

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 1997 through 2009, 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 (1/1/2010 to 12/1/2012).

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-21st and the average of the incurred and paid-to-21st methods.

As an illustration, the incurred loss development approach generated an indemnity severity ratio of 0.6804 for policy year 2004 (page 6.1). Fitting the severity ratios for policy years 1998 to 2001 using a straight line and projecting that to 2004 yielded a severity ratio of 0.9975 (page 6.2) which overstates our current estimate for 2004 by 0.3171 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-21)
	1997	0.5625	0.5673	0.5578
	1998	0.5772	0.5725	0.5821
	1999	0.6223	0.6113	0.6332
	2000	0.8409	0.8399	0.8417
	2001	0.7359	0.7260	0.7457
	2002	0.7211	0.7079	0.7341
	2003	0.7346	0.7209	0.7481
	2004	0.7063	0.6804	0.7324
	2005	0.7436	0.7462	0.7412
	2006	0.7334	0.7262	0.7406
	2007	0.8206	0.8361	0.8052
	2008	0.7941	0.7729	0.8152
	2009	0.8325	0.8680	0.7970

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-21)
1997-2000 (4)	2003	1.0469	1.0332	1.0600
1998-2001 (4)	2004	1.0067	0.9975	1.0154
1999-2002 (4)	2005	0.8162	0.8004	0.8317
2000-2003 (4)	2006	0.6080	0.5799	0.6358
2001-2004 (4)	2007	0.6906	0.6531	0.7284
2002-2005 (4)	2008	0.7440	0.7473	0.7415
2003-2006 (4)	2009	0.7446	0.7552	0.7344
1997-2001 (5)	2004	0.9730	0.9558	0.9898
1998-2002 (5)	2005	0.9002	0.8843	0.9156
1999-2003 (5)	2006	0.7834	0.7648	0.8017
2000-2004 (5)	2007	0.6125	0.5730	0.6523
2001-2005 (5)	2008	0.7286	0.7227	0.7350
2002-2006 (5)	2009	0.7446	0.7473	0.7423
1997-2002 (6)	2005	0.9104	0.8896	0.9308
1998-2003 (6)	2006	0.8591	0.8407	0.8771
1999-2004 (6)	2007	0.7404	0.7097	0.7712
2000-2005 (6)	2008	0.6588	0.6438	0.6742
2001-2006 (6)	2009	0.7333	0.7298	0.7372
1997-2003 (7)	2006	0.8816	0.8593	0.9034
1998-2004 (7)	2007	0.8109	0.7822	0.8396
1999-2005 (7)	2008	0.7493	0.7362	0.7626
2000-2006 (7)	2009	0.6761	0.6650	0.6875
1997-2004 (8)	2007	0.8412	0.8106	0.8717
1998-2005 (8)	2008	0.8070	0.7924	0.8217
1999-2006 (8)	2009	0.7465	0.7363	0.7569
1997-2005 (9)	2008	0.8357	0.8172	0.8543
1998-2006 (9)	2009	0.7966	0.7846	0.8087
1997-2006 (10)	2009	0.8246	0.8088	0.8403

**Indemnity**  
**Linear Fit**  
**Differences: (Actual - Trended)**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-21)
1997-2000 (4)	2003	-0.3123	-0.3123	-0.3119
1998-2001 (4)	2004	-0.3004	-0.3171	-0.2830
1999-2002 (4)	2005	-0.0726	-0.0542	-0.0905
2000-2003 (4)	2006	0.1254	0.1463	0.1048
2001-2004 (4)	2007	0.1300	0.1830	0.0768
2002-2005 (4)	2008	0.0501	0.0256	0.0737
2003-2006 (4)	2009	0.0879	0.1128	0.0626
1997-2001 (5)	2004	-0.2667	-0.2754	-0.2574
1998-2002 (5)	2005	-0.1566	-0.1381	-0.1744
1999-2003 (5)	2006	-0.0500	-0.0386	-0.0611
2000-2004 (5)	2007	0.2081	0.2631	0.1529
2001-2005 (5)	2008	0.0655	0.0502	0.0802
2002-2006 (5)	2009	0.0879	0.1207	0.0547
1997-2002 (6)	2005	-0.1668	-0.1434	-0.1896
1998-2003 (6)	2006	-0.1257	-0.1145	-0.1365
1999-2004 (6)	2007	0.0802	0.1264	0.0340
2000-2005 (6)	2008	0.1353	0.1291	0.1410
2001-2006 (6)	2009	0.0992	0.1382	0.0598
1997-2003 (7)	2006	-0.1482	-0.1331	-0.1628
1998-2004 (7)	2007	0.0097	0.0539	-0.0344
1999-2005 (7)	2008	0.0448	0.0367	0.0526
2000-2006 (7)	2009	0.1564	0.2030	0.1095
1997-2004 (8)	2007	-0.0206	0.0255	-0.0665
1998-2005 (8)	2008	-0.0129	-0.0195	-0.0065
1999-2006 (8)	2009	0.0860	0.1317	0.0401
1997-2005 (9)	2008	-0.0416	-0.0443	-0.0391
1998-2006 (9)	2009	0.0359	0.0834	-0.0117
1997-2006 (10)	2009	0.0079	0.0592	-0.0433

