

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 loss 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	(Incur)	(Pd-25)
Freq Adj LR		(Pd & Inc)		
r^2				
4 Point	Linear	0.216	0.070	0.348
5 Point	Linear	0.568	0.350	0.670
6 Point	Linear	0.711	0.609	0.766
7 Point	Linear	0.818	0.754	0.852
8 Point	Linear	0.856	0.801	0.884
9 Point	Linear	0.898	0.860	0.914
10 Point	Linear	0.922	0.897	0.931
4 Point	Expon'l	0.211	0.067	0.342
5 Point	Expon'l	0.568	0.349	0.668
6 Point	Expon'l	0.702	0.604	0.755
7 Point	Expon'l	0.813	0.752	0.846
8 Point	Expon'l	0.853	0.799	0.881
9 Point	Expon'l	0.897	0.859	0.914
10 Point	Expon'l	0.923	0.897	0.934

MEDICAL		Average	(Incur)	(Pd-25)
Freq Adj LR		(Pd & Inc)		
r^2				
4 Point	Linear	0.939	0.942	0.923
5 Point	Linear	0.909	0.864	0.926
6 Point	Linear	0.931	0.907	0.944
7 Point	Linear	0.948	0.929	0.957
8 Point	Linear	0.938	0.921	0.946
9 Point	Linear	0.956	0.945	0.962
10 Point	Linear	0.966	0.957	0.971
4 Point	Expon'l	0.944	0.944	0.930
5 Point	Expon'l	0.917	0.868	0.937
6 Point	Expon'l	0.922	0.897	0.936
7 Point	Expon'l	0.945	0.926	0.955
8 Point	Expon'l	0.939	0.922	0.948
9 Point	Expon'l	0.957	0.944	0.964
10 Point	Expon'l	0.959	0.949	0.966

INDEMNITY Linear FITTED	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
4 Point	2008	0.8616	0.8278	0.8954
	2009	0.8681	0.8308	0.9055
	2010	0.8747	0.8339	0.9156
	2011	0.8813	0.8370	0.9257
5 Point	2007	0.8394	0.8151	0.8636
	2008	0.8512	0.8214	0.8810
	2009	0.8629	0.8276	0.8983
	2010	0.8747	0.8339	0.9156
	2011	0.8865	0.8402	0.9329
6 Point	2006	0.7912	0.7758	0.8064
	2007	0.8129	0.7911	0.8346
	2008	0.8346	0.8064	0.8628
	2009	0.8563	0.8216	0.8910
	2010	0.8780	0.8369	0.9192
	2011	0.8997	0.8522	0.9474
7 Point	2005	0.7587	0.7478	0.7694
	2006	0.7829	0.7661	0.7996
	2007	0.8071	0.7843	0.8299
	2008	0.8313	0.8025	0.8601
	2009	0.8555	0.8207	0.8903
	2010	0.8797	0.8389	0.9206
	2011	0.9039	0.8571	0.9508
8 Point	2004	0.7403	0.7345	0.7460
	2005	0.7633	0.7518	0.7749
	2006	0.7863	0.7690	0.8037
	2007	0.8094	0.7862	0.8326
	2008	0.8324	0.8034	0.8615
	2009	0.8555	0.8207	0.8903
	2010	0.8785	0.8379	0.9192
	2011	0.9016	0.8551	0.9481
9 Point	2003	0.7142	0.7099	0.7185
	2004	0.7378	0.7284	0.7471
	2005	0.7613	0.7470	0.7757
	2006	0.7849	0.7655	0.8044
	2007	0.8085	0.7840	0.8330
	2008	0.8321	0.8026	0.8616
	2009	0.8557	0.8211	0.8903
	2010	0.8792	0.8396	0.9189
	2011	0.9028	0.8582	0.9475
10 Point	2002	0.6922	0.6893	0.6951
	2003	0.7155	0.7082	0.7229
	2004	0.7389	0.7270	0.7507
	2005	0.7622	0.7459	0.7785
	2006	0.7855	0.7647	0.8063
	2007	0.8088	0.7836	0.8341
	2008	0.8322	0.8025	0.8619
	2009	0.8555	0.8213	0.8897
	2010	0.8788	0.8402	0.9175
	2011	0.9021	0.8590	0.9453

