

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 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 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		Average		
r^2		(Pd & Inc)	(Incur)	(Pd-25)
4 Point	Linear	0.956	0.965	0.941
5 Point	Linear	0.976	0.970	0.969
6 Point	Linear	0.836	0.909	0.679
7 Point	Linear	0.829	0.899	0.670
8 Point	Linear	0.866	0.913	0.769
9 Point	Linear	0.905	0.935	0.838
10 Point	Linear	0.913	0.943	0.854
4 Point	Expon'l	0.961	0.970	0.946
5 Point	Expon'l	0.979	0.976	0.971
6 Point	Expon'l	0.842	0.913	0.686
7 Point	Expon'l	0.831	0.900	0.676
8 Point	Expon'l	0.875	0.922	0.776
9 Point	Expon'l	0.910	0.939	0.842
10 Point	Expon'l	0.923	0.952	0.865

MEDICAL		Average		
r^2		(Pd & Inc)	(Incur)	(Pd-25)
4 Point	Linear	0.295	0.165	0.436
5 Point	Linear	0.183	0.247	0.099
6 Point	Linear	0.075	0.170	0.005
7 Point	Linear	0.197	0.325	0.054
8 Point	Linear	0.462	0.550	0.343
9 Point	Linear	0.532	0.607	0.423
10 Point	Linear	0.572	0.649	0.457
4 Point	Expon'l	0.293	0.165	0.431
5 Point	Expon'l	0.175	0.238	0.094
6 Point	Expon'l	0.073	0.168	0.004
7 Point	Expon'l	0.196	0.323	0.054
8 Point	Expon'l	0.459	0.548	0.338
9 Point	Expon'l	0.531	0.607	0.421
10 Point	Expon'l	0.573	0.649	0.457

INDEMNITY Linear FITTED	Policy Year	Loss Ratio Average (Pd & Inc)	Loss Ratio (Incur)	Loss Ratio (Pd-25)
4 Point	2008	0.5164	0.4961	0.5368
	2009	0.5020	0.4805	0.5235
	2010	0.4876	0.4649	0.5103
	2011	0.4732	0.4493	0.4970
5 Point	2007	0.5342	0.5187	0.5498
	2008	0.5187	0.5008	0.5366
	2009	0.5031	0.4828	0.5234
	2010	0.4876	0.4649	0.5103
	2011	0.4720	0.4470	0.4971
6 Point	2006	0.5348	0.5241	0.5455
	2007	0.5233	0.5096	0.5371
	2008	0.5119	0.4951	0.5287
	2009	0.5004	0.4806	0.5203
	2010	0.4890	0.4660	0.5119
	2011	0.4775	0.4515	0.5035
7 Point	2005	0.5395	0.5311	0.5478
	2006	0.5296	0.5183	0.5408
	2007	0.5197	0.5055	0.5338
	2008	0.5098	0.4928	0.5268
	2009	0.4999	0.4800	0.5198
	2010	0.4900	0.4672	0.5128
	2011	0.4801	0.4544	0.5058
8 Point	2004	0.5598	0.5544	0.5653
	2005	0.5478	0.5395	0.5562
	2006	0.5359	0.5246	0.5471
	2007	0.5239	0.5097	0.5380
	2008	0.5119	0.4949	0.5289
	2009	0.4999	0.4800	0.5198
	2010	0.4879	0.4651	0.5107
	2011	0.4759	0.4502	0.5016
9 Point	2003	0.5729	0.5678	0.5780
	2004	0.5607	0.5531	0.5683
	2005	0.5485	0.5385	0.5585
	2006	0.5364	0.5239	0.5488
	2007	0.5242	0.5093	0.5391
	2008	0.5120	0.4947	0.5293
	2009	0.4998	0.4801	0.5196
	2010	0.4877	0.4655	0.5099
	2011	0.4755	0.4508	0.5001
10 Point	2002	0.5952	0.5904	0.5999
	2003	0.5814	0.5745	0.5883
	2004	0.5676	0.5586	0.5766
	2005	0.5538	0.5428	0.5649
	2006	0.5401	0.5269	0.5533
	2007	0.5263	0.5110	0.5416
	2008	0.5125	0.4951	0.5300
	2009	0.4988	0.4792	0.5183
	2010	0.4850	0.4633	0.5066
	2011	0.4712	0.4475	0.4950

