

PENNSYLVANIA COMPENSATION RATING BUREAU

Measures of Goodness of Fit in Trend Calculations Using Severity Ratios

Estimates of trended severity ratios using from 4 to 10 data points for each loss development technique are shown in Exhibit 6 of this mailing.

The first page of the attachment shows R^2 values for the regressions producing those trended severity ratios.

Pages 2 and 3 show indemnity fitted severity ratios for each loss development method using from 4 to 10 data points. Page 2 uses linear regression and page 3 uses exponential techniques. Pages 4 and 5 present analogous results for medical-linear and medical-exponential respectively.

Pages 6 through 9 show residuals resulting from the comparison of actual and fitted (actual minus fitted) values for the curves used in the trend projections. Page 6 shows indemnity results using linear regression, page 7 is for indemnity-exponential, page 8 for medical-linear and page 9 for medical-exponential.

INDEMNITY		Average		
Freq	Adj LR	(Pd & Inc)	(Incur)	(Pd-23)
r ²				
4 Point	Linear	0.862	0.756	0.908
5 Point	Linear	0.912	0.863	0.929
6 Point	Linear	0.895	0.853	0.911
7 Point	Linear	0.916	0.901	0.914
8 Point	Linear	0.918	0.916	0.910
9 Point	Linear	0.922	0.934	0.902
10 Point	Linear	0.924	0.942	0.899
4 Point	Expon'l	0.855	0.754	0.898
5 Point	Expon'l	0.911	0.864	0.928
6 Point	Expon'l	0.899	0.855	0.916
7 Point	Expon'l	0.924	0.906	0.925
8 Point	Expon'l	0.932	0.924	0.928
9 Point	Expon'l	0.939	0.944	0.924
10 Point	Expon'l	0.944	0.955	0.926

MEDICAL		Average		
Freq	Adj LR	(Pd & Inc)	(Incur)	(Pd-23)
r ²				
4 Point	Linear	0.848	0.764	0.905
5 Point	Linear	0.897	0.837	0.936
6 Point	Linear	0.897	0.864	0.916
7 Point	Linear	0.936	0.914	0.948
8 Point	Linear	0.955	0.941	0.963
9 Point	Linear	0.968	0.958	0.974
10 Point	Linear	0.973	0.962	0.979
4 Point	Expon'l	0.834	0.754	0.891
5 Point	Expon'l	0.891	0.831	0.931
6 Point	Expon'l	0.896	0.862	0.916
7 Point	Expon'l	0.932	0.910	0.946
8 Point	Expon'l	0.946	0.932	0.955
9 Point	Expon'l	0.960	0.949	0.967
10 Point	Expon'l	0.969	0.959	0.976

INDEMNITY Linear FITTED	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
4 Point	2006	0.8081	0.7809	0.8352
	2007	0.8651	0.8189	0.9114
	2008	0.9222	0.8570	0.9875
	2009	0.9793	0.8950	1.0637
5 Point	2005	0.7622	0.7419	0.7825
	2006	0.8156	0.7802	0.8509
	2007	0.8689	0.8186	0.9192
	2008	0.9222	0.8570	0.9875
	2009	0.9755	0.8953	1.0559
6 Point	2004	0.7379	0.7255	0.7504
	2005	0.7833	0.7578	0.8089
	2006	0.8287	0.7902	0.8673
	2007	0.8742	0.8226	0.9258
	2008	0.9196	0.8550	0.9842
	2009	0.9650	0.8873	1.0427
7 Point	2003	0.7055	0.6944	0.7168
	2004	0.7480	0.7265	0.7695
	2005	0.7904	0.7586	0.8222
	2006	0.8328	0.7906	0.8750
	2007	0.8752	0.8227	0.9277
	2008	0.9176	0.8548	0.9804
	2009	0.9600	0.8868	1.0332
8 Point	2002	0.6805	0.6722	0.6889
	2003	0.7194	0.7023	0.7367
	2004	0.7584	0.7324	0.7844
	2005	0.7973	0.7625	0.8322
	2006	0.8362	0.7926	0.8799
	2007	0.8752	0.8227	0.9277
	2008	0.9141	0.8528	0.9754
	2009	0.9530	0.8829	1.0232
9 Point	2001	0.6570	0.6475	0.6666
	2002	0.6932	0.6767	0.7099
	2003	0.7294	0.7058	0.7531
	2004	0.7656	0.7349	0.7964
	2005	0.8018	0.7641	0.8397
	2006	0.8380	0.7932	0.8829
	2007	0.8743	0.8224	0.9262
	2008	0.9105	0.8515	0.9695
	2009	0.9467	0.8807	1.0127
10 Point	2000	0.6352	0.6260	0.6445
	2001	0.6691	0.6539	0.6844
	2002	0.7030	0.6819	0.7243
	2003	0.7370	0.7098	0.7643
	2004	0.7709	0.7377	0.8042
	2005	0.8049	0.7657	0.8441
	2006	0.8388	0.7936	0.8840
	2007	0.8727	0.8216	0.9240
	2008	0.9067	0.8495	0.9639
	2009	0.9406	0.8775	1.0038

