

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	0.6586	0.6550	0.6622
	2001	0.5557	0.5512	0.5600
	2002	0.6854	0.6828	0.6881
	2003	0.6763	0.6751	0.6775
	2004	0.7219	0.7087	0.7350
	2005	0.7727	0.7613	0.7841
	2006	0.7685	0.7622	0.7745
	2007	0.9240	0.9128	0.9352
	2008	1.0100	0.9662	1.0539
	2009	1.1604	1.1612	1.1596
	2010	1.4299	1.4363	1.4233
	2011	1.5543	1.5330	1.5756
	2012	1.5756	1.5219	1.6296

**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	0.7263	0.7274	0.7253
2001-2004 (4)	2007	0.8801	0.8636	0.8966
2002-2005 (4)	2008	0.8525	0.8281	0.8767
2003-2006 (4)	2009	0.8822	0.8681	0.8958
2004-2007 (4)	2010	1.0677	1.0622	1.0732
2005-2008 (4)	2011	1.2591	1.1950	1.3235
2006-2009 (4)	2012	1.5335	1.5133	1.5541
2000-2004 (5)	2007	0.7832	0.7702	0.7961
2001-2005 (5)	2008	0.9177	0.8989	0.9365
2002-2006 (5)	2009	0.8563	0.8405	0.8715
2003-2007 (5)	2010	1.0437	1.0285	1.0587
2004-2008 (5)	2011	1.2032	1.1555	1.2510
2005-2009 (5)	2012	1.4356	1.4146	1.4567
2000-2005 (6)	2008	0.8450	0.8289	0.8611
2001-2006 (6)	2009	0.9123	0.8983	0.9260
2002-2007 (6)	2010	0.9971	0.9805	1.0133
2003-2008 (6)	2011	1.1690	1.1228	1.2153
2004-2009 (6)	2012	1.3738	1.3545	1.3931
2000-2006 (7)	2009	0.8628	0.8497	0.8756
2001-2007 (7)	2010	1.0223	1.0070	1.0374
2002-2008 (7)	2011	1.1189	1.0768	1.1610
2003-2009 (7)	2012	1.3291	1.3050	1.3532
2000-2007 (8)	2010	0.9703	0.9557	0.9847
2001-2008 (8)	2011	1.1280	1.0906	1.1655
2002-2009 (8)	2012	1.2729	1.2480	1.2977
2000-2008 (9)	2011	1.0761	1.0421	1.1101
2001-2009 (9)	2012	1.2674	1.2435	1.2912
2000-2009 (10)	2012	1.2123	1.1893	1.2353

**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	0.0422	0.0348	0.0493
2001-2004 (4)	2007	0.0439	0.0492	0.0386
2002-2005 (4)	2008	0.1576	0.1381	0.1773
2003-2006 (4)	2009	0.2782	0.2931	0.2638
2004-2007 (4)	2010	0.3622	0.3741	0.3502
2005-2008 (4)	2011	0.2952	0.3380	0.2521
2006-2009 (4)	2012	0.0421	0.0086	0.0755
2000-2004 (5)	2007	0.1408	0.1426	0.1391
2001-2005 (5)	2008	0.0924	0.0673	0.1174
2002-2006 (5)	2009	0.3041	0.3207	0.2881
2003-2007 (5)	2010	0.3862	0.4078	0.3646
2004-2008 (5)	2011	0.3511	0.3775	0.3246
2005-2009 (5)	2012	0.1400	0.1073	0.1729
2000-2005 (6)	2008	0.1650	0.1373	0.1928
2001-2006 (6)	2009	0.2481	0.2629	0.2336
2002-2007 (6)	2010	0.4328	0.4558	0.4100
2003-2008 (6)	2011	0.3853	0.4102	0.3603
2004-2009 (6)	2012	0.2018	0.1674	0.2365
2000-2006 (7)	2009	0.2976	0.3115	0.2840
2001-2007 (7)	2010	0.4077	0.4293	0.3859
2002-2008 (7)	2011	0.4354	0.4562	0.4146
2003-2009 (7)	2012	0.2465	0.2169	0.2764
2000-2007 (8)	2010	0.4596	0.4806	0.4386
2001-2008 (8)	2011	0.4263	0.4424	0.4101
2002-2009 (8)	2012	0.3027	0.2739	0.3319
2000-2008 (9)	2011	0.4782	0.4909	0.4655
2001-2009 (9)	2012	0.3082	0.2784	0.3384
2000-2009 (10)	2012	0.3633	0.3326	0.3943

