

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 2000 through 2012, 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 (1/1/2013 to 12/1/2015).

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-24th and the average of the incurred and paid-to-24th methods.

As an illustration, the incurred loss development approach generated an indemnity severity ratio of 0.4378 for policy year 2007 (page 6.1). Fitting the severity ratios for policy years 2001 to 2004 using a straight line and projecting that to 2007 yielded a severity ratio of 0.3691 (page 6.2) which understates our current estimate for 2007 by 0.0687 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-24)
	2000	0.4497	0.4531	0.4463
	2001	0.3980	0.3969	0.3993
	2002	0.3734	0.3701	0.3767
	2003	0.3957	0.3964	0.3950
	2004	0.3850	0.3764	0.3936
	2005	0.4129	0.4126	0.4132
	2006	0.4240	0.4269	0.4210
	2007	0.4459	0.4378	0.4539
	2008	0.4445	0.4275	0.4615
	2009	0.4772	0.4770	0.4773
	2010	0.4865	0.4789	0.4941
	2011	0.5679	0.5307	0.6049
	2012	0.5917	0.5868	0.5970

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-24)
2000-2003 (4)	2006	0.3202	0.3155	0.3249
2001-2004 (4)	2007	0.3805	0.3691	0.3917
2002-2005 (4)	2008	0.4403	0.4373	0.4433
2003-2006 (4)	2009	0.4552	0.4605	0.4496
2004-2007 (4)	2010	0.5042	0.5028	0.5053
2005-2008 (4)	2011	0.4843	0.4512	0.5174
2006-2009 (4)	2012	0.5191	0.5053	0.5329
2000-2004 (5)	2007	0.3345	0.3216	0.3473
2001-2005 (5)	2008	0.4137	0.4093	0.4179
2002-2006 (5)	2009	0.4574	0.4614	0.4533
2003-2007 (5)	2010	0.4824	0.4767	0.4879
2004-2008 (5)	2011	0.4985	0.4799	0.5169
2005-2009 (5)	2012	0.5155	0.5011	0.5297
2000-2005 (6)	2008	0.3709	0.3636	0.3782
2001-2006 (6)	2009	0.4355	0.4370	0.4338
2002-2007 (6)	2010	0.4808	0.4766	0.4849
2003-2008 (6)	2011	0.4868	0.4686	0.5049
2004-2009 (6)	2012	0.5224	0.5141	0.5305
2000-2006 (7)	2009	0.3979	0.3959	0.3998
2001-2007 (7)	2010	0.4612	0.4566	0.4655
2002-2008 (7)	2011	0.4872	0.4723	0.5020
2003-2009 (7)	2012	0.5114	0.5012	0.5215
2000-2007 (8)	2010	0.4269	0.4204	0.4333
2001-2008 (8)	2011	0.4719	0.4582	0.4854
2002-2009 (8)	2012	0.5099	0.5009	0.5188
2000-2008 (9)	2011	0.4425	0.4284	0.4565
2001-2009 (9)	2012	0.4955	0.4865	0.5043
2000-2009 (10)	2012	0.4683	0.4582	0.4782

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)
2000-2003 (4)	2006	0.1038	0.1114	0.0961
2001-2004 (4)	2007	0.0654	0.0687	0.0622
2002-2005 (4)	2008	0.0042	-0.0098	0.0182
2003-2006 (4)	2009	0.0220	0.0165	0.0277
2004-2007 (4)	2010	-0.0177	-0.0239	-0.0112
2005-2008 (4)	2011	0.0836	0.0795	0.0875
2006-2009 (4)	2012	0.0726	0.0815	0.0641
2000-2004 (5)	2007	0.1114	0.1162	0.1066
2001-2005 (5)	2008	0.0308	0.0182	0.0436
2002-2006 (5)	2009	0.0198	0.0156	0.0240
2003-2007 (5)	2010	0.0041	0.0022	0.0062
2004-2008 (5)	2011	0.0694	0.0508	0.0880
2005-2009 (5)	2012	0.0763	0.0857	0.0673
2000-2005 (6)	2008	0.0736	0.0639	0.0833
2001-2006 (6)	2009	0.0417	0.0400	0.0435
2002-2007 (6)	2010	0.0057	0.0023	0.0092
2003-2008 (6)	2011	0.0811	0.0621	0.1000
2004-2009 (6)	2012	0.0693	0.0727	0.0665
2000-2006 (7)	2009	0.0793	0.0811	0.0775
2001-2007 (7)	2010	0.0253	0.0223	0.0286
2002-2008 (7)	2011	0.0807	0.0584	0.1029
2003-2009 (7)	2012	0.0803	0.0856	0.0755
2000-2007 (8)	2010	0.0596	0.0585	0.0608
2001-2008 (8)	2011	0.0960	0.0725	0.1195
2002-2009 (8)	2012	0.0818	0.0859	0.0782
2000-2008 (9)	2011	0.1254	0.1023	0.1484
2001-2009 (9)	2012	0.0962	0.1003	0.0927
2000-2009 (10)	2012	0.1234	0.1286	0.1188