INDEMNITY Expon'l FITTED	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
4 Point	2006	0.8077	0.7802	0.8354
	2007	0.8623	0.8173	0.9070
	2008	0.9206	0.8561	0.9847
	2009	0.9828	0.8968	1.0691
5 Point	2005	0.7644	0.7426	0.7866
	2006	0.8133	0.7787	0.8478
	2007	0.8652	0.8165	0.9137
	2008	0.9206	0.8561	0.9847
	2009	0.9794	0.8977	1.0613
6 Point	2004	0.7421	0.7275	0.7574
	2005	0.7826	0.7572	0.8081
	2006	0.8253	0.7882	0.8621
	2007	0.8704	0.8205	0.9199
	2008	0.9178	0.8540	0.9814
	2009	0.9679	0.8890	1.0471
7 Point	2003	0.7115	0.6975	0.7261
	2004	0.7484	0.7264	0.7707
	2005	0.7873	0.7565	0.8180
	2006	0.8281	0.7878	0.8682
	2007	0.8711	0.8204	0.9215
	2008	0.9163	0.8543	0.9780
	2009	0.9638	0.8896	1.0380
8 Point	2002	0.6881	0.6765	0.7004
	2003	0.7213	0.7031	0.7399
	2004	0.7562	0.7307	0.7816
	2005	0.7927	0.7595	0.8257
	2006	0.8310	0.7893	0.8723
	2007	0.8711	0.8204	0.9215
	2008	0.9132	0.8526	0.9734
	2009	0.9573	0.8861	1.0283
9 Point	2001	0.6661	0.6530	0.6798
	2002	0.6965	0.6783	0.7150
	2003	0.7282	0.7046	0.7520
	2004	0.7614	0.7318	0.7909
	2005	0.7961	0.7602	0.8318
	2006	0.8324	0.7896	0.8749
	2007	0.8703	0.8202	0.9201
	2008	0.9100	0.8520	0.9677
	2009	0.9515	0.8850	1.0178
10 Point	2000	0.6457	0.6327	0.6593
	2001	0.6737	0.6565	0.6913
	2002	0.7029	0.6813	0.7248
	2003	0.7334	0.7069	0.7599
	2004	0.7652	0.7336	0.7967
	2005	0.7984	0.7612	0.8353
	2006	0.8330	0.7899	0.8758
	2007	0.8691	0.8196	0.9182
	2008	0.9068	0.8505	0.9627
	2009	0.9461	0.8826	1.0093

MEDICAL Linear FITTED	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
4 Point	2006	0.7994	0.7722	0.8268
	2007	0.8446	0.8120	0.8774
	2008	0.8898	0.8517	0.9281
	2009	0.9350	0.8915	0.9787
5 Point	2005	0.7652	0.7429	0.7876
	2006	0.8068	0.7791	0.8344
	2007	0.8483	0.8154	0.8813
	2008	0.8898	0.8517	0.9281
	2009	0.9313	0.8880	0.9749
6 Point	2004	0.7431	0.7207	0.7656
	2005	0.7794	0.7531	0.8057
	2006	0.8156	0.7855	0.8457
	2007	0.8518	0.8180	0.8858
	2008	0.8880	0.8504	0.9258
	2009	0.9243	0.8829	0.9659
7 Point	2003	0.6984	0.6768	0.7199
	2004	0.7366	0.7119	0.7612
	2005	0.7748	0.7470	0.8026
	2006	0.8130	0.7820	0.8440
	2007	0.8512	0.8171	0.8853
	2008	0.8894	0.8522	0.9267
	2009	0.9276	0.8873	0.9681
8 Point	2002	0.6483	0.6295	0.6671
	2003	0.6889	0.6670	0.7107
	2004	0.7294	0.7045	0.7544
	2005	0.7700	0.7420	0.7980
	2006	0.8106	0.7796	0.8417
	2007	0.8512	0.8171	0.8853
	2008	0.8917	0.8546	0.9290
	2009	0.9323	0.8922	0.9727
9 Point	2001	0.6031	0.5851	0.6211
	2002	0.6445	0.6238	0.6651
	2003	0.6859	0.6626	0.7092
	2004	0.7273	0.7013	0.7533
	2005	0.7687	0.7400	0.7973
	2006	0.8100	0.7788	0.8414
	2007	0.8514	0.8175	0.8855
	2008	0.8928	0.8562	0.9295
	2009	0.9342	0.8950	0.9736
10 Point	2000	0.5699	0.5561	0.5836
	2001	0.6100	0.5933	0.6266
	2002	0.6501	0.6305	0.6696
	2003	0.6902	0.6677	0.7127
	2004	0.7303	0.7049	0.7557
	2005	0.7704	0.7421	0.7987
	2006	0.8105	0.7793	0.8418
	2007	0.8506	0.8165	0.8848
	2008	0.8907	0.8537	0.9278
	2009	0.9308	0.8909	0.9708

