

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 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 0.4515 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 0.4094 (page 6.2) which understates our current estimate for 2007 by 0.0421 points (page 6.3).

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

INDEMNITY	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-24)
	2000	0.4722	0.4724	0.4720
	2001	0.4152	0.4090	0.4214
	2002	0.4279	0.4263	0.4295
	2003	0.4165	0.4113	0.4216
	2004	0.4226	0.4104	0.4350
	2005	0.4402	0.4314	0.4489
	2006	0.4447	0.4396	0.4498
	2007	0.4675	0.4515	0.4834
	2008	0.4690	0.4439	0.4941
	2009	0.5081	0.5120	0.5040
	2010	0.5133	0.5020	0.5246
	2011	0.5983	0.5557	0.6409
	2012	0.6224	0.6090	0.6360

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-24)
2000-2003 (4)	2006	0.3635	0.3551	0.3717
2001-2004 (4)	2007	0.4254	0.4094	0.4417
2002-2005 (4)	2008	0.4462	0.4263	0.4660
2003-2006 (4)	2009	0.4770	0.4708	0.4832
2004-2007 (4)	2010	0.5064	0.4924	0.5200
2005-2008 (4)	2011	0.5045	0.4638	0.5452
2006-2009 (4)	2012	0.5586	0.5561	0.5608
2000-2004 (5)	2007	0.3819	0.3650	0.3990
2001-2005 (5)	2008	0.4468	0.4321	0.4615
2002-2006 (5)	2009	0.4590	0.4472	0.4709
2003-2007 (5)	2010	0.5004	0.4836	0.5169
2004-2008 (5)	2011	0.5089	0.4789	0.5386
2005-2009 (5)	2012	0.5460	0.5384	0.5533
2000-2005 (6)	2008	0.4090	0.3929	0.4251
2001-2006 (6)	2009	0.4578	0.4476	0.4679
2002-2007 (6)	2010	0.4837	0.4649	0.5025
2003-2008 (6)	2011	0.5065	0.4776	0.5354
2004-2009 (6)	2012	0.5430	0.5357	0.5500
2000-2006 (7)	2009	0.4261	0.4137	0.4384
2001-2007 (7)	2010	0.4794	0.4630	0.4958
2002-2008 (7)	2011	0.4942	0.4654	0.5229
2003-2009 (7)	2012	0.5373	0.5263	0.5481
2000-2007 (8)	2010	0.4505	0.4331	0.4679
2001-2008 (8)	2011	0.4903	0.4648	0.5158
2002-2009 (8)	2012	0.5241	0.5100	0.5380
2000-2008 (9)	2011	0.4653	0.4399	0.4906
2001-2009 (9)	2012	0.5180	0.5043	0.5315
2000-2009 (10)	2012	0.4938	0.4786	0.5089

**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	0.0812	0.0845	0.0781
2001-2004 (4)	2007	0.0421	0.0421	0.0417
2002-2005 (4)	2008	0.0229	0.0176	0.0281
2003-2006 (4)	2009	0.0311	0.0412	0.0209
2004-2007 (4)	2010	0.0069	0.0096	0.0046
2005-2008 (4)	2011	0.0938	0.0919	0.0957
2006-2009 (4)	2012	0.0638	0.0529	0.0752
2000-2004 (5)	2007	0.0856	0.0865	0.0844
2001-2005 (5)	2008	0.0222	0.0118	0.0326
2002-2006 (5)	2009	0.0491	0.0649	0.0331
2003-2007 (5)	2010	0.0130	0.0184	0.0077
2004-2008 (5)	2011	0.0895	0.0768	0.1023
2005-2009 (5)	2012	0.0764	0.0706	0.0827
2000-2005 (6)	2008	0.0600	0.0510	0.0690
2001-2006 (6)	2009	0.0503	0.0644	0.0361
2002-2007 (6)	2010	0.0296	0.0371	0.0221
2003-2008 (6)	2011	0.0918	0.0781	0.1055
2004-2009 (6)	2012	0.0794	0.0733	0.0860
2000-2006 (7)	2009	0.0820	0.0983	0.0656
2001-2007 (7)	2010	0.0339	0.0390	0.0288
2002-2008 (7)	2011	0.1041	0.0903	0.1180
2003-2009 (7)	2012	0.0851	0.0827	0.0879
2000-2007 (8)	2010	0.0628	0.0689	0.0567
2001-2008 (8)	2011	0.1080	0.0909	0.1251
2002-2009 (8)	2012	0.0983	0.0990	0.0980
2000-2008 (9)	2011	0.1330	0.1158	0.1503
2001-2009 (9)	2012	0.1044	0.1047	0.1045
2000-2009 (10)	2012	0.1286	0.1304	0.1271