INDEMNITY Expon'l FITTED	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
4 Point	2008	0.8617	0.8278	0.8956
	2009	0.8681	0.8308	0.9054
	2010	0.8745	0.8338	0.9153
	2011	0.8810	0.8368	0.9254
5 Point	2007	0.8394	0.8151	0.8637
	2008	0.8510	0.8213	0.8806
	2009	0.8627	0.8275	0.8978
	2010	0.8745	0.8338	0.9153
	2011	0.8865	0.8401	0.9332
6 Point	2006	0.7906	0.7752	0.8059
	2007	0.8116	0.7902	0.8329
	2008	0.8332	0.8055	0.8608
	2009	0.8554	0.8211	0.8897
	2010	0.8782	0.8370	0.9195
	2011	0.9016	0.8532	0.9503
7 Point	2005	0.7589	0.7477	0.7701
	2006	0.7817	0.7652	0.7982
	2007	0.8053	0.7830	0.8273
	2008	0.8295	0.8013	0.8575
	2009	0.8545	0.8200	0.8888
	2010	0.8802	0.8392	0.9213
	2011	0.9067	0.8588	0.9549
8 Point	2004	0.7416	0.7351	0.7482
	2005	0.7629	0.7514	0.7744
	2006	0.7848	0.7680	0.8016
	2007	0.8074	0.7850	0.8297
	2008	0.8306	0.8023	0.8587
	2009	0.8545	0.8200	0.8888
	2010	0.8790	0.8382	0.9200
	2011	0.9043	0.8567	0.9522
9 Point	2003	0.7164	0.7110	0.7221
	2004	0.7378	0.7282	0.7475
	2005	0.7599	0.7458	0.7739
	2006	0.7825	0.7638	0.8011
	2007	0.8059	0.7823	0.8294
	2008	0.8300	0.8012	0.8586
	2009	0.8548	0.8206	0.8889
	2010	0.8803	0.8404	0.9202
	2011	0.9066	0.8608	0.9526
10 Point	2002	0.6955	0.6912	0.7001
	2003	0.7163	0.7084	0.7244
	2004	0.7377	0.7260	0.7494
	2005	0.7598	0.7441	0.7754
	2006	0.7825	0.7626	0.8023
	2007	0.8059	0.7816	0.8300
	2008	0.8300	0.8010	0.8588
	2009	0.8548	0.8210	0.8885
	2010	0.8804	0.8414	0.9193
	2011	0.9067	0.8624	0.9511

MEDICAL Linear FITTED	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
4 Point	2008	0.8439	0.8060	0.8816
	2009	0.8840	0.8432	0.9246
	2010	0.9241	0.8805	0.9676
	2011	0.9641	0.9177	1.0106
5 Point	2007	0.8261	0.7960	0.8559
	2008	0.8587	0.8241	0.8931
	2009	0.8914	0.8523	0.9304
	2010	0.9241	0.8805	0.9676
	2011	0.9567	0.9086	1.0049
6 Point	2006	0.7710	0.7455	0.7964
	2007	0.8098	0.7798	0.8397
	2008	0.8486	0.8140	0.8830
	2009	0.8873	0.8483	0.9263
	2010	0.9261	0.8825	0.9696
	2011	0.9649	0.9167	1.0129
7 Point	2005	0.7402	0.7187	0.7616
	2006	0.7771	0.7513	0.8029
	2007	0.8141	0.7838	0.8443
	2008	0.8510	0.8163	0.8856
	2009	0.8879	0.8488	0.9270
	2010	0.9249	0.8814	0.9683
	2011	0.9618	0.9139	1.0097
8 Point	2004	0.7208	0.7020	0.7395
	2005	0.7542	0.7314	0.7770
	2006	0.7876	0.7608	0.8145
	2007	0.8211	0.7901	0.8520
	2008	0.8545	0.8195	0.8895
	2009	0.8879	0.8488	0.9270
	2010	0.9214	0.8782	0.9645
	2011	0.9548	0.9075	1.0020
9 Point	2003	0.6850	0.6683	0.7017
	2004	0.7189	0.6984	0.7393
	2005	0.7527	0.7286	0.7768
	2006	0.7865	0.7587	0.8144
	2007	0.8204	0.7888	0.8519
	2008	0.8542	0.8190	0.8895
	2009	0.8881	0.8491	0.9270
	2010	0.9219	0.8792	0.9646
	2011	0.9558	0.9093	1.0021
10 Point	2002	0.6423	0.6284	0.6562
	2003	0.6775	0.6601	0.6950
	2004	0.7128	0.6918	0.7338
	2005	0.7480	0.7234	0.7726
	2006	0.7833	0.7551	0.8114
	2007	0.8185	0.7868	0.8502
	2008	0.8538	0.8184	0.8890
	2009	0.8890	0.8501	0.9278
	2010	0.9243	0.8818	0.9667
	2011	0.9595	0.9134	1.0055

