PENNSYLVANIA COMPENSATION RATING BUREAU

Measures of Goodness of Fit in Trend Calculations Using Loss Ratios

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

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 loss 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 r^2		Average (Pd & Inc)	(Incur)	(Pd-27)
4 Point	Linear	0.663	0.758	0.497
5 Point	Linear	0.804	0.849	0.713
6 Point	Linear	0.886	0.914	0.833
7 Point	Linear	0.929	0.945	0.896
8 Point	Linear	0.922	0.944	0.880
9 Point	Linear	0.924	0.941	0.891
10 Point	Linear	0.935	0.949	0.908
4 Point	Expon'l	0.657	0.753	0.489
5 Point	Expon'l	0.797	0.844	0.706
6 Point	Expon'l	0.884	0.911	0.831
7 Point	Expon'l	0.927	0.944	0.894
8 Point	Expon'l	0.919	0.940	0.877
9 Point	Expon'l	0.919	0.934	0.887
10 Point	Expon'l	0.937	0.950	0.911

MEDICAL r^2		Average (Pd & Inc)	(Incur)	(Pd-27)
4 Point	Linear	0.427	0.438	0.383
5 Point	Linear	0.058	0.076	0.034
6 Point	Linear	0.062	0.066	0.054
7 Point	Linear	0.346	0.341	0.343
8 Point	Linear	0.280	0.323	0.214
9 Point	Linear	0.373	0.420	0.298
10 Point	Linear	0.542	0.577	0.487
4 Point	Expon'l	0.419	0.428	0.379
5 Point	Expon'l	0.058	0.076	0.034
6 Point	Expon'l	0.063	0.067	0.055
7 Point	Expon'l	0.342	0.337	0.341
8 Point	Expon'l	0.281	0.323	0.215
9 Point	Expon'l	0.373	0.419	0.299
10 Point	Expon'l	0.543	0.577	0.489

INDEMNITY Linear **FITTED**	Policy Year	Loss Ratio Average (Pd & Inc)	Loss Ratio (Incur)	Loss Ratio (Pd-27)
4 Point	2010	0.5278	0.5061	0.5495
	2011	0.5143	0.4881	0.5404
	2012	0.5007	0.4701	0.5313
	2013	0.4872	0.4521	0.5222
5 Point	2009	0.5422	0.5217	0.5625
	2010	0.5284	0.5045	0.5521
	2011	0.5145	0.4873	0.5417
	2012	0.5007	0.4701	0.5313
	2013	0.4869	0.4529	0.5209
6 Point	2008	0.5635	0.5447	0.5824
	2009	0.5477	0.5259	0.5694
	2010	0.5318	0.5071	0.5564
	2011	0.5159	0.4884	0.5434
	2012	0.5000	0.4696	0.5304
	2013	0.4842	0.4508	0.5174
7 Point	2007	0.5838	0.5681	0.5995
	2008	0.5669	0.5483	0.5855
	2009	0.5500	0.5284	0.5716
	2010	0.5331	0.5086	0.5577
	2011	0.5163	0.4887	0.5437
	2012	0.4994	0.4689	0.5298
	2013	0.4825	0.4490	0.5159
8 Point	2006	0.5927	0.5804	0.6051
	2007	0.5774	0.5620	0.5928
	2008	0.5621	0.5437	0.5805
	2009	0.5468	0.5254	0.5683
	2010	0.5315	0.5071	0.5560
	2011	0.5163	0.4887	0.5437
	2012	0.5010	0.4704	0.5315
	2013	0.4857	0.4521	0.5192
9 Point	2005	0.6019	0.5911	0.6127
	2006	0.5877	0.5741	0.6012
	2007	0.5735	0.5571	0.5898
	2008	0.5592	0.5401	0.5783
	2009	0.5450	0.5232	0.5669
	2010	0.5308	0.5062	0.5554
	2011	0.5166	0.4892	0.5440
	2012	0.5024	0.4722	0.5326
	2013	0.4882	0.4552	0.5211
10 Point	2004	0.6247	0.6168	0.6327
	2005	0.6091	0.5984	0.6199
	2006	0.5936	0.5801	0.6071
	2007	0.5780	0.5617	0.5943
	2008	0.5624	0.5433	0.5815
	2009	0.5468	0.5250	0.5687
	2010	0.5313	0.5066	0.5559
	2011	0.5157	0.4883	0.5431
	2012	0.5001	0.4699	0.5303
	2013	0.4846	0.4516	0.5175