MEDICAL Expon'l FITTED	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
4 Point	2006	0.7988	0.7712	0.8266
	2007	0.8426	0.8101	0.8753
	2008	0.8888	0.8508	0.9269
	2009	0.9375	0.8937	0.9814
5 Point	2005	0.7664	0.7435	0.7894
	2006	0.8052	0.7777	0.8328
	2007	0.8460	0.8135	0.8786
	2008	0.8888	0.8508	0.9269
	2009	0.9338	0.8899	0.9778
6 Point	2004	0.7457	0.7226	0.7689
	2005	0.7788	0.7525	0.8052
	2006	0.8133	0.7835	0.8432
	2007	0.8494	0.8159	0.8829
	2008	0.8870	0.8496	0.9246
	2009	0.9263	0.8847	0.9682
7 Point	2003	0.7021	0.6797	0.7245
	2004	0.7361	0.7112	0.7610
	2005	0.7717	0.7441	0.7994
	2006	0.8091	0.7785	0.8397
	2007	0.8483	0.8146	0.8820
	2008	0.8893	0.8523	0.9265
	2009	0.9324	0.8918	0.9732
8 Point	2002	0.6536	0.6338	0.6733
	2003	0.6886	0.6664	0.7107
	2004	0.7254	0.7007	0.7501
	2005	0.7643	0.7368	0.7917
	2006	0.8052	0.7747	0.8356
	2007	0.8483	0.8146	0.8820
	2008	0.8937	0.8565	0.9310
	2009	0.9415	0.9006	0.9826
9 Point	2001	0.6109	0.5917	0.6300
	2002	0.6453	0.6242	0.6664
	2003	0.6817	0.6584	0.7050
	2004	0.7202	0.6946	0.7457
	2005	0.7608	0.7328	0.7888
	2006	0.8037	0.7730	0.8344
	2007	0.8490	0.8155	0.8827
	2008	0.8969	0.8603	0.9337
	2009	0.9475	0.9075	0.9877
10 Point	2000	0.5807	0.5656	0.5958
	2001	0.6130	0.5959	0.6302
	2002	0.6472	0.6278	0.6666
	2003	0.6832	0.6614	0.7051
	2004	0.7213	0.6968	0.7458
	2005	0.7615	0.7341	0.7889
	2006	0.8039	0.7734	0.8344
	2007	0.8487	0.8148	0.8826
	2008	0.8959	0.8584	0.9336
	2009	0.9458	0.9043	0.9875