MEDICAL Expon'l FITTED	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
4 Point	2008	0.8452	0.8070	0.8832
	2009	0.8832	0.8425	0.9238
	2010	0.9229	0.8795	0.9663
	2011	0.9644	0.9181	1.0108
5 Point	2007	0.8279	0.7974	0.8581
	2008	0.8585	0.8239	0.8928
	2009	0.8901	0.8512	0.9288
	2010	0.9229	0.8795	0.9663
	2011	0.9570	0.9087	1.0053
6 Point	2006	0.7731	0.7471	0.7990
	2007	0.8087	0.7788	0.8385
	2008	0.8459	0.8118	0.8799
	2009	0.8849	0.8462	0.9235
	2010	0.9257	0.8821	0.9691
	2011	0.9683	0.9195	1.0170
7 Point	2005	0.7438	0.7216	0.7659
	2006	0.7769	0.7510	0.8027
	2007	0.8115	0.7816	0.8412
	2008	0.8476	0.8135	0.8816
	2009	0.8853	0.8467	0.9239
	2010	0.9247	0.8812	0.9682
	2011	0.9659	0.9171	1.0147
8 Point	2004	0.7257	0.7060	0.7455
	2005	0.7552	0.7322	0.7782
	2006	0.7858	0.7592	0.8123
	2007	0.8177	0.7873	0.8479
	2008	0.8508	0.8165	0.8851
	2009	0.8853	0.8467	0.9239
	2010	0.9212	0.8780	0.9644
	2011	0.9586	0.9105	1.0067
9 Point	2003	0.6913	0.6733	0.7093
	2004	0.7204	0.6996	0.7413
	2005	0.7508	0.7269	0.7747
	2006	0.7825	0.7553	0.8097
	2007	0.8155	0.7848	0.8462
	2008	0.8499	0.8154	0.8844
	2009	0.8858	0.8472	0.9243
	2010	0.9232	0.8803	0.9660
	2011	0.9621	0.9146	1.0095
10 Point	2002	0.6500	0.6346	0.6654
	2003	0.6796	0.6616	0.6976
	2004	0.7105	0.6897	0.7313
	2005	0.7429	0.7190	0.7667
	2006	0.7767	0.7495	0.8038
	2007	0.8121	0.7813	0.8427
	2008	0.8490	0.8145	0.8834
	2009	0.8877	0.8491	0.9262
	2010	0.9281	0.8851	0.9710
	2011	0.9704	0.9227	1.0179

INDEMNITY Linear RESIDUALS	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
4 Point	2008	0.0099	0.0095	0.0103
	2009	-0.0045	-0.0053	-0.0037
	2010	-0.0207	-0.0179	-0.0235
	2011	0.0153	0.0137	0.0169
5 Point	2007	-0.0104	-0.0064	-0.0144
	2008	0.0203	0.0159	0.0247
	2009	0.0007	-0.0021	0.0035
	2010	-0.0207	-0.0179	-0.0235
	2011	0.0101	0.0105	0.0097
6 Point	2006	-0.0332	-0.0300	-0.0362
	2007	0.0161	0.0176	0.0146
	2008	0.0369	0.0309	0.0429
	2009	0.0073	0.0039	0.0108
	2010	-0.0240	-0.0209	-0.0271
	2011	-0.0031	-0.0015	-0.0048
7 Point	2005	-0.0125	-0.0146	-0.0103
	2006	-0.0249	-0.0202	-0.0294
	2007	0.0219	0.0244	0.0193
	2008	0.0402	0.0348	0.0456
	2009	0.0081	0.0048	0.0115
	2010	-0.0257	-0.0229	-0.0285
	2011	-0.0073	-0.0064	-0.0082
8 Point	2004	0.0081	0.0069	0.0096
	2005	-0.0171	-0.0186	-0.0158
	2006	-0.0283	-0.0232	-0.0335
	2007	0.0196	0.0225	0.0166
	2008	0.0391	0.0339	0.0442
	2009	0.0081	0.0048	0.0115
	2010	-0.0245	-0.0219	-0.0271
	2011	-0.0050	-0.0044	-0.0055
9 Point	2003	-0.0050	-0.0122	0.0022
	2004	0.0106	0.0130	0.0085
	2005	-0.0151	-0.0138	-0.0166
	2006	-0.0269	-0.0197	-0.0342
	2007	0.0205	0.0247	0.0162
	2008	0.0394	0.0347	0.0441
	2009	0.0079	0.0044	0.0115
	2010	-0.0252	-0.0236	-0.0268
	2011	-0.0062	-0.0075	-0.0049
10 Point	2002	0.0030	-0.0039	0.0100
	2003	-0.0063	-0.0105	-0.0022
	2004	0.0095	0.0144	0.0049
	2005	-0.0160	-0.0127	-0.0194
	2006	-0.0275	-0.0189	-0.0361
	2007	0.0202	0.0251	0.0151
	2008	0.0393	0.0348	0.0438
	2009	0.0081	0.0042	0.0121
	2010	-0.0248	-0.0242	-0.0254
	2011	-0.0055	-0.0083	-0.0027

