

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 0.4380 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 0.3697 (page 6.2) which understates our current estimate for 2007 by 0.0683 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	0.4499	0.4533	0.4464
	2001	0.3983	0.3970	0.3994
	2002	0.3735	0.3702	0.3769
	2003	0.3960	0.3968	0.3951
	2004	0.3852	0.3767	0.3938
	2005	0.4131	0.4128	0.4134
	2006	0.4242	0.4270	0.4211
	2007	0.4460	0.4380	0.4541
	2008	0.4447	0.4277	0.4617
	2009	0.4773	0.4772	0.4775
	2010	0.4867	0.4793	0.4943
	2011	0.5681	0.5309	0.6051
	2012	0.5924	0.5872	0.5974

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	0.3205	0.3160	0.3251
2001-2004 (4)	2007	0.3807	0.3697	0.3919
2002-2005 (4)	2008	0.4406	0.4376	0.4435
2003-2006 (4)	2009	0.4553	0.4603	0.4498
2004-2007 (4)	2010	0.5042	0.5028	0.5055
2005-2008 (4)	2011	0.4845	0.4514	0.5176
2006-2009 (4)	2012	0.5192	0.5056	0.5332
2000-2004 (5)	2007	0.3347	0.3221	0.3476
2001-2005 (5)	2008	0.4139	0.4098	0.4182
2002-2006 (5)	2009	0.4577	0.4615	0.4534
2003-2007 (5)	2010	0.4824	0.4766	0.4882
2004-2008 (5)	2011	0.4986	0.4800	0.5171
2005-2009 (5)	2012	0.5155	0.5013	0.5300
2000-2005 (6)	2008	0.3711	0.3639	0.3785
2001-2006 (6)	2009	0.4357	0.4372	0.4340
2002-2007 (6)	2010	0.4810	0.4768	0.4851
2003-2008 (6)	2011	0.4869	0.4686	0.5052
2004-2009 (6)	2012	0.5224	0.5143	0.5307
2000-2006 (7)	2009	0.3981	0.3961	0.3999
2001-2007 (7)	2010	0.4612	0.4568	0.4657
2002-2008 (7)	2011	0.4874	0.4724	0.5022
2003-2009 (7)	2012	0.5115	0.5013	0.5218
2000-2007 (8)	2010	0.4270	0.4206	0.4335
2001-2008 (8)	2011	0.4720	0.4584	0.4856
2002-2009 (8)	2012	0.5100	0.5010	0.5191
2000-2008 (9)	2011	0.4426	0.4286	0.4567
2001-2009 (9)	2012	0.4956	0.4867	0.5045
2000-2009 (10)	2012	0.4684	0.4584	0.4785

**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	0.1037	0.1110	0.0960
2001-2004 (4)	2007	0.0653	0.0683	0.0622
2002-2005 (4)	2008	0.0041	-0.0099	0.0182
2003-2006 (4)	2009	0.0221	0.0169	0.0277
2004-2007 (4)	2010	-0.0175	-0.0235	-0.0112
2005-2008 (4)	2011	0.0836	0.0795	0.0875
2006-2009 (4)	2012	0.0733	0.0816	0.0642
2000-2004 (5)	2007	0.1113	0.1159	0.1065
2001-2005 (5)	2008	0.0308	0.0180	0.0435
2002-2006 (5)	2009	0.0197	0.0157	0.0241
2003-2007 (5)	2010	0.0043	0.0027	0.0061
2004-2008 (5)	2011	0.0695	0.0509	0.0880
2005-2009 (5)	2012	0.0769	0.0859	0.0674
2000-2005 (6)	2008	0.0736	0.0638	0.0832
2001-2006 (6)	2009	0.0416	0.0400	0.0435
2002-2007 (6)	2010	0.0057	0.0025	0.0092
2003-2008 (6)	2011	0.0812	0.0623	0.0999
2004-2009 (6)	2012	0.0700	0.0729	0.0667
2000-2006 (7)	2009	0.0792	0.0811	0.0776
2001-2007 (7)	2010	0.0255	0.0225	0.0286
2002-2008 (7)	2011	0.0807	0.0585	0.1029
2003-2009 (7)	2012	0.0809	0.0859	0.0757
2000-2007 (8)	2010	0.0597	0.0587	0.0608
2001-2008 (8)	2011	0.0961	0.0725	0.1195
2002-2009 (8)	2012	0.0824	0.0862	0.0783
2000-2008 (9)	2011	0.1255	0.1023	0.1484
2001-2009 (9)	2012	0.0968	0.1005	0.0929
2000-2009 (10)	2012	0.1240	0.1288	0.1189