**Indemnity  
Exponential Fit  
Trended Severity Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-24)
2000-2003 (4)	2006	0.3699	0.3626	0.3773
2001-2004 (4)	2007	0.4255	0.4095	0.4418
2002-2005 (4)	2008	0.4463	0.4261	0.4668
2003-2006 (4)	2009	0.4794	0.4733	0.4856
2004-2007 (4)	2010	0.5106	0.4967	0.5239
2005-2008 (4)	2011	0.5071	0.4644	0.5510
2006-2009 (4)	2012	0.5656	0.5619	0.5680
2000-2004 (5)	2007	0.3858	0.3705	0.4015
2001-2005 (5)	2008	0.4471	0.4322	0.4622
2002-2006 (5)	2009	0.4597	0.4474	0.4720
2003-2007 (5)	2010	0.5042	0.4869	0.5215
2004-2008 (5)	2011	0.5129	0.4815	0.5442
2005-2009 (5)	2012	0.5515	0.5424	0.5595
2000-2005 (6)	2008	0.4105	0.3953	0.4259
2001-2006 (6)	2009	0.4585	0.4481	0.4690
2002-2007 (6)	2010	0.4854	0.4658	0.5051
2003-2008 (6)	2011	0.5108	0.4802	0.5416
2004-2009 (6)	2012	0.5496	0.5414	0.5565
2000-2006 (7)	2009	0.4268	0.4148	0.4389
2001-2007 (7)	2010	0.4810	0.4640	0.4979
2002-2008 (7)	2011	0.4967	0.4666	0.5271
2003-2009 (7)	2012	0.5437	0.5311	0.5554
2000-2007 (8)	2010	0.4507	0.4336	0.4679
2001-2008 (8)	2011	0.4926	0.4660	0.5193
2002-2009 (8)	2012	0.5282	0.5122	0.5436
2000-2008 (9)	2011	0.4656	0.4404	0.4911
2001-2009 (9)	2012	0.5216	0.5063	0.5363
2000-2009 (10)	2012	0.4944	0.4780	0.5103

**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	0.0748	0.0770	0.0725
2001-2004 (4)	2007	0.0420	0.0420	0.0416
2002-2005 (4)	2008	0.0227	0.0178	0.0273
2003-2006 (4)	2009	0.0287	0.0387	0.0184
2004-2007 (4)	2010	0.0027	0.0053	0.0007
2005-2008 (4)	2011	0.0912	0.0913	0.0899
2006-2009 (4)	2012	0.0568	0.0471	0.0680
2000-2004 (5)	2007	0.0817	0.0810	0.0819
2001-2005 (5)	2008	0.0219	0.0117	0.0319
2002-2006 (5)	2009	0.0484	0.0646	0.0320
2003-2007 (5)	2010	0.0091	0.0151	0.0031
2004-2008 (5)	2011	0.0854	0.0742	0.0967
2005-2009 (5)	2012	0.0709	0.0666	0.0765
2000-2005 (6)	2008	0.0585	0.0486	0.0682
2001-2006 (6)	2009	0.0496	0.0639	0.0350
2002-2007 (6)	2010	0.0279	0.0362	0.0195
2003-2008 (6)	2011	0.0875	0.0755	0.0993
2004-2009 (6)	2012	0.0728	0.0676	0.0795
2000-2006 (7)	2009	0.0813	0.0972	0.0651
2001-2007 (7)	2010	0.0323	0.0380	0.0267
2002-2008 (7)	2011	0.1016	0.0891	0.1138
2003-2009 (7)	2012	0.0787	0.0779	0.0806
2000-2007 (8)	2010	0.0626	0.0684	0.0567
2001-2008 (8)	2011	0.1057	0.0897	0.1216
2002-2009 (8)	2012	0.0942	0.0968	0.0924
2000-2008 (9)	2011	0.1327	0.1153	0.1498
2001-2009 (9)	2012	0.1008	0.1027	0.0997
2000-2009 (10)	2012	0.1280	0.1310	0.1257