**Indemnity
Exponential Fit
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-24)
2000-2003 (4)	2006	0.3297	0.3261	0.3334
2001-2004 (4)	2007	0.3807	0.3694	0.3918
2002-2005 (4)	2008	0.4429	0.4396	0.4461
2003-2006 (4)	2009	0.4578	0.4638	0.4517
2004-2007 (4)	2010	0.5138	0.5140	0.5133
2005-2008 (4)	2011	0.4877	0.4521	0.5247
2006-2009 (4)	2012	0.5242	0.5078	0.5406
2000-2004 (5)	2007	0.3411	0.3300	0.3522
2001-2005 (5)	2008	0.4138	0.4090	0.4182
2002-2006 (5)	2009	0.4614	0.4659	0.4568
2003-2007 (5)	2010	0.4874	0.4816	0.4929
2004-2008 (5)	2011	0.5061	0.4863	0.5258
2005-2009 (5)	2012	0.5211	0.5042	0.5378
2000-2005 (6)	2008	0.3732	0.3664	0.3800
2001-2006 (6)	2009	0.4365	0.4379	0.4348
2002-2007 (6)	2010	0.4868	0.4827	0.4907
2003-2008 (6)	2011	0.4921	0.4724	0.5118
2004-2009 (6)	2012	0.5320	0.5230	0.5405
2000-2006 (7)	2009	0.3986	0.3965	0.4005
2001-2007 (7)	2010	0.4636	0.4589	0.4679
2002-2008 (7)	2011	0.4937	0.4776	0.5097
2003-2009 (7)	2012	0.5188	0.5073	0.5301
2000-2007 (8)	2010	0.4270	0.4206	0.4331
2001-2008 (8)	2011	0.4754	0.4609	0.4895
2002-2009 (8)	2012	0.5184	0.5083	0.5282
2000-2008 (9)	2011	0.4430	0.4289	0.4569
2001-2009 (9)	2012	0.5007	0.4908	0.5102
2000-2009 (10)	2012	0.4693	0.4587	0.4797

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)
2000-2003 (4)	2006	0.0943	0.1008	0.0876
2001-2004 (4)	2007	0.0652	0.0684	0.0621
2002-2005 (4)	2008	0.0016	-0.0121	0.0154
2003-2006 (4)	2009	0.0194	0.0132	0.0256
2004-2007 (4)	2010	-0.0273	-0.0351	-0.0192
2005-2008 (4)	2011	0.0802	0.0786	0.0802
2006-2009 (4)	2012	0.0675	0.0790	0.0564
2000-2004 (5)	2007	0.1048	0.1078	0.1017
2001-2005 (5)	2008	0.0307	0.0185	0.0433
2002-2006 (5)	2009	0.0158	0.0111	0.0205
2003-2007 (5)	2010	-0.0009	-0.0027	0.0012
2004-2008 (5)	2011	0.0618	0.0444	0.0791
2005-2009 (5)	2012	0.0706	0.0826	0.0592
2000-2005 (6)	2008	0.0713	0.0611	0.0815
2001-2006 (6)	2009	0.0407	0.0391	0.0425
2002-2007 (6)	2010	-0.0003	-0.0038	0.0034
2003-2008 (6)	2011	0.0758	0.0583	0.0931
2004-2009 (6)	2012	0.0597	0.0638	0.0565
2000-2006 (7)	2009	0.0786	0.0805	0.0768
2001-2007 (7)	2010	0.0229	0.0200	0.0262
2002-2008 (7)	2011	0.0742	0.0531	0.0952
2003-2009 (7)	2012	0.0729	0.0795	0.0669
2000-2007 (8)	2010	0.0595	0.0583	0.0610
2001-2008 (8)	2011	0.0925	0.0698	0.1154
2002-2009 (8)	2012	0.0733	0.0785	0.0688
2000-2008 (9)	2011	0.1249	0.1018	0.1480
2001-2009 (9)	2012	0.0910	0.0960	0.0868
2000-2009 (10)	2012	0.1224	0.1281	0.1173