INDEMNITY Expon'l **FITTED**	Policy Year	Loss Ratio Average (Pd & Inc)	Loss Ratio (Incur)	Loss Ratio (Pd-27)
4 Point	2010	0.5276	0.5059	0.5493
	2011	0.5139	0.4875	0.5402
	2012	0.5005	0.4698	0.5311
	2013	0.4875	0.4527	0.5223
5 Point	2009	0.5423	0.5221	0.5626
	2010	0.5280	0.5040	0.5519
	2011	0.5141	0.4866	0.5414
	2012	0.5005	0.4698	0.5311
	2013	0.4873	0.4536	0.5211
6 Point	2008	0.5640	0.5455	0.5825
	2009	0.5472	0.5254	0.5690
	2010	0.5310	0.5060	0.5558
	2011	0.5152	0.4874	0.5430
	2012	0.5000	0.4694	0.5304
	2013	0.4851	0.4521	0.5181
7 Point	2007	0.5848	0.5697	0.6000
	2008	0.5666	0.5480	0.5853
	2009	0.5490	0.5271	0.5709
	2010	0.5320	0.5070	0.5569
	2011	0.5155	0.4876	0.5432
	2012	0.4995	0.4690	0.5299
	2013	0.4840	0.4511	0.5169
8 Point	2006	0.5942	0.5828	0.6059
	2007	0.5776	0.5624	0.5928
	2008	0.5614	0.5427	0.5800
	2009	0.5457	0.5237	0.5675
	2010	0.5304	0.5053	0.5552
	2011	0.5155	0.4876	0.5432
	2012	0.5010	0.4705	0.5315
	2013	0.4870	0.4540	0.5200
9 Point	2005	0.6039	0.5943	0.6139
	2006	0.5883	0.5751	0.6015
	2007	0.5730	0.5565	0.5895
	2008	0.5581	0.5386	0.5776
	2009	0.5437	0.5212	0.5660
	2010	0.5296	0.5043	0.5546
	2011	0.5159	0.4881	0.5435
	2012	0.5025	0.4723	0.5326
	2013	0.4895	0.4571	0.5219
10 Point	2004	0.6272	0.6206	0.6341
	2005	0.6098	0.5996	0.6202
	2006	0.5929	0.5793	0.6066
	2007	0.5765	0.5596	0.5932
	2008	0.5605	0.5407	0.5802
	2009	0.5450	0.5223	0.5675
	2010	0.5299	0.5046	0.5550
	2011	0.5152	0.4875	0.5428
	2012	0.5010	0.4710	0.5309
	2013	0.4871	0.4550	0.5192