**Indemnity  
Exponential Fit  
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-21)
1997-2000 (4)	2003	1.1429	1.1179	1.1674
1998-2001 (4)	2004	1.0914	1.0806	1.1013
1999-2002 (4)	2005	0.8341	0.8182	0.8497
2000-2003 (4)	2006	0.6247	0.6008	0.6489
2001-2004 (4)	2007	0.6911	0.6545	0.7284
2002-2005 (4)	2008	0.7438	0.7464	0.7415
2003-2006 (4)	2009	0.7448	0.7559	0.7345
1997-2001 (5)	2004	1.0419	1.0161	1.0674
1998-2002 (5)	2005	0.9420	0.9234	0.9600
1999-2003 (5)	2006	0.7954	0.7769	0.8138
2000-2004 (5)	2007	0.6263	0.5918	0.6618
2001-2005 (5)	2008	0.7282	0.7214	0.7350
2002-2006 (5)	2009	0.7446	0.7473	0.7424
1997-2002 (6)	2005	0.9569	0.9290	0.9846
1998-2003 (6)	2006	0.8882	0.8675	0.9084
1999-2004 (6)	2007	0.7480	0.7170	0.7794
2000-2005 (6)	2008	0.6661	0.6517	0.6806
2001-2006 (6)	2009	0.7332	0.7292	0.7372
1997-2003 (7)	2006	0.9186	0.8906	0.9465
1998-2004 (7)	2007	0.8292	0.7971	0.8612
1999-2005 (7)	2008	0.7560	0.7427	0.7692
2000-2006 (7)	2009	0.6814	0.6706	0.6923
1997-2004 (8)	2007	0.8674	0.8305	0.9046
1998-2005 (8)	2008	0.8231	0.8071	0.8389
1999-2006 (8)	2009	0.7523	0.7421	0.7625
1997-2005 (9)	2008	0.8594	0.8371	0.8816
1998-2006 (9)	2009	0.8102	0.7974	0.8228
1997-2006 (10)	2009	0.8451	0.8265	0.8636

**Indemnity**  
**Exponential Fit**  
**Differences: (Actual - Trended)**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-21)
1997-2000 (4)	2003	-0.4083	-0.3970	-0.4193
1998-2001 (4)	2004	-0.3851	-0.4002	-0.3689
1999-2002 (4)	2005	-0.0905	-0.0720	-0.1085
2000-2003 (4)	2006	0.1087	0.1254	0.0917
2001-2004 (4)	2007	0.1295	0.1816	0.0768
2002-2005 (4)	2008	0.0503	0.0265	0.0737
2003-2006 (4)	2009	0.0877	0.1121	0.0625
1997-2001 (5)	2004	-0.3356	-0.3357	-0.3350
1998-2002 (5)	2005	-0.1984	-0.1772	-0.2188
1999-2003 (5)	2006	-0.0620	-0.0507	-0.0732
2000-2004 (5)	2007	0.1943	0.2443	0.1434
2001-2005 (5)	2008	0.0659	0.0515	0.0802
2002-2006 (5)	2009	0.0879	0.1207	0.0546
1997-2002 (6)	2005	-0.2133	-0.1828	-0.2434
1998-2003 (6)	2006	-0.1548	-0.1413	-0.1678
1999-2004 (6)	2007	0.0726	0.1191	0.0258
2000-2005 (6)	2008	0.1280	0.1212	0.1346
2001-2006 (6)	2009	0.0993	0.1388	0.0598
1997-2003 (7)	2006	-0.1852	-0.1644	-0.2059
1998-2004 (7)	2007	-0.0086	0.0390	-0.0560
1999-2005 (7)	2008	0.0381	0.0302	0.0460
2000-2006 (7)	2009	0.1511	0.1974	0.1047
1997-2004 (8)	2007	-0.0468	0.0056	-0.0994
1998-2005 (8)	2008	-0.0290	-0.0342	-0.0237
1999-2006 (8)	2009	0.0802	0.1259	0.0345
1997-2005 (9)	2008	-0.0653	-0.0642	-0.0664
1998-2006 (9)	2009	0.0223	0.0706	-0.0258
1997-2006 (10)	2009	-0.0126	0.0415	-0.0666