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-24)
	2000	0.5343	0.5490	0.5195
	2001	0.4555	0.4653	0.4456
	2002	0.4881	0.4878	0.4885
	2003	0.5465	0.5629	0.5301
	2004	0.5588	0.5567	0.5608
	2005	0.6159	0.6278	0.6041
	2006	0.6275	0.6406	0.6143
	2007	0.7432	0.7466	0.7397
	2008	0.8121	0.8003	0.8236
	2009	0.9059	0.8923	0.9197
	2010	1.1338	1.1583	1.1095
	2011	1.2568	1.2665	1.2473
	2012	1.3019	1.2926	1.3114

**Medical
Linear Fit
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-24)
2000-2003 (4)	2006	0.5372	0.5451	0.5295
2001-2004 (4)	2007	0.6780	0.6754	0.6805
2002-2005 (4)	2008	0.7304	0.7450	0.7158
2003-2006 (4)	2009	0.7222	0.7339	0.7105
2004-2007 (4)	2010	0.8905	0.9051	0.8758
2005-2008 (4)	2011	1.0166	0.9844	1.0482
2006-2009 (4)	2012	1.1790	1.1339	1.2244
2000-2004 (5)	2007	0.5866	0.5808	0.5925
2001-2005 (5)	2008	0.7287	0.7371	0.7205
2002-2006 (5)	2009	0.7415	0.7604	0.7224
2003-2007 (5)	2010	0.8494	0.8526	0.8462
2004-2008 (5)	2011	0.9885	0.9774	0.9991
2005-2009 (5)	2012	1.1232	1.0859	1.1605
2000-2005 (6)	2008	0.6552	0.6584	0.6521
2001-2006 (6)	2009	0.7460	0.7596	0.7324
2002-2007 (6)	2010	0.8443	0.8549	0.8335
2003-2008 (6)	2011	0.9481	0.9339	0.9620
2004-2009 (6)	2012	1.0940	1.0724	1.1155
2000-2006 (7)	2009	0.6905	0.6990	0.6819
2001-2007 (7)	2010	0.8361	0.8442	0.8279
2002-2008 (7)	2011	0.9348	0.9294	0.9397
2003-2009 (7)	2012	1.0540	1.0312	1.0768
2000-2007 (8)	2010	0.7815	0.7865	0.7766
2001-2008 (8)	2011	0.9210	0.9161	0.9257
2002-2009 (8)	2012	1.0350	1.0204	1.0495
2000-2008 (9)	2011	0.8689	0.8631	0.8746
2001-2009 (9)	2012	1.0168	1.0035	1.0299
2000-2009 (10)	2012	0.9659	0.9526	0.9791

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)
2000-2003 (4)	2006	0.0903	0.0955	0.0848
2001-2004 (4)	2007	0.0652	0.0712	0.0592
2002-2005 (4)	2008	0.0817	0.0553	0.1079
2003-2006 (4)	2009	0.1837	0.1584	0.2092
2004-2007 (4)	2010	0.2433	0.2533	0.2337
2005-2008 (4)	2011	0.2402	0.2821	0.1991
2006-2009 (4)	2012	0.1229	0.1587	0.0870
2000-2004 (5)	2007	0.1566	0.1658	0.1473
2001-2005 (5)	2008	0.0834	0.0633	0.1031
2002-2006 (5)	2009	0.1644	0.1319	0.1973
2003-2007 (5)	2010	0.2844	0.3057	0.2634
2004-2008 (5)	2011	0.2684	0.2891	0.2482
2005-2009 (5)	2012	0.1787	0.2067	0.1509
2000-2005 (6)	2008	0.1569	0.1419	0.1715
2001-2006 (6)	2009	0.1599	0.1327	0.1873
2002-2007 (6)	2010	0.2895	0.3034	0.2760
2003-2008 (6)	2011	0.3087	0.3326	0.2853
2004-2009 (6)	2012	0.2079	0.2202	0.1959
2000-2006 (7)	2009	0.2154	0.1933	0.2378
2001-2007 (7)	2010	0.2977	0.3141	0.2817
2002-2008 (7)	2011	0.3221	0.3371	0.3076
2003-2009 (7)	2012	0.2479	0.2614	0.2346
2000-2007 (8)	2010	0.3523	0.3718	0.3329
2001-2008 (8)	2011	0.3358	0.3504	0.3216
2002-2009 (8)	2012	0.2669	0.2722	0.2619
2000-2008 (9)	2011	0.3879	0.4034	0.3727
2001-2009 (9)	2012	0.2851	0.2891	0.2815
2000-2009 (10)	2012	0.3360	0.3400	0.3323