MEDICAL Linear **FITTED**	Policy Year	Loss Ratio Average (Pd & Inc)	Loss Ratio (Incur)	Loss Ratio (Pd-27)
4 Point	2010	0.5980	0.5801	0.6157
	2011	0.5897	0.5701	0.6092
	2012	0.5814	0.5600	0.6027
	2013	0.5731	0.5499	0.5962
5 Point	2009	0.5882	0.5692	0.6071
	2010	0.5859	0.5661	0.6056
	2011	0.5836	0.5631	0.6042
	2012	0.5814	0.5600	0.6027
	2013	0.5791	0.5569	0.6013
6 Point	2008	0.5886	0.5689	0.6083
	2009	0.5869	0.5668	0.6069
	2010	0.5851	0.5646	0.6055
	2011	0.5833	0.5625	0.6041
	2012	0.5815	0.5603	0.6028
	2013	0.5798	0.5581	0.6014
7 Point	2007	0.6042	0.5862	0.6223
	2008	0.5993	0.5805	0.6180
	2009	0.5943	0.5749	0.6137
	2010	0.5893	0.5693	0.6094
	2011	0.5844	0.5636	0.6051
	2012	0.5794	0.5580	0.6008
	2013	0.5745	0.5523	0.5965
8 Point	2006	0.6027	0.5864	0.6190
	2007	0.5990	0.5818	0.6162
	2008	0.5954	0.5773	0.6134
	2009	0.5917	0.5727	0.6106
	2010	0.5880	0.5682	0.6079
	2011	0.5844	0.5636	0.6051
	2012	0.5807	0.5591	0.6023
	2013	0.5771	0.5545	0.5996
9 Point	2005	0.6071	0.5917	0.6224
	2006	0.6033	0.5870	0.6195
	2007	0.5995	0.5823	0.6166
	2008	0.5957	0.5776	0.6138
	2009	0.5919	0.5730	0.6109
	2010	0.5881	0.5683	0.6080
	2011	0.5843	0.5636	0.6051
	2012	0.5805	0.5589	0.6022
	2013	0.5767	0.5542	0.5993
10 Point	2004	0.6244	0.6094	0.6395
	2005	0.6185	0.6026	0.6344
	2006	0.6126	0.5959	0.6292
	2007	0.6066	0.5892	0.6241
	2008	0.6007	0.5824	0.6190
	2009	0.5948	0.5757	0.6138
	2010	0.5888	0.5689	0.6087
	2011	0.5829	0.5622	0.6036
	2012	0.5770	0.5555	0.5984
	2013	0.5710	0.5487	0.5933

MEDICAL Expon'l **FITTED**	Policy Year	Loss Ratio Average (Pd & Inc)	Loss Ratio (Incur)	Loss Ratio (Pd-27)
4 Point	2010	0.5979	0.5800	0.6157
	2011	0.5895	0.5698	0.6091
	2012	0.5812	0.5598	0.6026
	2013	0.5731	0.5499	0.5962
5 Point	2009	0.5880	0.5690	0.6070
	2010	0.5858	0.5659	0.6055
	2011	0.5835	0.5628	0.6041
	2012	0.5812	0.5598	0.6026
	2013	0.5790	0.5567	0.6012
6 Point	2008	0.5886	0.5689	0.6083
	2009	0.5868	0.5667	0.6069
	2010	0.5850	0.5644	0.6054
	2011	0.5832	0.5623	0.6040
	2012	0.5814	0.5601	0.6026
	2013	0.5796	0.5579	0.6012
7 Point	2007	0.6040	0.5860	0.6221
	2008	0.5990	0.5802	0.6178
	2009	0.5940	0.5745	0.6135
	2010	0.5891	0.5689	0.6092
	2011	0.5842	0.5634	0.6050
	2012	0.5793	0.5579	0.6008
	2013	0.5745	0.5524	0.5966
8 Point	2006	0.6026	0.5863	0.6188
	2007	0.5989	0.5817	0.6160
	2008	0.5952	0.5770	0.6133
	2009	0.5915	0.5724	0.6105
	2010	0.5878	0.5679	0.6077
	2011	0.5842	0.5634	0.6050
	2012	0.5806	0.5589	0.6022
	2013	0.5770	0.5544	0.5995
9 Point	2005	0.6071	0.5918	0.6224
	2006	0.6032	0.5869	0.6194
	2007	0.5993	0.5821	0.6165
	2008	0.5955	0.5774	0.6136
	2009	0.5917	0.5726	0.6107
	2010	0.5879	0.5680	0.6078
	2011	0.5842	0.5633	0.6049
	2012	0.5804	0.5587	0.6021
	2013	0.5767	0.5542	0.5992
10 Point	2004	0.6242	0.6093	0.6392
	2005	0.6181	0.6023	0.6340
	2006	0.6121	0.5954	0.6288
	2007	0.6061	0.5886	0.6237
	2008	0.6002	0.5818	0.6186
	2009	0.5944	0.5752	0.6135
	2010	0.5886	0.5686	0.6085
	2011	0.5828	0.5621	0.6035
	2012	0.5772	0.5556	0.5986
	2013	0.5715	0.5493	0.5937

