

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 1991 through 2003, 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 (1/1/2004 to 12/1/2006).

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-20<sup>th</sup> and the average of the incurred and paid-20<sup>th</sup> methods.

As an illustration, the incurred loss development approach generated an indemnity severity ratio of 0.4746 for policy year 1999 (page 6.1). Fitting the severity ratios for policy years 1993 to 1996 using a straight line and projecting that to 1999 yielded a severity ratio of 0.3935 (page 6.2) which understates our current estimate for 1999 by 0.0811 points (page 6.3).

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

INDEMNITY	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
	1991	0.3151	0.3087	0.3215
	1992	0.3355	0.3268	0.3443
	1993	0.3386	0.3331	0.3440
	1994	0.3186	0.3095	0.3278
	1995	0.3400	0.3356	0.3445
	1996	0.3709	0.3668	0.3752
	1997	0.3788	0.3910	0.3667
	1998	0.3856	0.3835	0.3878
	1999	0.4738	0.4746	0.4731
	2000	0.5875	0.5994	0.5756
	2001	0.5433	0.5618	0.5250
	2002	0.5929	0.5961	0.5898
	2003	0.5598	0.5725	0.5470

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-20)
1991-1994 (4)	1997	0.3331	0.3234	0.3428
1992-1995 (4)	1998	0.3303	0.3275	0.3331
1993-1996 (4)	1999	0.3953	0.3935	0.3975
1994-1997 (4)	2000	0.4473	0.4748	0.4199
1995-1998 (4)	2001	0.4339	0.4448	0.4232
1996-1999 (4)	2002	0.5443	0.5461	0.5424
1997-2000 (4)	2003	0.7779	0.7845	0.7712
1991-1995 (5)	1998	0.3460	0.3410	0.3512
1992-1996 (5)	1999	0.3768	0.3756	0.3783
1993-1997 (5)	2000	0.4157	0.4338	0.3980
1994-1998 (5)	2001	0.4452	0.4590	0.4315
1995-1999 (5)	2002	0.5310	0.5377	0.5244
1996-2000 (5)	2003	0.7034	0.7175	0.6893
1991-1996 (6)	1999	0.3793	0.3762	0.3826
1992-1997 (6)	2000	0.3997	0.4142	0.3853
1993-1998 (6)	2001	0.4256	0.4362	0.4152
1994-1999 (6)	2002	0.5226	0.5329	0.5124
1995-2000 (6)	2003	0.6668	0.6821	0.6515
1991-1997 (7)	2000	0.3989	0.4094	0.3887
1992-1998 (7)	2001	0.4132	0.4230	0.4036
1993-1999 (7)	2002	0.4963	0.5051	0.4876
1994-2000 (7)	2003	0.6412	0.6581	0.6244
1991-1998 (8)	2001	0.4120	0.4196	0.4046
1992-1999 (8)	2002	0.4772	0.4860	0.4685
1993-2000 (8)	2003	0.6053	0.6203	0.5904
1991-1999 (9)	2002	0.4690	0.4763	0.4618
1992-2000 (9)	2003	0.5772	0.5916	0.5629
1991-2000 (10)	2003	0.5602	0.5728	0.5476

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

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
1991-1994 (4)	1997	0.0457	0.0676	0.0239
1992-1995 (4)	1998	0.0553	0.0560	0.0547
1993-1996 (4)	1999	0.0785	0.0811	0.0756
1994-1997 (4)	2000	0.1403	0.1246	0.1557
1995-1998 (4)	2001	0.1094	0.1170	0.1018
1996-1999 (4)	2002	0.0486	0.0500	0.0474
1997-2000 (4)	2003	-0.2181	-0.2120	-0.2242
1991-1995 (5)	1998	0.0396	0.0425	0.0366
1992-1996 (5)	1999	0.0970	0.0990	0.0948
1993-1997 (5)	2000	0.1718	0.1657	0.1776
1994-1998 (5)	2001	0.0981	0.1028	0.0935
1995-1999 (5)	2002	0.0619	0.0584	0.0654
1996-2000 (5)	2003	-0.1436	-0.1450	-0.1423
1991-1996 (6)	1999	0.0945	0.0984	0.0905
1992-1997 (6)	2000	0.1878	0.1852	0.1903
1993-1998 (6)	2001	0.1177	0.1256	0.1098
1994-1999 (6)	2002	0.0703	0.0632	0.0774
1995-2000 (6)	2003	-0.1070	-0.1096	-0.1045
1991-1997 (7)	2000	0.1886	0.1900	0.1869
1992-1998 (7)	2001	0.1301	0.1388	0.1214
1993-1999 (7)	2002	0.0966	0.0910	0.1022
1994-2000 (7)	2003	-0.0814	-0.0856	-0.0774
1991-1998 (8)	2001	0.1313	0.1422	0.1204
1992-1999 (8)	2002	0.1157	0.1101	0.1213
1993-2000 (8)	2003	-0.0455	-0.0478	-0.0434
1991-1999 (9)	2002	0.1239	0.1198	0.1280
1992-2000 (9)	2003	-0.0174	-0.0191	-0.0159
1991-2000 (10)	2003	-0.0004	-0.0003	-0.0006