INDEMNITY Expon'l FITTED	Policy Year	Loss Ratio Average (Pd & Inc)	Loss Ratio (Incur)	Loss Ratio (Pd-25)
4 Point	2008	0.5165	0.4962	0.5368
	2009	0.5018	0.4802	0.5233
	2010	0.4874	0.4647	0.5101
	2011	0.4735	0.4497	0.4973
5 Point	2007	0.5346	0.5191	0.5500
	2008	0.5184	0.5003	0.5364
	2009	0.5027	0.4822	0.5231
	2010	0.4874	0.4647	0.5101
	2011	0.4726	0.4478	0.4975
6 Point	2006	0.5353	0.5249	0.5457
	2007	0.5233	0.5095	0.5370
	2008	0.5115	0.4945	0.5284
	2009	0.5000	0.4799	0.5200
	2010	0.4887	0.4658	0.5117
	2011	0.4777	0.4521	0.5035
7 Point	2005	0.5401	0.5322	0.5481
	2006	0.5297	0.5184	0.5408
	2007	0.5194	0.5050	0.5336
	2008	0.5093	0.4920	0.5265
	2009	0.4994	0.4793	0.5195
	2010	0.4898	0.4669	0.5126
	2011	0.4803	0.4549	0.5057
8 Point	2004	0.5606	0.5557	0.5656
	2005	0.5478	0.5395	0.5561
	2006	0.5353	0.5238	0.5467
	2007	0.5230	0.5085	0.5375
	2008	0.5111	0.4937	0.5284
	2009	0.4994	0.4793	0.5195
	2010	0.4880	0.4653	0.5107
	2011	0.4769	0.4518	0.5021
9 Point	2003	0.5740	0.5697	0.5785
	2004	0.5609	0.5535	0.5682
	2005	0.5480	0.5379	0.5581
	2006	0.5354	0.5226	0.5481
	2007	0.5231	0.5078	0.5384
	2008	0.5111	0.4934	0.5288
	2009	0.4994	0.4794	0.5193
	2010	0.4880	0.4659	0.5101
	2011	0.4768	0.4527	0.5010
10 Point	2002	0.5966	0.5929	0.6006
	2003	0.5815	0.5751	0.5881
	2004	0.5668	0.5578	0.5758
	2005	0.5525	0.5410	0.5638
	2006	0.5385	0.5248	0.5521
	2007	0.5248	0.5090	0.5406
	2008	0.5116	0.4937	0.5293
	2009	0.4986	0.4789	0.5183
	2010	0.4860	0.4645	0.5075
	2011	0.4737	0.4505	0.4969

MEDICAL Linear FITTED	Policy Year	Loss Ratio Average (Pd & Inc)	Loss Ratio (Incur)	Loss Ratio (Pd-25)
4 Point	2008	0.5067	0.4838	0.5294
	2009	0.5106	0.4870	0.5340
	2010	0.5144	0.4902	0.5386
	2011	0.5183	0.4934	0.5432
5 Point	2007	0.5276	0.5084	0.5468
	2008	0.5232	0.5023	0.5441
	2009	0.5188	0.4963	0.5413
	2010	0.5144	0.4902	0.5386
	2011	0.5100	0.4842	0.5359
6 Point	2006	0.5237	0.5062	0.5412
	2007	0.5216	0.5024	0.5408
	2008	0.5195	0.4986	0.5403
	2009	0.5173	0.4948	0.5398
	2010	0.5152	0.4910	0.5394
	2011	0.5131	0.4872	0.5389
7 Point	2005	0.5296	0.5138	0.5453
	2006	0.5266	0.5091	0.5440
	2007	0.5236	0.5044	0.5427
	2008	0.5206	0.4997	0.5414
	2009	0.5176	0.4951	0.5401
	2010	0.5146	0.4904	0.5388
	2011	0.5116	0.4857	0.5375
8 Point	2004	0.5490	0.5340	0.5640
	2005	0.5427	0.5262	0.5592
	2006	0.5365	0.5185	0.5544
	2007	0.5302	0.5107	0.5497
	2008	0.5239	0.5029	0.5449
	2009	0.5176	0.4951	0.5401
	2010	0.5113	0.4873	0.5353
	2011	0.5051	0.4795	0.5306
9 Point	2003	0.5540	0.5395	0.5685
	2004	0.5480	0.5321	0.5638
	2005	0.5419	0.5247	0.5591
	2006	0.5359	0.5173	0.5543
	2007	0.5298	0.5100	0.5496
	2008	0.5237	0.5026	0.5449
	2009	0.5177	0.4952	0.5401
	2010	0.5116	0.4878	0.5354
	2011	0.5056	0.4805	0.5307
10 Point	2002	0.5575	0.5441	0.5709
	2003	0.5519	0.5372	0.5665
	2004	0.5462	0.5302	0.5622
	2005	0.5406	0.5233	0.5578
	2006	0.5349	0.5163	0.5535
	2007	0.5293	0.5094	0.5491
	2008	0.5236	0.5024	0.5447
	2009	0.5180	0.4955	0.5404
	2010	0.5123	0.4885	0.5360
	2011	0.5067	0.4816	0.5317