INDEMNITY Linear RESIDUALS	Policy Year	Loss Ratio Average (Pd & Inc)	Loss Ratio (Incur)	Loss Ratio (Pd-27)
4 Point	2010	0.0078	0.0082	0.0074
	2011	-0.0038	-0.0039	-0.0037
	2012	-0.0158	-0.0167	-0.0150
	2013	0.0118	0.0125	0.0112
5 Point	2009	0.0005	-0.0016	0.0027
	2010	0.0072	0.0098	0.0048
	2011	-0.0040	-0.0031	-0.0050
	2012	-0.0158	-0.0167	-0.0150
	2013	0.0121	0.0117	0.0125
6 Point	2008	0.0069	0.0052	0.0085
	2009	-0.0050	-0.0058	-0.0042
	2010	0.0038	0.0072	0.0005
	2011	-0.0054	-0.0042	-0.0067
	2012	-0.0151	-0.0162	-0.0141
	2013	0.0148	0.0138	0.0160
7 Point	2007	0.0051	0.0055	0.0047
	2008	0.0035	0.0016	0.0054
	2009	-0.0073	-0.0083	-0.0064
	2010	0.0025	0.0057	-0.0008
	2011	-0.0058	-0.0045	-0.0070
	2012	-0.0145	-0.0155	-0.0135
	2013	0.0165	0.0156	0.0175
8 Point	2006	-0.0112	-0.0107	-0.0117
	2007	0.0115	0.0116	0.0114
	2008	0.0083	0.0062	0.0104
	2009	-0.0041	-0.0053	-0.0031
	2010	0.0041	0.0072	0.0009
	2011	-0.0058	-0.0045	-0.0070
	2012	-0.0161	-0.0170	-0.0152
	2013	0.0133	0.0125	0.0142
9 Point	2005	-0.0101	-0.0125	-0.0077
	2006	-0.0062	-0.0044	-0.0078
	2007	0.0154	0.0165	0.0144
	2008	0.0112	0.0098	0.0126
	2009	-0.0023	-0.0031	-0.0017
	2010	0.0048	0.0081	0.0015
	2011	-0.0061	-0.0050	-0.0073
	2012	-0.0175	-0.0188	-0.0163
	2013	0.0108	0.0094	0.0123
10 Point	2004	0.0163	0.0164	0.0162
	2005	-0.0173	-0.0198	-0.0149
	2006	-0.0121	-0.0104	-0.0137
	2007	0.0109	0.0119	0.0099
	2008	0.0080	0.0066	0.0094
	2009	-0.0041	-0.0049	-0.0035
	2010	0.0043	0.0077	0.0010
	2011	-0.0052	-0.0041	-0.0064
	2012	-0.0152	-0.0165	-0.0140
	2013	0.0144	0.0130	0.0159