**Indemnity  
Exponential Fit  
Trended Severity Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
1991-1994 (4)	1997	0.3331	0.3232	0.3430
1992-1995 (4)	1998	0.3299	0.3270	0.3330
1993-1996 (4)	1999	0.3977	0.3965	0.3995
1994-1997 (4)	2000	0.4614	0.4985	0.4268
1995-1998 (4)	2001	0.4408	0.4542	0.4276
1996-1999 (4)	2002	0.5615	0.5642	0.5590
1997-2000 (4)	2003	0.8909	0.8905	0.8917
1991-1995 (5)	1998	0.3464	0.3412	0.3516
1992-1996 (5)	1999	0.3770	0.3761	0.3782
1993-1997 (5)	2000	0.4209	0.4422	0.4006
1994-1998 (5)	2001	0.4572	0.4761	0.4391
1995-1999 (5)	2002	0.5505	0.5606	0.5405
1996-2000 (5)	2003	0.7656	0.7839	0.7475
1991-1996 (6)	1999	0.3806	0.3777	0.3838
1992-1997 (6)	2000	0.4019	0.4183	0.3862
1993-1998 (6)	2001	0.4319	0.4452	0.4192
1994-1999 (6)	2002	0.5453	0.5620	0.5293
1995-2000 (6)	2003	0.7183	0.7403	0.6967
1991-1997 (7)	2000	0.4020	0.4137	0.3906
1992-1998 (7)	2001	0.4170	0.4288	0.4057
1993-1999 (7)	2002	0.5094	0.5225	0.4969
1994-2000 (7)	2003	0.6888	0.7157	0.6629
1991-1998 (8)	2001	0.4164	0.4256	0.4076
1992-1999 (8)	2002	0.4851	0.4975	0.4733
1993-2000 (8)	2003	0.6347	0.6566	0.6136
1991-1999 (9)	2002	0.4767	0.4869	0.4669
1992-2000 (9)	2003	0.5954	0.6156	0.5760
1991-2000 (10)	2003	0.5753	0.5925	0.5586

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

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
1991-1994 (4)	1997	0.0457	0.0678	0.0237
1992-1995 (4)	1998	0.0557	0.0565	0.0548
1993-1996 (4)	1999	0.0761	0.0781	0.0736
1994-1997 (4)	2000	0.1261	0.1009	0.1488
1995-1998 (4)	2001	0.1025	0.1076	0.0974
1996-1999 (4)	2002	0.0314	0.0319	0.0308
1997-2000 (4)	2003	-0.3311	-0.3180	-0.3447
1991-1995 (5)	1998	0.0392	0.0423	0.0362
1992-1996 (5)	1999	0.0968	0.0985	0.0949
1993-1997 (5)	2000	0.1666	0.1572	0.1750
1994-1998 (5)	2001	0.0861	0.0857	0.0859
1995-1999 (5)	2002	0.0424	0.0355	0.0493
1996-2000 (5)	2003	-0.2058	-0.2114	-0.2005
1991-1996 (6)	1999	0.0932	0.0969	0.0893
1992-1997 (6)	2000	0.1856	0.1811	0.1894
1993-1998 (6)	2001	0.1114	0.1166	0.1058
1994-1999 (6)	2002	0.0476	0.0341	0.0605
1995-2000 (6)	2003	-0.1585	-0.1678	-0.1497
1991-1997 (7)	2000	0.1855	0.1857	0.1850
1992-1998 (7)	2001	0.1263	0.1330	0.1193
1993-1999 (7)	2002	0.0835	0.0736	0.0929
1994-2000 (7)	2003	-0.1290	-0.1432	-0.1159
1991-1998 (8)	2001	0.1269	0.1362	0.1174
1992-1999 (8)	2002	0.1078	0.0986	0.1165
1993-2000 (8)	2003	-0.0749	-0.0841	-0.0666
1991-1999 (9)	2002	0.1162	0.1092	0.1229
1992-2000 (9)	2003	-0.0356	-0.0431	-0.0290
1991-2000 (10)	2003	-0.0155	-0.0200	-0.0116