INDEMNITY Expon'l RESIDUALS	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
4 Point	2008	0.0098	0.0095	0.0101
	2009	-0.0045	-0.0053	-0.0036
	2010	-0.0205	-0.0178	-0.0232
	2011	0.0156	0.0139	0.0172
5 Point	2007	-0.0104	-0.0064	-0.0145
	2008	0.0205	0.0160	0.0251
	2009	0.0009	-0.0020	0.0040
	2010	-0.0205	-0.0178	-0.0232
	2011	0.0101	0.0106	0.0094
6 Point	2006	-0.0326	-0.0294	-0.0357
	2007	0.0174	0.0185	0.0163
	2008	0.0383	0.0318	0.0449
	2009	0.0082	0.0044	0.0121
	2010	-0.0242	-0.0210	-0.0274
	2011	-0.0050	-0.0025	-0.0077
7 Point	2005	-0.0127	-0.0145	-0.0110
	2006	-0.0237	-0.0194	-0.0280
	2007	0.0237	0.0257	0.0219
	2008	0.0420	0.0360	0.0482
	2009	0.0091	0.0055	0.0130
	2010	-0.0262	-0.0232	-0.0292
	2011	-0.0101	-0.0081	-0.0123
8 Point	2004	0.0068	0.0063	0.0074
	2005	-0.0167	-0.0182	-0.0153
	2006	-0.0268	-0.0222	-0.0314
	2007	0.0216	0.0237	0.0195
	2008	0.0409	0.0350	0.0470
	2009	0.0091	0.0055	0.0130
	2010	-0.0250	-0.0222	-0.0279
	2011	-0.0077	-0.0060	-0.0096
9 Point	2003	-0.0072	-0.0133	-0.0014
	2004	0.0106	0.0132	0.0081
	2005	-0.0137	-0.0126	-0.0148
	2006	-0.0245	-0.0180	-0.0309
	2007	0.0231	0.0264	0.0198
	2008	0.0415	0.0361	0.0471
	2009	0.0088	0.0049	0.0129
	2010	-0.0263	-0.0244	-0.0281
	2011	-0.0100	-0.0101	-0.0100
10 Point	2002	-0.0003	-0.0058	0.0050
	2003	-0.0071	-0.0107	-0.0037
	2004	0.0107	0.0154	0.0062
	2005	-0.0136	-0.0109	-0.0163
	2006	-0.0245	-0.0168	-0.0321
	2007	0.0231	0.0271	0.0192
	2008	0.0415	0.0363	0.0469
	2009	0.0088	0.0045	0.0133
	2010	-0.0264	-0.0254	-0.0272
	2011	-0.0101	-0.0117	-0.0085