INDEMNITY Linear RESIDUALS	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
4 Point	2006	-0.0220	-0.0221	-0.0218
	2007	0.0164	0.0187	0.0140
	2008	0.0332	0.0290	0.0374
	2009	-0.0276	-0.0256	-0.0296
5 Point	2005	0.0075	-0.0007	0.0157
	2006	-0.0295	-0.0214	-0.0375
	2007	0.0126	0.0190	0.0062
	2008	0.0332	0.0290	0.0374
	2009	-0.0238	-0.0259	-0.0218
6 Point	2004	0.0264	0.0199	0.0329
	2005	-0.0136	-0.0166	-0.0107
	2006	-0.0426	-0.0314	-0.0539
	2007	0.0073	0.0150	-0.0004
	2008	0.0358	0.0310	0.0407
	2009	-0.0133	-0.0179	-0.0086
7 Point	2003	0.0151	0.0016	0.0286
	2004	0.0164	0.0189	0.0138
	2005	-0.0207	-0.0174	-0.0240
	2006	-0.0467	-0.0318	-0.0616
	2007	0.0063	0.0149	-0.0023
	2008	0.0378	0.0312	0.0445
	2009	-0.0083	-0.0174	0.0009
8 Point	2002	0.0243	0.0137	0.0349
	2003	0.0012	-0.0063	0.0087
	2004	0.0059	0.0130	-0.0011
	2005	-0.0276	-0.0213	-0.0340
	2006	-0.0501	-0.0338	-0.0665
	2007	0.0063	0.0149	-0.0023
	2008	0.0413	0.0332	0.0495
	2009	-0.0013	-0.0135	0.0109
9 Point	2001	0.0254	0.0090	0.0419
	2002	0.0116	0.0092	0.0139
	2003	-0.0088	-0.0098	-0.0077
	2004	-0.0013	0.0105	-0.0131
	2005	-0.0321	-0.0229	-0.0415
	2006	-0.0519	-0.0344	-0.0695
	2007	0.0072	0.0152	-0.0008
	2008	0.0449	0.0345	0.0554
	2009	0.0050	-0.0113	0.0214
10 Point	2000	0.0272	0.0144	0.0400
	2001	0.0133	0.0026	0.0241
	2002	0.0018	0.0040	-0.0005
	2003	-0.0164	-0.0138	-0.0189
	2004	-0.0066	0.0077	-0.0209
	2005	-0.0352	-0.0245	-0.0459
	2006	-0.0527	-0.0348	-0.0706
	2007	0.0088	0.0160	0.0014
	2008	0.0487	0.0365	0.0610
	2009	0.0111	-0.0081	0.0303

INDEMNITY Expon'l RESIDUALS	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
4 Point	2006	-0.0216	-0.0214	-0.0220
	2007	0.0192	0.0203	0.0184
	2008	0.0348	0.0299	0.0402
	2009	-0.0311	-0.0274	-0.0350
5 Point	2005	0.0053	-0.0014	0.0116
	2006	-0.0272	-0.0199	-0.0344
	2007	0.0163	0.0211	0.0117
	2008	0.0348	0.0299	0.0402
	2009	-0.0277	-0.0283	-0.0272
6 Point	2004	0.0222	0.0179	0.0259
	2005	-0.0129	-0.0160	-0.0099
	2006	-0.0392	-0.0294	-0.0487
	2007	0.0111	0.0171	0.0055
	2008	0.0376	0.0320	0.0435
	2009	-0.0162	-0.0196	-0.0130
7 Point	2003	0.0091	-0.0015	0.0193
	2004	0.0159	0.0190	0.0126
	2005	-0.0176	-0.0153	-0.0198
	2006	-0.0420	-0.0290	-0.0548
	2007	0.0104	0.0172	0.0039
	2008	0.0391	0.0317	0.0469
	2009	-0.0121	-0.0202	-0.0039
8 Point	2002	0.0167	0.0094	0.0234
	2003	-0.0007	-0.0071	0.0055
	2004	0.0081	0.0147	0.0017
	2005	-0.0230	-0.0183	-0.0275
	2006	-0.0449	-0.0305	-0.0589
	2007	0.0104	0.0172	0.0039
	2008	0.0422	0.0334	0.0515
	2009	-0.0056	-0.0167	0.0058
	9 Point	2001	0.0163	0.0035
2002		0.0083	0.0076	0.0088
2003		-0.0076	-0.0086	-0.0066
2004		0.0029	0.0136	-0.0076
2005		-0.0264	-0.0190	-0.0336
2006		-0.0463	-0.0308	-0.0615
2007		0.0112	0.0174	0.0053
2008		0.0454	0.0340	0.0572
2009		0.0002	-0.0156	0.0163
10 Point	2000	0.0167	0.0077	0.0252
	2001	0.0087	0.0000	0.0172
	2002	0.0019	0.0046	-0.0010
	2003	-0.0128	-0.0109	-0.0145
	2004	-0.0009	0.0118	-0.0134
	2005	-0.0287	-0.0200	-0.0371
	2006	-0.0469	-0.0311	-0.0624
	2007	0.0124	0.0180	0.0072
	2008	0.0486	0.0355	0.0622
	2009	0.0056	-0.0132	0.0248