**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	0.7310	0.7326	0.7296
2001-2004 (4)	2007	0.9293	0.9099	0.9488
2002-2005 (4)	2008	0.8633	0.8360	0.8908
2003-2006 (4)	2009	0.8991	0.8831	0.9146
2004-2007 (4)	2010	1.1043	1.1021	1.1066
2005-2008 (4)	2011	1.3457	1.2655	1.4272
2006-2009 (4)	2012	1.7340	1.7023	1.7650
2000-2004 (5)	2007	0.7945	0.7809	0.8081
2001-2005 (5)	2008	0.9681	0.9456	0.9908
2002-2006 (5)	2009	0.8675	0.8500	0.8846
2003-2007 (5)	2010	1.0832	1.0656	1.1007
2004-2008 (5)	2011	1.2738	1.2188	1.3288
2005-2009 (5)	2012	1.5761	1.5476	1.6036
2000-2005 (6)	2008	0.8640	0.8463	0.8817
2001-2006 (6)	2009	0.9553	0.9391	0.9713
2002-2007 (6)	2010	1.0234	1.0042	1.0424
2003-2008 (6)	2011	1.2371	1.1814	1.2931
2004-2009 (6)	2012	1.4922	1.4689	1.5145
2000-2006 (7)	2009	0.8844	0.8700	0.8986
2001-2007 (7)	2010	1.0816	1.0634	1.0997
2002-2008 (7)	2011	1.1684	1.1191	1.2179
2003-2009 (7)	2012	1.4388	1.4059	1.4710
2000-2007 (8)	2010	1.0042	0.9876	1.0207
2001-2008 (8)	2011	1.2093	1.1642	1.2545
2002-2009 (8)	2012	1.3569	1.3235	1.3897
2000-2008 (9)	2011	1.1285	1.0895	1.1673
2001-2009 (9)	2012	1.3819	1.3496	1.4137
2000-2009 (10)	2012	1.2919	1.2621	1.3211

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	0.0375	0.0296	0.0449
2001-2004 (4)	2007	-0.0053	0.0029	-0.0136
2002-2005 (4)	2008	0.1467	0.1302	0.1631
2003-2006 (4)	2009	0.2613	0.2781	0.2450
2004-2007 (4)	2010	0.3256	0.3342	0.3167
2005-2008 (4)	2011	0.2086	0.2675	0.1484
2006-2009 (4)	2012	-0.1584	-0.1804	-0.1354
2000-2004 (5)	2007	0.1295	0.1319	0.1271
2001-2005 (5)	2008	0.0419	0.0206	0.0631
2002-2006 (5)	2009	0.2929	0.3112	0.2750
2003-2007 (5)	2010	0.3467	0.3707	0.3226
2004-2008 (5)	2011	0.2805	0.3142	0.2468
2005-2009 (5)	2012	-0.0005	-0.0257	0.0260
2000-2005 (6)	2008	0.1460	0.1199	0.1722
2001-2006 (6)	2009	0.2051	0.2221	0.1883
2002-2007 (6)	2010	0.4065	0.4321	0.3809
2003-2008 (6)	2011	0.3172	0.3516	0.2825
2004-2009 (6)	2012	0.0834	0.0530	0.1151
2000-2006 (7)	2009	0.2760	0.2912	0.2610
2001-2007 (7)	2010	0.3483	0.3729	0.3236
2002-2008 (7)	2011	0.3859	0.4139	0.3577
2003-2009 (7)	2012	0.1368	0.1160	0.1586
2000-2007 (8)	2010	0.4257	0.4487	0.4026
2001-2008 (8)	2011	0.3450	0.3688	0.3211
2002-2009 (8)	2012	0.2187	0.1984	0.2399
2000-2008 (9)	2011	0.4258	0.4435	0.4083
2001-2009 (9)	2012	0.1937	0.1723	0.2159
2000-2009 (10)	2012	0.2837	0.2598	0.3085