INDEMNITY Expon'l RESIDUALS	Policy Year	Loss Ratio Average (Pd & Inc)	Loss Ratio (Incur)	Loss Ratio (Pd-27)
4 Point	2010	0.0080	0.0084	0.0076
	2011	-0.0034	-0.0033	-0.0035
	2012	-0.0156	-0.0164	-0.0148
	2013	0.0115	0.0119	0.0111
5 Point	2009	0.0004	-0.0020	0.0026
	2010	0.0076	0.0103	0.0050
	2011	-0.0036	-0.0024	-0.0047
	2012	-0.0156	-0.0164	-0.0148
	2013	0.0117	0.0110	0.0123
6 Point	2008	0.0064	0.0044	0.0084
	2009	-0.0045	-0.0053	-0.0038
	2010	0.0046	0.0083	0.0011
	2011	-0.0047	-0.0032	-0.0063
	2012	-0.0151	-0.0160	-0.0141
	2013	0.0139	0.0125	0.0153
7 Point	2007	0.0041	0.0039	0.0042
	2008	0.0038	0.0019	0.0056
	2009	-0.0063	-0.0070	-0.0057
	2010	0.0036	0.0073	0.0000
	2011	-0.0050	-0.0034	-0.0065
	2012	-0.0146	-0.0156	-0.0136
	2013	0.0150	0.0135	0.0165
8 Point	2006	-0.0127	-0.0131	-0.0125
	2007	0.0113	0.0112	0.0114
	2008	0.0090	0.0072	0.0109
	2009	-0.0030	-0.0036	-0.0023
	2010	0.0052	0.0090	0.0017
	2011	-0.0050	-0.0034	-0.0065
	2012	-0.0161	-0.0171	-0.0152
	2013	0.0120	0.0106	0.0134
9 Point	2005	-0.0121	-0.0157	-0.0089
	2006	-0.0068	-0.0054	-0.0081
	2007	0.0159	0.0171	0.0147
	2008	0.0123	0.0113	0.0133
	2009	-0.0010	-0.0011	-0.0008
	2010	0.0060	0.0100	0.0023
	2011	-0.0054	-0.0039	-0.0068
	2012	-0.0176	-0.0189	-0.0163
	2013	0.0095	0.0075	0.0115
10 Point	2004	0.0138	0.0126	0.0148
	2005	-0.0180	-0.0210	-0.0152
	2006	-0.0114	-0.0096	-0.0132
	2007	0.0124	0.0140	0.0110
	2008	0.0099	0.0092	0.0107
	2009	-0.0023	-0.0022	-0.0023
	2010	0.0057	0.0097	0.0019
	2011	-0.0047	-0.0033	-0.0061
	2012	-0.0161	-0.0176	-0.0146
	2013	0.0119	0.0096	0.0142

MEDICAL Linear **RESIDUALS**	Policy Year	Loss Ratio Average (Pd & Inc)	Loss Ratio (Incur)	Loss Ratio (Pd-27)
4 Point	2010	0.0013	0.0039	-0.0012
	2011	0.0069	0.0048	0.0091
	2012	-0.0179	-0.0213	-0.0145
	2013	0.0096	0.0126	0.0067
5 Point	2009	-0.0121	-0.0140	-0.0101
	2010	0.0134	0.0179	0.0089
	2011	0.0130	0.0118	0.0141
	2012	-0.0179	-0.0213	-0.0145
	2013	0.0036	0.0056	0.0016
6 Point	2008	-0.0016	-0.0030	-0.0002
	2009	-0.0108	-0.0116	-0.0099
	2010	0.0142	0.0194	0.0090
	2011	0.0133	0.0124	0.0142
	2012	-0.0180	-0.0216	-0.0146
	2013	0.0029	0.0044	0.0015
7 Point	2007	0.0160	0.0174	0.0145
	2008	-0.0123	-0.0146	-0.0099
	2009	-0.0182	-0.0197	-0.0167
	2010	0.0100	0.0147	0.0051
	2011	0.0122	0.0113	0.0132
	2012	-0.0159	-0.0193	-0.0126
	2013	0.0083	0.0102	0.0064
8 Point	2006	-0.0091	-0.0076	-0.0107
	2007	0.0212	0.0218	0.0206
	2008	-0.0084	-0.0114	-0.0053
	2009	-0.0156	-0.0175	-0.0136
	2010	0.0113	0.0158	0.0066
	2011	0.0122	0.0113	0.0132
	2012	-0.0172	-0.0204	-0.0141
	2013	0.0057	0.0080	0.0033
9 Point	2005	0.0012	0.0013	0.0012
	2006	-0.0097	-0.0082	-0.0112
	2007	0.0207	0.0213	0.0202
	2008	-0.0087	-0.0117	-0.0057
	2009	-0.0158	-0.0178	-0.0139
	2010	0.0112	0.0157	0.0065
	2011	0.0123	0.0113	0.0132
	2012	-0.0170	-0.0202	-0.0140
	2013	0.0060	0.0083	0.0036
10 Point	2004	0.0257	0.0245	0.0269
	2005	-0.0102	-0.0096	-0.0108
	2006	-0.0190	-0.0171	-0.0209
	2007	0.0136	0.0144	0.0127
	2008	-0.0137	-0.0165	-0.0109
	2009	-0.0187	-0.0205	-0.0168
	2010	0.0105	0.0151	0.0058
	2011	0.0137	0.0127	0.0147
	2012	-0.0135	-0.0168	-0.0102
	2013	0.0117	0.0138	0.0096