**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	0.3299	0.3265	0.3335
2001-2004 (4)	2007	0.3809	0.3700	0.3921
2002-2005 (4)	2008	0.4432	0.4399	0.4464
2003-2006 (4)	2009	0.4579	0.4635	0.4519
2004-2007 (4)	2010	0.5138	0.5139	0.5134
2005-2008 (4)	2011	0.4878	0.4523	0.5249
2006-2009 (4)	2012	0.5242	0.5081	0.5409
2000-2004 (5)	2007	0.3413	0.3305	0.3524
2001-2005 (5)	2008	0.4139	0.4095	0.4185
2002-2006 (5)	2009	0.4617	0.4660	0.4569
2003-2007 (5)	2010	0.4874	0.4815	0.4931
2004-2008 (5)	2011	0.5062	0.4864	0.5260
2005-2009 (5)	2012	0.5211	0.5044	0.5381
2000-2005 (6)	2008	0.3734	0.3668	0.3803
2001-2006 (6)	2009	0.4367	0.4381	0.4350
2002-2007 (6)	2010	0.4870	0.4828	0.4909
2003-2008 (6)	2011	0.4922	0.4724	0.5120
2004-2009 (6)	2012	0.5320	0.5231	0.5407
2000-2006 (7)	2009	0.3988	0.3968	0.4007
2001-2007 (7)	2010	0.4636	0.4591	0.4681
2002-2008 (7)	2011	0.4939	0.4777	0.5098
2003-2009 (7)	2012	0.5188	0.5073	0.5303
2000-2007 (8)	2010	0.4271	0.4208	0.4333
2001-2008 (8)	2011	0.4755	0.4611	0.4897
2002-2009 (8)	2012	0.5185	0.5084	0.5284
2000-2008 (9)	2011	0.4431	0.4292	0.4571
2001-2009 (9)	2012	0.5008	0.4910	0.5105
2000-2009 (10)	2012	0.4694	0.4589	0.4799

**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	0.1005	0.0876
2001-2004 (4)	2007	0.0651	0.0680	0.0620
2002-2005 (4)	2008	0.0015	-0.0122	0.0153
2003-2006 (4)	2009	0.0194	0.0137	0.0256
2004-2007 (4)	2010	-0.0271	-0.0346	-0.0191
2005-2008 (4)	2011	0.0803	0.0786	0.0802
2006-2009 (4)	2012	0.0682	0.0791	0.0565
2000-2004 (5)	2007	0.1047	0.1075	0.1017
2001-2005 (5)	2008	0.0308	0.0182	0.0432
2002-2006 (5)	2009	0.0156	0.0112	0.0206
2003-2007 (5)	2010	-0.0007	-0.0022	0.0012
2004-2008 (5)	2011	0.0619	0.0445	0.0791
2005-2009 (5)	2012	0.0713	0.0828	0.0593
2000-2005 (6)	2008	0.0713	0.0609	0.0814
2001-2006 (6)	2009	0.0406	0.0391	0.0425
2002-2007 (6)	2010	-0.0003	-0.0035	0.0034
2003-2008 (6)	2011	0.0759	0.0585	0.0931
2004-2009 (6)	2012	0.0604	0.0641	0.0567
2000-2006 (7)	2009	0.0785	0.0804	0.0768
2001-2007 (7)	2010	0.0231	0.0202	0.0262
2002-2008 (7)	2011	0.0742	0.0532	0.0953
2003-2009 (7)	2012	0.0736	0.0799	0.0671
2000-2007 (8)	2010	0.0596	0.0585	0.0610
2001-2008 (8)	2011	0.0926	0.0698	0.1154
2002-2009 (8)	2012	0.0739	0.0788	0.0690
2000-2008 (9)	2011	0.1250	0.1017	0.1480
2001-2009 (9)	2012	0.0916	0.0962	0.0869
2000-2009 (10)	2012	0.1230	0.1283	0.1175