MEDICAL Linear RESIDUALS	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
4 Point	2006	-0.0235	-0.0270	-0.0200
	2007	0.0308	0.0371	0.0247
	2008	0.0088	0.0069	0.0105
	2009	-0.0161	-0.0170	-0.0152
5 Point	2005	0.0074	0.0069	0.0077
	2006	-0.0308	-0.0339	-0.0276
	2007	0.0271	0.0336	0.0208
	2008	0.0088	0.0069	0.0105
	2009	-0.0124	-0.0135	-0.0114
6 Point	2004	0.0177	0.0128	0.0226
	2005	-0.0068	-0.0033	-0.0104
	2006	-0.0397	-0.0403	-0.0389
	2007	0.0236	0.0310	0.0163
	2008	0.0106	0.0082	0.0128
	2009	-0.0054	-0.0084	-0.0024
7 Point	2003	-0.0099	-0.0132	-0.0066
	2004	0.0242	0.0216	0.0270
	2005	-0.0022	0.0028	-0.0073
	2006	-0.0371	-0.0368	-0.0372
	2007	0.0242	0.0319	0.0168
	2008	0.0092	0.0064	0.0119
	2009	-0.0087	-0.0128	-0.0046
8 Point	2002	-0.0166	-0.0172	-0.0161
	2003	-0.0004	-0.0034	0.0026
	2004	0.0314	0.0290	0.0338
	2005	0.0026	0.0078	-0.0027
	2006	-0.0347	-0.0344	-0.0349
	2007	0.0242	0.0319	0.0168
	2008	0.0069	0.0040	0.0096
	2009	-0.0134	-0.0177	-0.0091
9 Point	2001	-0.0076	-0.0113	-0.0039
	2002	-0.0128	-0.0115	-0.0141
	2003	0.0026	0.0010	0.0041
	2004	0.0335	0.0322	0.0349
	2005	0.0039	0.0098	-0.0020
	2006	-0.0341	-0.0336	-0.0346
	2007	0.0240	0.0315	0.0166
	2008	0.0058	0.0024	0.0091
	2009	-0.0153	-0.0205	-0.0101
10 Point	2000	0.0154	0.0186	0.0125
	2001	-0.0145	-0.0195	-0.0094
	2002	-0.0184	-0.0182	-0.0186
	2003	-0.0017	-0.0041	0.0006
	2004	0.0305	0.0286	0.0325
	2005	0.0022	0.0077	-0.0034
	2006	-0.0346	-0.0341	-0.0350
	2007	0.0248	0.0325	0.0173
	2008	0.0079	0.0049	0.0108
	2009	-0.0119	-0.0164	-0.0073

MEDICAL Expon'l RESIDUALS	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-23)
4 Point	2006	-0.0229	-0.0260	-0.0198
	2007	0.0328	0.0389	0.0268
	2008	0.0098	0.0078	0.0117
	2009	-0.0186	-0.0192	-0.0179
5 Point	2005	0.0062	0.0063	0.0059
	2006	-0.0293	-0.0325	-0.0260
	2007	0.0294	0.0355	0.0235
	2008	0.0098	0.0078	0.0117
	2009	-0.0149	-0.0154	-0.0143
6 Point	2004	0.0151	0.0109	0.0193
	2005	-0.0062	-0.0027	-0.0099
	2006	-0.0374	-0.0383	-0.0364
	2007	0.0260	0.0331	0.0192
	2008	0.0116	0.0090	0.0140
	2009	-0.0074	-0.0102	-0.0047
7 Point	2003	-0.0136	-0.0161	-0.0112
	2004	0.0247	0.0223	0.0272
	2005	0.0009	0.0057	-0.0041
	2006	-0.0332	-0.0333	-0.0329
	2007	0.0271	0.0344	0.0201
	2008	0.0093	0.0063	0.0121
	2009	-0.0135	-0.0173	-0.0097
8 Point	2002	-0.0219	-0.0215	-0.0223
	2003	-0.0001	-0.0028	0.0026
	2004	0.0354	0.0328	0.0381
	2005	0.0083	0.0130	0.0036
	2006	-0.0293	-0.0295	-0.0288
	2007	0.0271	0.0344	0.0201
	2008	0.0049	0.0021	0.0076
	2009	-0.0226	-0.0261	-0.0191
9 Point	2001	-0.0154	-0.0179	-0.0128
	2002	-0.0136	-0.0119	-0.0154
	2003	0.0068	0.0052	0.0083
	2004	0.0406	0.0389	0.0425
	2005	0.0118	0.0170	0.0065
	2006	-0.0278	-0.0278	-0.0276
	2007	0.0264	0.0335	0.0194
	2008	0.0017	-0.0017	0.0049
	2009	-0.0286	-0.0330	-0.0242
10 Point	2000	0.0046	0.0091	0.0003
	2001	-0.0175	-0.0221	-0.0130
	2002	-0.0155	-0.0155	-0.0156
	2003	0.0053	0.0022	0.0082
	2004	0.0395	0.0367	0.0424
	2005	0.0111	0.0157	0.0064
	2006	-0.0280	-0.0282	-0.0276
	2007	0.0267	0.0342	0.0195
	2008	0.0027	0.0002	0.0050
	2009	-0.0269	-0.0298	-0.0240