**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-21)
	1997	0.5431	0.5606	0.5257
	1998	0.6344	0.6435	0.6253
	1999	0.7197	0.7398	0.6996
	2000	0.9773	1.0266	0.9280
	2001	0.8794	0.9340	0.8247
	2002	0.9623	0.9963	0.9281
	2003	1.0088	1.0570	0.9606
	2004	1.1033	1.1443	1.0624
	2005	1.1805	1.2430	1.1177
	2006	1.1440	1.1919	1.0960
	2007	1.4300	1.4908	1.3693
	2008	1.5434	1.6151	1.4719
	2009	1.6139	1.6456	1.5823

**Medical  
Linear Fit  
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-21)
1997-2000 (4)	2003	1.3432	1.4151	1.2712
1998-2001 (4)	2004	1.2494	1.3572	1.1414
1999-2002 (4)	2005	1.1681	1.2288	1.1071
2000-2003 (4)	2006	1.0368	1.0726	1.0009
2001-2004 (4)	2007	1.3116	1.3441	1.2795
2002-2005 (4)	2008	1.4008	1.4825	1.3190
2003-2006 (4)	2009	1.3264	1.3856	1.2669
1997-2001 (5)	2004	1.2585	1.3459	1.1710
1998-2002 (5)	2005	1.2424	1.3179	1.1665
1999-2003 (5)	2006	1.1911	1.2528	1.1293
2000-2004 (5)	2007	1.1769	1.2108	1.1431
2001-2005 (5)	2008	1.3985	1.4579	1.3389
2002-2006 (5)	2009	1.3473	1.4151	1.2794
1997-2002 (6)	2005	1.2714	1.3412	1.2013
1998-2003 (6)	2006	1.2568	1.3308	1.1827
1999-2004 (6)	2007	1.2711	1.3249	1.2172
2000-2005 (6)	2008	1.2911	1.3456	1.2365
2001-2006 (6)	2009	1.3720	1.4271	1.3168
1997-2003 (7)	2006	1.2920	1.3630	1.2207
1998-2004 (7)	2007	1.3200	1.3859	1.2541
1999-2005 (7)	2008	1.3539	1.4204	1.2871
2000-2006 (7)	2009	1.3029	1.3551	1.2506
1997-2004 (8)	2007	1.3506	1.4163	1.2848
1998-2005 (8)	2008	1.3912	1.4662	1.3160
1999-2006 (8)	2009	1.3609	1.4237	1.2979
1997-2005 (9)	2008	1.4171	1.4914	1.3426
1998-2006 (9)	2009	1.4002	1.4712	1.3290
1997-2006 (10)	2009	1.4301	1.5016	1.3584

**Medical****Linear Fit****Differences: (Actual - Trended)**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-21)
1997-2000 (4)	2003	-0.3344	-0.3581	-0.3106
1998-2001 (4)	2004	-0.1461	-0.2129	-0.0790
1999-2002 (4)	2005	0.0124	0.0142	0.0106
2000-2003 (4)	2006	0.1072	0.1194	0.0951
2001-2004 (4)	2007	0.1184	0.1467	0.0898
2002-2005 (4)	2008	0.1426	0.1326	0.1529
2003-2006 (4)	2009	0.2875	0.2600	0.3155
1997-2001 (5)	2004	-0.1552	-0.2016	-0.1086
1998-2002 (5)	2005	-0.0619	-0.0749	-0.0488
1999-2003 (5)	2006	-0.0471	-0.0609	-0.0332
2000-2004 (5)	2007	0.2531	0.2800	0.2262
2001-2005 (5)	2008	0.1449	0.1572	0.1331
2002-2006 (5)	2009	0.2666	0.2305	0.3029
1997-2002 (6)	2005	-0.0909	-0.0982	-0.0836
1998-2003 (6)	2006	-0.1128	-0.1389	-0.0867
1999-2004 (6)	2007	0.1589	0.1659	0.1521
2000-2005 (6)	2008	0.2523	0.2695	0.2354
2001-2006 (6)	2009	0.2419	0.2185	0.2655
1997-2003 (7)	2006	-0.1480	-0.1711	-0.1247
1998-2004 (7)	2007	0.1100	0.1049	0.1152
1999-2005 (7)	2008	0.1895	0.1947	0.1848
2000-2006 (7)	2009	0.3110	0.2905	0.3317
1997-2004 (8)	2007	0.0794	0.0745	0.0845
1998-2005 (8)	2008	0.1522	0.1489	0.1559
1999-2006 (8)	2009	0.2530	0.2219	0.2844
1997-2005 (9)	2008	0.1263	0.1237	0.1293
1998-2006 (9)	2009	0.2137	0.1744	0.2533
1997-2006 (10)	2009	0.1838	0.1440	0.2239