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

MEDICAL	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
	1991	0.3099	0.3074	0.3125
	1992	0.4438	0.4830	0.4046
	1993	0.3714	0.3857	0.3570
	1994	0.3882	0.4131	0.3634
	1995	0.4543	0.5012	0.4073
	1996	0.4687	0.5025	0.4349
	1997	0.5351	0.5805	0.4895
	1998	0.5993	0.6448	0.5536
	1999	0.7207	0.7852	0.6559
	2000	0.8792	1.0197	0.7389
	2001	0.8553	0.9908	0.7200
	2002	1.0937	1.3864	0.8009
	2003	0.9695	1.0835	0.8553

**Medical**  
**Linear Fit**  
**Trended Severity Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
1991-1994 (4)	1997	0.4515	0.4962	0.4067
1992-1995 (4)	1998	0.4362	0.4827	0.3896
1993-1996 (4)	1999	0.5818	0.6480	0.5156
1994-1997 (4)	2000	0.6664	0.7259	0.6064
1995-1998 (4)	2001	0.7400	0.7862	0.6934
1996-1999 (4)	2002	0.9500	1.0388	0.8607
1997-2000 (4)	2003	1.2027	1.4137	0.9922
1991-1995 (5)	1998	0.5101	0.5769	0.4432
1992-1996 (5)	1999	0.4916	0.5344	0.4489
1993-1997 (5)	2000	0.6475	0.7161	0.5787
1994-1998 (5)	2001	0.7406	0.7998	0.6810
1995-1999 (5)	2002	0.8873	0.9580	0.8162
1996-2000 (5)	2003	1.1439	1.3261	0.9618
1991-1996 (6)	1999	0.5384	0.5983	0.4784
1992-1997 (6)	2000	0.5716	0.6232	0.5198
1993-1998 (6)	2001	0.7201	0.7873	0.6525
1994-1999 (6)	2002	0.8678	0.9435	0.7915
1995-2000 (6)	2003	1.0723	1.2231	0.9215
1991-1997 (7)	2000	0.5977	0.6620	0.5332
1992-1998 (7)	2001	0.6532	0.7082	0.5979
1993-1999 (7)	2002	0.8377	0.9178	0.7572
1994-2000 (7)	2003	1.0357	1.1775	0.8939
1991-1998 (8)	2001	0.6661	0.7317	0.6003
1992-1999 (8)	2002	0.7711	0.8399	0.7019
1993-2000 (8)	2003	0.9946	1.1308	0.8583
1991-1999 (9)	2002	0.7705	0.8470	0.6937
1992-2000 (9)	2003	0.9242	1.0442	0.8040
1991-2000 (10)	2003	0.9105	1.0316	0.7893



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

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
1991-1994 (4)	1997	0.0837	0.0843	0.0828
1992-1995 (4)	1998	0.1631	0.1622	0.1640
1993-1996 (4)	1999	0.1389	0.1372	0.1403
1994-1997 (4)	2000	0.2128	0.2938	0.1325
1995-1998 (4)	2001	0.1153	0.2046	0.0266
1996-1999 (4)	2002	0.1437	0.3476	-0.0598
1997-2000 (4)	2003	-0.2332	-0.3302	-0.1369
1991-1995 (5)	1998	0.0892	0.0679	0.1104
1992-1996 (5)	1999	0.2291	0.2509	0.2070
1993-1997 (5)	2000	0.2317	0.3036	0.1602
1994-1998 (5)	2001	0.1147	0.1910	0.0390
1995-1999 (5)	2002	0.2064	0.4284	-0.0153
1996-2000 (5)	2003	-0.1744	-0.2426	-0.1065
1991-1996 (6)	1999	0.1823	0.1869	0.1775
1992-1997 (6)	2000	0.3076	0.3965	0.2191
1993-1998 (6)	2001	0.1352	0.2035	0.0675
1994-1999 (6)	2002	0.2259	0.4429	0.0094
1995-2000 (6)	2003	-0.1028	-0.1396	-0.0662
1991-1997 (7)	2000	0.2815	0.3577	0.2058
1992-1998 (7)	2001	0.2021	0.2826	0.1221
1993-1999 (7)	2002	0.2560	0.4686	0.0437
1994-2000 (7)	2003	-0.0662	-0.0940	-0.0386
1991-1998 (8)	2001	0.1892	0.2591	0.1197
1992-1999 (8)	2002	0.3226	0.5465	0.0990
1993-2000 (8)	2003	-0.0251	-0.0473	-0.0030
1991-1999 (9)	2002	0.3232	0.5394	0.1072
1992-2000 (9)	2003	0.0453	0.0393	0.0513
1991-2000 (10)	2003	0.0590	0.0519	0.0660