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

MEDICAL	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-24)
	2000	0.6627	0.6606	0.6648
	2001	0.5591	0.5561	0.5622
	2002	0.6904	0.6897	0.6912
	2003	0.6815	0.6823	0.6807
	2004	0.7274	0.7164	0.7384
	2005	0.7791	0.7701	0.7881
	2006	0.7755	0.7720	0.7790
	2007	0.9331	0.9252	0.9410
	2008	1.0212	0.9805	1.0620
	2009	1.1750	1.1802	1.1696
	2010	1.4515	1.4637	1.4390
	2011	1.5840	1.5683	1.6000
	2012	1.6314	1.5784	1.6845

**Medical  
Linear Fit  
Trended Severity Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-24)
2000-2003 (4)	2006	0.7329	0.7366	0.7292
2001-2004 (4)	2007	0.8878	0.8742	0.9013
2002-2005 (4)	2008	0.8600	0.8385	0.8814
2003-2006 (4)	2009	0.8910	0.8805	0.9016
2004-2007 (4)	2010	1.0799	1.0787	1.0810
2005-2008 (4)	2011	1.2750	1.2149	1.3352
2006-2009 (4)	2012	1.5552	1.5404	1.5697
2000-2004 (5)	2007	0.7901	0.7799	0.8003
2001-2005 (5)	2008	0.9260	0.9103	0.9416
2002-2006 (5)	2009	0.8647	0.8523	0.8770
2003-2007 (5)	2010	1.0550	1.0439	1.0660
2004-2008 (5)	2011	1.2181	1.1745	1.2618
2005-2009 (5)	2012	1.4555	1.4400	1.4709
2000-2005 (6)	2008	0.8528	0.8396	0.8659
2001-2006 (6)	2009	0.9212	0.9107	0.9317
2002-2007 (6)	2010	1.0076	0.9950	1.0202
2003-2008 (6)	2011	1.1829	1.1408	1.2252
2004-2009 (6)	2012	1.3925	1.3784	1.4064
2000-2006 (7)	2009	0.8713	0.8615	0.8810
2001-2007 (7)	2010	1.0330	1.0216	1.0442
2002-2008 (7)	2011	1.1320	1.0938	1.1701
2003-2009 (7)	2012	1.3466	1.3275	1.3656
2000-2007 (8)	2010	0.9804	0.9697	0.9911
2001-2008 (8)	2011	1.1409	1.1075	1.1744
2002-2009 (8)	2012	1.2893	1.2692	1.3092
2000-2008 (9)	2011	1.0883	1.0582	1.1184
2001-2009 (9)	2012	1.2833	1.2642	1.3023
2000-2009 (10)	2012	1.2274	1.2091	1.2457



**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	0.0426	0.0354	0.0498
2001-2004 (4)	2007	0.0453	0.0510	0.0397
2002-2005 (4)	2008	0.1612	0.1420	0.1806
2003-2006 (4)	2009	0.2840	0.2997	0.2680
2004-2007 (4)	2010	0.3717	0.3850	0.3580
2005-2008 (4)	2011	0.3090	0.3534	0.2648
2006-2009 (4)	2012	0.0762	0.0380	0.1148
2000-2004 (5)	2007	0.1430	0.1453	0.1407
2001-2005 (5)	2008	0.0952	0.0702	0.1204
2002-2006 (5)	2009	0.3103	0.3279	0.2926
2003-2007 (5)	2010	0.3965	0.4198	0.3730
2004-2008 (5)	2011	0.3659	0.3938	0.3383
2005-2009 (5)	2012	0.1759	0.1385	0.2136
2000-2005 (6)	2008	0.1684	0.1409	0.1961
2001-2006 (6)	2009	0.2538	0.2695	0.2379
2002-2007 (6)	2010	0.4439	0.4687	0.4188
2003-2008 (6)	2011	0.4011	0.4275	0.3748
2004-2009 (6)	2012	0.2389	0.2000	0.2781
2000-2006 (7)	2009	0.3037	0.3187	0.2886
2001-2007 (7)	2010	0.4185	0.4421	0.3948
2002-2008 (7)	2011	0.4520	0.4745	0.4299
2003-2009 (7)	2012	0.2848	0.2509	0.3189
2000-2007 (8)	2010	0.4711	0.4940	0.4479
2001-2008 (8)	2011	0.4431	0.4608	0.4256
2002-2009 (8)	2012	0.3421	0.3092	0.3753
2000-2008 (9)	2011	0.4957	0.5101	0.4816
2001-2009 (9)	2012	0.3481	0.3142	0.3822
2000-2009 (10)	2012	0.4040	0.3693	0.4388