**Medical  
Exponential Fit  
Trended Loss Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-21)
1997-2000 (4)	2003	1.6414	1.7434	1.5397
1998-2001 (4)	2004	1.4115	1.5751	1.2551
1999-2002 (4)	2005	1.2398	1.3133	1.1660
2000-2003 (4)	2006	1.0388	1.0735	1.0042
2001-2004 (4)	2007	1.3668	1.3914	1.3440
2002-2005 (4)	2008	1.4548	1.5456	1.3641
2003-2006 (4)	2009	1.3527	1.4123	1.2926
1997-2001 (5)	2004	1.4752	1.6023	1.3502
1998-2002 (5)	2005	1.3800	1.4860	1.2756
1999-2003 (5)	2006	1.2560	1.3278	1.1844
2000-2004 (5)	2007	1.1893	1.2205	1.1586
2001-2005 (5)	2008	1.4682	1.5253	1.4112
2002-2006 (5)	2009	1.3845	1.4568	1.3123
1997-2002 (6)	2005	1.4732	1.5701	1.3765
1998-2003 (6)	2006	1.3826	1.4819	1.2847
1999-2004 (6)	2007	1.3447	1.4056	1.2839
2000-2005 (6)	2008	1.3187	1.3712	1.2660
2001-2006 (6)	2009	1.4293	1.4823	1.3765
1997-2003 (7)	2006	1.4836	1.5804	1.3874
1998-2004 (7)	2007	1.4525	1.5390	1.3669
1999-2005 (7)	2008	1.4396	1.5148	1.3644
2000-2006 (7)	2009	1.3335	1.3839	1.2831
1997-2004 (8)	2007	1.5496	1.6376	1.4619
1998-2005 (8)	2008	1.5348	1.6317	1.4387
1999-2006 (8)	2009	1.4427	1.5122	1.3731
1997-2005 (9)	2008	1.6279	1.7268	1.5293
1998-2006 (9)	2009	1.5368	1.6263	1.4480
1997-2006 (10)	2009	1.6326	1.7259	1.5396

**Medical**  
**Exponential Fit**  
**Differences: (Actual - Trended)**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-21)
1997-2000 (4)	2003	-0.6326	-0.6864	-0.5791
1998-2001 (4)	2004	-0.3082	-0.4308	-0.1927
1999-2002 (4)	2005	-0.0593	-0.0703	-0.0483
2000-2003 (4)	2006	0.1052	0.1184	0.0918
2001-2004 (4)	2007	0.0632	0.0994	0.0253
2002-2005 (4)	2008	0.0886	0.0695	0.1078
2003-2006 (4)	2009	0.2612	0.2333	0.2897
1997-2001 (5)	2004	-0.3719	-0.4580	-0.2878
1998-2002 (5)	2005	-0.1995	-0.2430	-0.1579
1999-2003 (5)	2006	-0.1120	-0.1359	-0.0884
2000-2004 (5)	2007	0.2407	0.2703	0.2107
2001-2005 (5)	2008	0.0752	0.0898	0.0607
2002-2006 (5)	2009	0.2294	0.1888	0.2700
1997-2002 (6)	2005	-0.2927	-0.3271	-0.2588
1998-2003 (6)	2006	-0.2386	-0.2900	-0.1887
1999-2004 (6)	2007	0.0853	0.0852	0.0854
2000-2005 (6)	2008	0.2247	0.2439	0.2059
2001-2006 (6)	2009	0.1846	0.1633	0.2058
1997-2003 (7)	2006	-0.3396	-0.3885	-0.2914
1998-2004 (7)	2007	-0.0225	-0.0482	0.0024
1999-2005 (7)	2008	0.1038	0.1003	0.1075
2000-2006 (7)	2009	0.2804	0.2617	0.2992
1997-2004 (8)	2007	-0.1196	-0.1468	-0.0926
1998-2005 (8)	2008	0.0086	-0.0166	0.0332
1999-2006 (8)	2009	0.1712	0.1334	0.2092
1997-2005 (9)	2008	-0.0845	-0.1117	-0.0574
1998-2006 (9)	2009	0.0771	0.0193	0.1343
1997-2006 (10)	2009	-0.0187	-0.0803	0.0427