**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)
2000-2003 (4)	2006	0.5368	0.5437	0.5300
2001-2004 (4)	2007	0.7078	0.7017	0.7137
2002-2005 (4)	2008	0.7611	0.7786	0.7436
2003-2006 (4)	2009	0.7380	0.7489	0.7272
2004-2007 (4)	2010	0.9380	0.9590	0.9172
2005-2008 (4)	2011	1.0893	1.0410	1.1392
2006-2009 (4)	2012	1.3076	1.2338	1.3861
2000-2004 (5)	2007	0.5901	0.5831	0.5974
2001-2005 (5)	2008	0.7668	0.7740	0.7595
2002-2006 (5)	2009	0.7712	0.7939	0.7485
2003-2007 (5)	2010	0.8857	0.8868	0.8848
2004-2008 (5)	2011	1.0621	1.0484	1.0752
2005-2009 (5)	2012	1.2262	1.1675	1.2876
2000-2005 (6)	2008	0.6651	0.6665	0.6639
2001-2006 (6)	2009	0.7851	0.7994	0.7708
2002-2007 (6)	2010	0.8919	0.9055	0.8782
2003-2008 (6)	2011	1.0083	0.9871	1.0298
2004-2009 (6)	2012	1.1978	1.1676	1.2285
2000-2006 (7)	2009	0.7061	0.7135	0.6987
2001-2007 (7)	2010	0.8919	0.9000	0.8836
2002-2008 (7)	2011	1.0040	0.9974	1.0101
2003-2009 (7)	2012	1.1432	1.1086	1.1790
2000-2007 (8)	2010	0.8089	0.8124	0.8054
2001-2008 (8)	2011	0.9973	0.9892	1.0052
2002-2009 (8)	2012	1.1316	1.1115	1.1517
2000-2008 (9)	2011	0.9131	0.9039	0.9222
2001-2009 (9)	2012	1.1193	1.0992	1.1396
2000-2009 (10)	2012	1.0322	1.0129	1.0519

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)
2000-2003 (4)	2006	0.0907	0.0969	0.0843
2001-2004 (4)	2007	0.0354	0.0449	0.0260
2002-2005 (4)	2008	0.0510	0.0217	0.0800
2003-2006 (4)	2009	0.1679	0.1434	0.1925
2004-2007 (4)	2010	0.1958	0.1993	0.1923
2005-2008 (4)	2011	0.1675	0.2255	0.1081
2006-2009 (4)	2012	-0.0057	0.0588	-0.0747
2000-2004 (5)	2007	0.1531	0.1635	0.1423
2001-2005 (5)	2008	0.0453	0.0263	0.0641
2002-2006 (5)	2009	0.1347	0.0984	0.1712
2003-2007 (5)	2010	0.2481	0.2715	0.2247
2004-2008 (5)	2011	0.1947	0.2181	0.1721
2005-2009 (5)	2012	0.0757	0.1251	0.0238
2000-2005 (6)	2008	0.1470	0.1338	0.1597
2001-2006 (6)	2009	0.1208	0.0929	0.1489
2002-2007 (6)	2010	0.2419	0.2528	0.2313
2003-2008 (6)	2011	0.2485	0.2794	0.2175
2004-2009 (6)	2012	0.1041	0.1250	0.0829
2000-2006 (7)	2009	0.1998	0.1788	0.2210
2001-2007 (7)	2010	0.2419	0.2583	0.2259
2002-2008 (7)	2011	0.2528	0.2691	0.2372
2003-2009 (7)	2012	0.1587	0.1840	0.1324
2000-2007 (8)	2010	0.3249	0.3459	0.3041
2001-2008 (8)	2011	0.2595	0.2773	0.2421
2002-2009 (8)	2012	0.1703	0.1811	0.1597
2000-2008 (9)	2011	0.3437	0.3626	0.3251
2001-2009 (9)	2012	0.1826	0.1934	0.1718
2000-2009 (10)	2012	0.2697	0.2797	0.2595