MEDICAL Expon'l RESIDUALS	Policy Year	Loss Ratio Average (Pd & Inc)	Loss Ratio (Incur)	Loss Ratio (Pd-27)
4 Point	2010	0.0014	0.0040	-0.0012
	2011	0.0071	0.0051	0.0092
	2012	-0.0177	-0.0211	-0.0144
	2013	0.0096	0.0126	0.0067
5 Point	2009	-0.0119	-0.0138	-0.0100
	2010	0.0135	0.0181	0.0090
	2011	0.0131	0.0121	0.0142
	2012	-0.0177	-0.0211	-0.0144
	2013	0.0037	0.0058	0.0017
6 Point	2008	-0.0016	-0.0030	-0.0002
	2009	-0.0107	-0.0115	-0.0099
	2010	0.0143	0.0196	0.0091
	2011	0.0134	0.0126	0.0143
	2012	-0.0179	-0.0214	-0.0144
	2013	0.0031	0.0046	0.0017
7 Point	2007	0.0162	0.0176	0.0147
	2008	-0.0120	-0.0143	-0.0097
	2009	-0.0179	-0.0193	-0.0165
	2010	0.0102	0.0151	0.0053
	2011	0.0124	0.0115	0.0133
	2012	-0.0158	-0.0192	-0.0126
	2013	0.0082	0.0101	0.0063
8 Point	2006	-0.0090	-0.0075	-0.0105
	2007	0.0213	0.0219	0.0208
	2008	-0.0082	-0.0111	-0.0052
	2009	-0.0154	-0.0172	-0.0135
	2010	0.0115	0.0161	0.0068
	2011	0.0124	0.0115	0.0133
	2012	-0.0171	-0.0202	-0.0140
	2013	0.0057	0.0081	0.0034
9 Point	2005	0.0012	0.0012	0.0012
	2006	-0.0096	-0.0081	-0.0111
	2007	0.0209	0.0215	0.0203
	2008	-0.0085	-0.0115	-0.0055
	2009	-0.0156	-0.0174	-0.0137
	2010	0.0114	0.0160	0.0067
	2011	0.0124	0.0116	0.0134
	2012	-0.0169	-0.0200	-0.0139
	2013	0.0060	0.0083	0.0037
10 Point	2004	0.0259	0.0246	0.0272
	2005	-0.0098	-0.0093	-0.0104
	2006	-0.0185	-0.0166	-0.0205
	2007	0.0141	0.0150	0.0131
	2008	-0.0132	-0.0159	-0.0105
	2009	-0.0183	-0.0200	-0.0165
	2010	0.0107	0.0154	0.0060
	2011	0.0138	0.0128	0.0148
	2012	-0.0137	-0.0169	-0.0104
	2013	0.0112	0.0132	0.0092