MEDICAL Linear RESIDUALS	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
4 Point	2008	0.0125	0.0107	0.0143
	2009	-0.0160	-0.0170	-0.0150
	2010	-0.0055	0.0019	-0.0127
	2011	0.0090	0.0044	0.0135
5 Point	2007	0.0148	0.0181	0.0115
	2008	-0.0023	-0.0074	0.0028
	2009	-0.0234	-0.0261	-0.0208
	2010	-0.0055	0.0019	-0.0127
	2011	0.0164	0.0135	0.0192
6 Point	2006	-0.0203	-0.0202	-0.0202
	2007	0.0311	0.0343	0.0277
	2008	0.0078	0.0027	0.0129
	2009	-0.0193	-0.0221	-0.0167
	2010	-0.0075	-0.0001	-0.0147
	2011	0.0082	0.0054	0.0112
7 Point	2005	0.0091	0.0086	0.0097
	2006	-0.0264	-0.0260	-0.0267
	2007	0.0268	0.0303	0.0231
	2008	0.0054	0.0004	0.0103
	2009	-0.0199	-0.0226	-0.0174
	2010	-0.0063	0.0011	-0.0134
	2011	0.0113	0.0082	0.0144
8 Point	2004	0.0245	0.0222	0.0269
	2005	-0.0049	-0.0041	-0.0057
	2006	-0.0369	-0.0355	-0.0383
	2007	0.0198	0.0240	0.0154
	2008	0.0019	-0.0028	0.0064
	2009	-0.0199	-0.0226	-0.0174
	2010	-0.0028	0.0042	-0.0096
	2011	0.0183	0.0146	0.0221
9 Point	2003	-0.0038	-0.0072	-0.0004
	2004	0.0264	0.0258	0.0271
	2005	-0.0034	-0.0013	-0.0055
	2006	-0.0358	-0.0334	-0.0382
	2007	0.0205	0.0253	0.0155
	2008	0.0022	-0.0023	0.0064
	2009	-0.0201	-0.0229	-0.0174
	2010	-0.0033	0.0032	-0.0097
	2011	0.0173	0.0128	0.0220
10 Point	2002	-0.0168	-0.0184	-0.0152
	2003	0.0037	0.0010	0.0063
	2004	0.0325	0.0324	0.0326
	2005	0.0013	0.0039	-0.0013
	2006	-0.0326	-0.0298	-0.0352
	2007	0.0224	0.0273	0.0172
	2008	0.0026	-0.0017	0.0069
	2009	-0.0210	-0.0239	-0.0182
	2010	-0.0057	0.0006	-0.0118
	2011	0.0136	0.0087	0.0186

MEDICAL Expon'l RESIDUALS	Policy Year	Severity Ratio (Avg Pd & Inc)	Severity Ratio (Incur)	Severity Ratio (Pd-25)
4 Point	2008	0.0112	0.0097	0.0127
	2009	-0.0152	-0.0163	-0.0142
	2010	-0.0043	0.0029	-0.0114
	2011	0.0087	0.0040	0.0133
5 Point	2007	0.0130	0.0167	0.0093
	2008	-0.0021	-0.0072	0.0031
	2009	-0.0221	-0.0250	-0.0192
	2010	-0.0043	0.0029	-0.0114
	2011	0.0161	0.0134	0.0188
6 Point	2006	-0.0224	-0.0218	-0.0228
	2007	0.0322	0.0353	0.0289
	2008	0.0105	0.0049	0.0160
	2009	-0.0169	-0.0200	-0.0139
	2010	-0.0071	0.0003	-0.0142
	2011	0.0048	0.0026	0.0071
7 Point	2005	0.0055	0.0057	0.0054
	2006	-0.0262	-0.0257	-0.0265
	2007	0.0294	0.0325	0.0262
	2008	0.0088	0.0032	0.0143
	2009	-0.0173	-0.0205	-0.0143
	2010	-0.0061	0.0012	-0.0133
	2011	0.0072	0.0050	0.0094
8 Point	2004	0.0196	0.0182	0.0209
	2005	-0.0059	-0.0049	-0.0069
	2006	-0.0351	-0.0339	-0.0361
	2007	0.0232	0.0268	0.0195
	2008	0.0056	0.0002	0.0108
	2009	-0.0173	-0.0205	-0.0143
	2010	-0.0026	0.0044	-0.0095
	2011	0.0145	0.0116	0.0174
9 Point	2003	-0.0101	-0.0122	-0.0080
	2004	0.0249	0.0246	0.0251
	2005	-0.0015	0.0004	-0.0034
	2006	-0.0318	-0.0300	-0.0335
	2007	0.0254	0.0293	0.0212
	2008	0.0065	0.0013	0.0115
	2009	-0.0178	-0.0210	-0.0147
	2010	-0.0046	0.0021	-0.0111
	2011	0.0110	0.0075	0.0146
10 Point	2002	-0.0245	-0.0246	-0.0244
	2003	0.0016	-0.0005	0.0037
	2004	0.0348	0.0345	0.0351
	2005	0.0064	0.0083	0.0046
	2006	-0.0260	-0.0242	-0.0276
	2007	0.0288	0.0328	0.0247
	2008	0.0074	0.0022	0.0125
	2009	-0.0197	-0.0229	-0.0166
	2010	-0.0095	-0.0027	-0.0161
	2011	0.0027	-0.0006	0.0062