**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	0.5323	0.5464	0.5182
	2001	0.4536	0.4629	0.4445
	2002	0.4860	0.4852	0.4869
	2003	0.5437	0.5594	0.5281
	2004	0.5560	0.5532	0.5588
	2005	0.6122	0.6230	0.6015
	2006	0.6233	0.6351	0.6114
	2007	0.7380	0.7399	0.7360
	2008	0.8049	0.7916	0.8182
	2009	0.8973	0.8818	0.9129
	2010	1.1206	1.1419	1.0992
	2011	1.2371	1.2440	1.2301
	2012	1.2626	1.2531	1.2722

**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	0.5339	0.5411	0.5269
2001-2004 (4)	2007	0.6740	0.6705	0.6774
2002-2005 (4)	2008	0.7254	0.7384	0.7124
2003-2006 (4)	2009	0.7166	0.7263	0.7066
2004-2007 (4)	2010	0.8831	0.8953	0.8706
2005-2008 (4)	2011	1.0064	0.9722	1.0404
2006-2009 (4)	2012	1.1659	1.1184	1.2136
2000-2004 (5)	2007	0.5831	0.5765	0.5897
2001-2005 (5)	2008	0.7239	0.7308	0.7169
2002-2006 (5)	2009	0.7358	0.7529	0.7185
2003-2007 (5)	2010	0.8426	0.8436	0.8414
2004-2008 (5)	2011	0.9787	0.9654	0.9918
2005-2009 (5)	2012	1.1110	1.0713	1.1508
2000-2005 (6)	2008	0.6508	0.6528	0.6488
2001-2006 (6)	2009	0.7406	0.7524	0.7285
2002-2007 (6)	2010	0.8376	0.8461	0.8288
2003-2008 (6)	2011	0.9391	0.9227	0.9554
2004-2009 (6)	2012	1.0823	1.0582	1.1064
2000-2006 (7)	2009	0.6853	0.6924	0.6782
2001-2007 (7)	2010	0.8296	0.8358	0.8232
2002-2008 (7)	2011	0.9261	0.9187	0.9335
2003-2009 (7)	2012	1.0431	1.0179	1.0684
2000-2007 (8)	2010	0.7755	0.7786	0.7722
2001-2008 (8)	2011	0.9128	0.9059	0.9196
2002-2009 (8)	2012	1.0246	1.0076	1.0416
2000-2008 (9)	2011	0.8612	0.8534	0.8689
2001-2009 (9)	2012	1.0069	0.9913	1.0223
2000-2009 (10)	2012	0.9565	0.9410	0.9719



**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	0.0894	0.0940	0.0845
2001-2004 (4)	2007	0.0640	0.0694	0.0586
2002-2005 (4)	2008	0.0795	0.0532	0.1059
2003-2006 (4)	2009	0.1808	0.1555	0.2063
2004-2007 (4)	2010	0.2375	0.2466	0.2286
2005-2008 (4)	2011	0.2307	0.2718	0.1897
2006-2009 (4)	2012	0.0967	0.1347	0.0586
2000-2004 (5)	2007	0.1549	0.1634	0.1463
2001-2005 (5)	2008	0.0810	0.0608	0.1013
2002-2006 (5)	2009	0.1615	0.1289	0.1944
2003-2007 (5)	2010	0.2780	0.2983	0.2578
2004-2008 (5)	2011	0.2584	0.2786	0.2383
2005-2009 (5)	2012	0.1516	0.1818	0.1214
2000-2005 (6)	2008	0.1541	0.1388	0.1694
2001-2006 (6)	2009	0.1567	0.1294	0.1844
2002-2007 (6)	2010	0.2830	0.2958	0.2704
2003-2008 (6)	2011	0.2980	0.3213	0.2747
2004-2009 (6)	2012	0.1803	0.1949	0.1658
2000-2006 (7)	2009	0.2120	0.1894	0.2347
2001-2007 (7)	2010	0.2910	0.3061	0.2760
2002-2008 (7)	2011	0.3110	0.3254	0.2966
2003-2009 (7)	2012	0.2195	0.2352	0.2039
2000-2007 (8)	2010	0.3451	0.3633	0.3270
2001-2008 (8)	2011	0.3243	0.3381	0.3105
2002-2009 (8)	2012	0.2380	0.2455	0.2306
2000-2008 (9)	2011	0.3759	0.3906	0.3612
2001-2009 (9)	2012	0.2557	0.2618	0.2499
2000-2009 (10)	2012	0.3061	0.3121	0.3003

