	2011	1.3965	1.4025	1.3905
1999-2007 (9)	2010	1.2443	1.2820	1.2067
2000-2008 (9)	2011	1.3388	1.3486	1.3289
1999-2008 (10)	2011	1.3566	1.3813	1.3318



**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	-0.1102	-0.1808	-0.0397
2000-2003 (4)	2006	0.0370	0.0043	0.0701
2001-2004 (4)	2007	0.0456	0.0265	0.0648
2002-2005 (4)	2008	0.2035	0.2034	0.2037
2003-2006 (4)	2009	0.3371	0.4234	0.2507
2004-2007 (4)	2010	0.4464	0.5584	0.3342
2005-2008 (4)	2011	0.5562	0.6625	0.4500
1999-2003 (5)	2006	-0.0792	-0.1382	-0.0199
2000-2004 (5)	2007	0.1555	0.1381	0.1731
2001-2005 (5)	2008	0.1048	0.0782	0.1314
2002-2006 (5)	2009	0.3921	0.4869	0.2973
2003-2007 (5)	2010	0.4563	0.5653	0.3472
2004-2008 (5)	2011	0.6348	0.7419	0.5280
1999-2004 (6)	2007	0.0774	0.0376	0.1172
2000-2005 (6)	2008	0.1849	0.1568	0.2132
2001-2006 (6)	2009	0.3088	0.3823	0.2354
2002-2007 (6)	2010	0.5321	0.6504	0.4138
2003-2008 (6)	2011	0.6618	0.7639	0.5599
1999-2005 (7)	2008	0.1277	0.0797	0.1758
2000-2006 (7)	2009	0.3607	0.4300	0.2914
2001-2007 (7)	2010	0.4917	0.5954	0.3881
2002-2008 (7)	2011	0.7369	0.8445	0.6294
1999-2006 (8)	2009	0.3089	0.3597	0.2582
2000-2007 (8)	2010	0.5488	0.6495	0.4483
2001-2008 (8)	2011	0.7179	0.8125	0.6235
1999-2007 (9)	2010	0.5177	0.6026	0.4329
2000-2008 (9)	2011	0.7756	0.8664	0.6851
1999-2008 (10)	2011	0.7578	0.8337	0.6822

**Medical  
Exponential Fit  
Trended Severity Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
1999-2002 (4)	2005	1.1615	1.3074	1.0238
2000-2003 (4)	2006	0.9248	0.9791	0.8702
2001-2004 (4)	2007	1.1729	1.2250	1.1209
2002-2005 (4)	2008	1.0585	1.0636	1.0554
2003-2006 (4)	2009	1.1267	1.1267	1.1279
2004-2007 (4)	2010	1.3518	1.3534	1.3520
2005-2008 (4)	2011	1.6610	1.6404	1.6836
1999-2003 (5)	2006	1.0977	1.2018	0.9972
2000-2004 (5)	2007	1.0167	1.0646	0.9687
2001-2005 (5)	2008	1.2103	1.2456	1.1750
2002-2006 (5)	2009	1.0583	1.0512	1.0681
2003-2007 (5)	2010	1.3566	1.3607	1.3541
2004-2008 (5)	2011	1.5556	1.5341	1.5794
1999-2004 (6)	2007	1.1457	1.2345	1.0591
2000-2005 (6)	2008	1.0939	1.1312	1.0564
2001-2006 (6)	2009	1.1828	1.1973	1.1689
2002-2007 (6)	2010	1.2557	1.2500	1.2643
2003-2008 (6)	2011	1.5368	1.5204	1.5554
1999-2005 (7)	2008	1.1980	1.2706	1.1264
2000-2006 (7)	2009	1.1078	1.1284	1.0874
2001-2007 (7)	2010	1.3402	1.3520	1.3297
2002-2008 (7)	2011	1.4297	1.4078	1.4554
1999-2006 (8)	2009	1.2011	1.2519	1.1506
2000-2007 (8)	2010	1.2558	1.2730	1.2393
2001-2008 (8)	2011	1.4916	1.4857	1.4994
1999-2007 (9)	2010	1.3306	1.3757	1.2859
2000-2008 (9)	2011	1.4032	1.4049	1.4026
1999-2008 (10)	2011	1.4653	1.4939	1.4368

**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	-0.1941	-0.3064	-0.0902
2000-2003 (4)	2006	0.0307	-0.0028	0.0646
2001-2004 (4)	2007	-0.0173	-0.0400	0.0055
2002-2005 (4)	2008	0.1943	0.1985	0.1880
2003-2006 (4)	2009	0.3141	0.4067	0.2203
2004-2007 (4)	2010	0.4102	0.5312	0.2876
2005-2008 (4)	2011	0.4534	0.5746	0.3304
1999-2003 (5)	2006	-0.1422	-0.2255	-0.0624
2000-2004 (5)	2007	0.1389	0.1204	0.1577
2001-2005 (5)	2008	0.0425	0.0165	0.0684
2002-2006 (5)	2009	0.3825	0.4822	0.2801
2003-2007 (5)	2010	0.4054	0.5239	0.2855
2004-2008 (5)	2011	0.5588	0.6809	0.4346
1999-2004 (6)	2007	0.0099	-0.0495	0.0673
2000-2005 (6)	2008	0.1589	0.1309	0.1870
2001-2006 (6)	2009	0.2580	0.3361	0.1793
2002-2007 (6)	2010	0.5063	0.6346	0.3753
2003-2008 (6)	2011	0.5776	0.6946	0.4586
1999-2005 (7)	2008	0.0548	-0.0085	0.1170
2000-2006 (7)	2009	0.3330	0.4050	0.2608
2001-2007 (7)	2010	0.4218	0.5326	0.3099
2002-2008 (7)	2011	0.6847	0.8072	0.5586
1999-2006 (8)	2009	0.2397	0.2815	0.1976
2000-2007 (8)	2010	0.5062	0.6116	0.4003
2001-2008 (8)	2011	0.6228	0.7293	0.5146
1999-2007 (9)	2010	0.4314	0.5089	0.3537
2000-2008 (9)	2011	0.7112	0.8101	0.6114
1999-2008 (10)	2011	0.6491	0.7211	0.5772