**Medical  
Exponential Fit  
Trended Severity Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-24)
2000-2003 (4)	2006	0.7379	0.7421	0.7337
2001-2004 (4)	2007	0.9380	0.9218	0.9540
2002-2005 (4)	2008	0.8711	0.8468	0.8957
2003-2006 (4)	2009	0.9084	0.8961	0.9208
2004-2007 (4)	2010	1.1177	1.1203	1.1153
2005-2008 (4)	2011	1.3641	1.2881	1.4413
2006-2009 (4)	2012	1.7616	1.7359	1.7854
2000-2004 (5)	2007	0.8018	0.7911	0.8125
2001-2005 (5)	2008	0.9775	0.9584	0.9966
2002-2006 (5)	2009	0.8763	0.8623	0.8903
2003-2007 (5)	2010	1.0956	1.0824	1.1088
2004-2008 (5)	2011	1.2909	1.2403	1.3414
2005-2009 (5)	2012	1.6005	1.5779	1.6215
2000-2005 (6)	2008	0.8723	0.8578	0.8868
2001-2006 (6)	2009	0.9653	0.9529	0.9777
2002-2007 (6)	2010	1.0348	1.0197	1.0498
2003-2008 (6)	2011	1.2529	1.2016	1.3046
2004-2009 (6)	2012	1.5147	1.4973	1.5309
2000-2006 (7)	2009	0.8936	0.8827	0.9044
2001-2007 (7)	2010	1.0938	1.0800	1.1075
2002-2008 (7)	2011	1.1829	1.1379	1.2282
2003-2009 (7)	2012	1.4596	1.4323	1.4859
2000-2007 (8)	2010	1.0154	1.0030	1.0278
2001-2008 (8)	2011	1.2244	1.1837	1.2650
2002-2009 (8)	2012	1.3759	1.3478	1.4032
2000-2008 (9)	2011	1.1422	1.1076	1.1768
2001-2009 (9)	2012	1.4011	1.3742	1.4271
2000-2009 (10)	2012	1.3094	1.2849	1.3333

**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	0.0376	0.0299	0.0453
2001-2004 (4)	2007	-0.0049	0.0034	-0.0130
2002-2005 (4)	2008	0.1501	0.1337	0.1663
2003-2006 (4)	2009	0.2666	0.2841	0.2488
2004-2007 (4)	2010	0.3338	0.3434	0.3237
2005-2008 (4)	2011	0.2199	0.2802	0.1587
2006-2009 (4)	2012	-0.1302	-0.1575	-0.1009
2000-2004 (5)	2007	0.1313	0.1341	0.1285
2001-2005 (5)	2008	0.0437	0.0221	0.0654
2002-2006 (5)	2009	0.2987	0.3179	0.2793
2003-2007 (5)	2010	0.3559	0.3813	0.3302
2004-2008 (5)	2011	0.2931	0.3280	0.2586
2005-2009 (5)	2012	0.0309	0.0005	0.0630
2000-2005 (6)	2008	0.1489	0.1227	0.1752
2001-2006 (6)	2009	0.2097	0.2273	0.1919
2002-2007 (6)	2010	0.4167	0.4440	0.3892
2003-2008 (6)	2011	0.3311	0.3667	0.2954
2004-2009 (6)	2012	0.1167	0.0811	0.1536
2000-2006 (7)	2009	0.2814	0.2975	0.2652
2001-2007 (7)	2010	0.3577	0.3837	0.3315
2002-2008 (7)	2011	0.4011	0.4304	0.3718
2003-2009 (7)	2012	0.1718	0.1461	0.1986
2000-2007 (8)	2010	0.4361	0.4607	0.4112
2001-2008 (8)	2011	0.3596	0.3846	0.3350
2002-2009 (8)	2012	0.2555	0.2306	0.2813
2000-2008 (9)	2011	0.4418	0.4607	0.4232
2001-2009 (9)	2012	0.2303	0.2042	0.2574
2000-2009 (10)	2012	0.3220	0.2935	0.3512