**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	0.5335	0.5397	0.5273
2001-2004 (4)	2007	0.7034	0.6963	0.7102
2002-2005 (4)	2008	0.7555	0.7712	0.7398
2003-2006 (4)	2009	0.7319	0.7407	0.7230
2004-2007 (4)	2010	0.9294	0.9475	0.9112
2005-2008 (4)	2011	1.0772	1.0269	1.1297
2006-2009 (4)	2012	1.2910	1.2150	1.3720
2000-2004 (5)	2007	0.5865	0.5786	0.5945
2001-2005 (5)	2008	0.7613	0.7670	0.7554
2002-2006 (5)	2009	0.7648	0.7854	0.7443
2003-2007 (5)	2010	0.8781	0.8767	0.8794
2004-2008 (5)	2011	1.0504	1.0341	1.0664
2005-2009 (5)	2012	1.2112	1.1502	1.2753
2000-2005 (6)	2008	0.6605	0.6606	0.6603
2001-2006 (6)	2009	0.7789	0.7911	0.7663
2002-2007 (6)	2010	0.8842	0.8952	0.8729
2003-2008 (6)	2011	0.9978	0.9741	1.0220
2004-2009 (6)	2012	1.1833	1.1502	1.2170
2000-2006 (7)	2009	0.7006	0.7064	0.6947
2001-2007 (7)	2010	0.8843	0.8901	0.8781
2002-2008 (7)	2011	0.9938	0.9845	1.0027
2003-2009 (7)	2012	1.1300	1.0926	1.1686
2000-2007 (8)	2010	0.8021	0.8036	0.8005
2001-2008 (8)	2011	0.9874	0.9768	0.9978
2002-2009 (8)	2012	1.1188	1.0957	1.1419
2000-2008 (9)	2011	0.9042	0.8928	0.9155
2001-2009 (9)	2012	1.1070	1.0841	1.1300
2000-2009 (10)	2012	1.0211	0.9993	1.0432

**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	0.0898	0.0954	0.0841
2001-2004 (4)	2007	0.0346	0.0436	0.0258
2002-2005 (4)	2008	0.0494	0.0204	0.0784
2003-2006 (4)	2009	0.1654	0.1411	0.1899
2004-2007 (4)	2010	0.1912	0.1944	0.1880
2005-2008 (4)	2011	0.1599	0.2171	0.1004
2006-2009 (4)	2012	-0.0284	0.0381	-0.0998
2000-2004 (5)	2007	0.1515	0.1613	0.1415
2001-2005 (5)	2008	0.0436	0.0246	0.0628
2002-2006 (5)	2009	0.1325	0.0964	0.1686
2003-2007 (5)	2010	0.2425	0.2652	0.2198
2004-2008 (5)	2011	0.1867	0.2099	0.1637
2005-2009 (5)	2012	0.0514	0.1029	-0.0031
2000-2005 (6)	2008	0.1444	0.1310	0.1579
2001-2006 (6)	2009	0.1184	0.0907	0.1466
2002-2007 (6)	2010	0.2364	0.2467	0.2263
2003-2008 (6)	2011	0.2393	0.2699	0.2081
2004-2009 (6)	2012	0.0793	0.1029	0.0552
2000-2006 (7)	2009	0.1967	0.1754	0.2182
2001-2007 (7)	2010	0.2363	0.2518	0.2211
2002-2008 (7)	2011	0.2433	0.2595	0.2274
2003-2009 (7)	2012	0.1326	0.1605	0.1036
2000-2007 (8)	2010	0.3185	0.3383	0.2987
2001-2008 (8)	2011	0.2497	0.2672	0.2323
2002-2009 (8)	2012	0.1438	0.1574	0.1303
2000-2008 (9)	2011	0.3329	0.3512	0.3146
2001-2009 (9)	2012	0.1556	0.1690	0.1422
2000-2009 (10)	2012	0.2415	0.2538	0.2290