**Medical**  
**Exponential Fit**  
**Trended Severity Ratios**

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
1991-1994 (4)	1997	0.4695	0.5282	0.4147
1992-1995 (4)	1998	0.4347	0.4805	0.3889
1993-1996 (4)	1999	0.6151	0.6978	0.5350
1994-1997 (4)	2000	0.7173	0.7856	0.6487
1995-1998 (4)	2001	0.7886	0.8308	0.7471
1996-1999 (4)	2002	1.0792	1.1873	0.9705
1997-2000 (4)	2003	1.4261	1.7297	1.1328
1991-1995 (5)	1998	0.5345	0.6211	0.4536
1992-1996 (5)	1999	0.4947	0.5390	0.4505
1993-1997 (5)	2000	0.6960	0.7826	0.6114
1994-1998 (5)	2001	0.8106	0.8777	0.7431
1995-1999 (5)	2002	0.9822	1.0543	0.9098
1996-2000 (5)	2003	1.3602	1.6162	1.1094
1991-1996 (6)	1999	0.5665	0.6444	0.4927
1992-1997 (6)	2000	0.5834	0.6387	0.5283
1993-1998 (6)	2001	0.7882	0.8736	0.7040
1994-1999 (6)	2002	0.9781	1.0670	0.8888
1995-2000 (6)	2003	1.2411	1.4252	1.0557
1991-1997 (7)	2000	0.6359	0.7205	0.5550
1992-1998 (7)	2001	0.6796	0.7402	0.6191
1993-1999 (7)	2002	0.9422	1.0460	0.8395
1994-2000 (7)	2003	1.2119	1.3927	1.0307
1991-1998 (8)	2001	0.7191	0.8070	0.6343
1992-1999 (8)	2002	0.8225	0.9005	0.7445
1993-2000 (8)	2003	1.1573	1.3393	0.9777
1991-1999 (9)	2002	0.8487	0.9529	0.7478
1992-2000 (9)	2003	1.0172	1.1578	0.8766
1991-2000 (10)	2003	1.0291	1.1920	0.8711

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

Years Used (# Yrs)	3 Yr Trend To	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-20)
1991-1994 (4)	1997	0.0656	0.0523	0.0748
1992-1995 (4)	1998	0.1646	0.1643	0.1647
1993-1996 (4)	1999	0.1056	0.0874	0.1209
1994-1997 (4)	2000	0.1619	0.2341	0.0902
1995-1998 (4)	2001	0.0667	0.1600	-0.0271
1996-1999 (4)	2002	0.0145	0.1991	-0.1696
1997-2000 (4)	2003	-0.4566	-0.6462	-0.2775
1991-1995 (5)	1998	0.0648	0.0237	0.1000
1992-1996 (5)	1999	0.2260	0.2462	0.2054
1993-1997 (5)	2000	0.1832	0.2371	0.1275
1994-1998 (5)	2001	0.0447	0.1131	-0.0231
1995-1999 (5)	2002	0.1115	0.3321	-0.1089
1996-2000 (5)	2003	-0.3907	-0.5327	-0.2541
1991-1996 (6)	1999	0.1542	0.1408	0.1632
1992-1997 (6)	2000	0.2958	0.3810	0.2106
1993-1998 (6)	2001	0.0671	0.1172	0.0160
1994-1999 (6)	2002	0.1156	0.3194	-0.0879
1995-2000 (6)	2003	-0.2716	-0.3417	-0.2004
1991-1997 (7)	2000	0.2433	0.2992	0.1839
1992-1998 (7)	2001	0.1757	0.2506	0.1009
1993-1999 (7)	2002	0.1515	0.3404	-0.0386
1994-2000 (7)	2003	-0.2424	-0.3092	-0.1754
1991-1998 (8)	2001	0.1362	0.1838	0.0857
1992-1999 (8)	2002	0.2712	0.4859	0.0564
1993-2000 (8)	2003	-0.1878	-0.2558	-0.1224
1991-1999 (9)	2002	0.2450	0.4335	0.0531
1992-2000 (9)	2003	-0.0477	-0.0743	-0.0213
1991-2000 (10)	2003	-0.0596	-0.1085	-0.0158