MEDICAL Expon'l FITTED	Policy Year	Loss Ratio Average (Pd & Inc)	Loss Ratio (Incur)	Loss Ratio (Pd-25)
4 Point	2008	0.5066	0.4838	0.5294
	2009	0.5105	0.4869	0.5340
	2010	0.5144	0.4902	0.5386
	2011	0.5183	0.4934	0.5432
5 Point	2007	0.5273	0.5079	0.5465
	2008	0.5229	0.5019	0.5439
	2009	0.5186	0.4960	0.5412
	2010	0.5144	0.4902	0.5386
	2011	0.5102	0.4844	0.5359
6 Point	2006	0.5235	0.5059	0.5410
	2007	0.5214	0.5021	0.5406
	2008	0.5193	0.4983	0.5402
	2009	0.5172	0.4946	0.5397
	2010	0.5151	0.4909	0.5393
	2011	0.5130	0.4872	0.5389
7 Point	2005	0.5294	0.5136	0.5452
	2006	0.5264	0.5088	0.5439
	2007	0.5234	0.5041	0.5426
	2008	0.5204	0.4995	0.5413
	2009	0.5175	0.4949	0.5400
	2010	0.5145	0.4903	0.5387
	2011	0.5116	0.4857	0.5375
8 Point	2004	0.5486	0.5337	0.5635
	2005	0.5422	0.5257	0.5587
	2006	0.5359	0.5178	0.5540
	2007	0.5297	0.5100	0.5493
	2008	0.5236	0.5024	0.5446
	2009	0.5175	0.4949	0.5400
	2010	0.5115	0.4874	0.5354
	2011	0.5055	0.4801	0.5309
9 Point	2003	0.5539	0.5395	0.5683
	2004	0.5476	0.5318	0.5635
	2005	0.5415	0.5242	0.5587
	2006	0.5354	0.5167	0.5540
	2007	0.5294	0.5094	0.5493
	2008	0.5234	0.5021	0.5446
	2009	0.5175	0.4950	0.5400
	2010	0.5117	0.4879	0.5354
	2011	0.5060	0.4810	0.5309
10 Point	2002	0.5576	0.5444	0.5708
	2003	0.5517	0.5371	0.5663
	2004	0.5459	0.5299	0.5619
	2005	0.5402	0.5228	0.5575
	2006	0.5345	0.5157	0.5531
	2007	0.5289	0.5088	0.5488
	2008	0.5233	0.5020	0.5445
	2009	0.5178	0.4953	0.5403
	2010	0.5123	0.4886	0.5360
	2011	0.5070	0.4821	0.5318

INDEMNITY Linear RESIDUALS	Policy Year	Loss Ratio Average (Pd & Inc)	Loss Ratio (Incur)	Loss Ratio (Pd-25)
4 Point	2008	0.0037	0.0036	0.0037
	2009	-0.0042	-0.0047	-0.0037
	2010	-0.0026	-0.0015	-0.0037
	2011	0.0031	0.0026	0.0037
5 Point	2007	0.0023	0.0047	-0.0002
	2008	0.0014	-0.0011	0.0039
	2009	-0.0053	-0.0070	-0.0036
	2010	-0.0026	-0.0015	-0.0037
	2011	0.0043	0.0049	0.0036
6 Point	2006	-0.0136	-0.0113	-0.0159
	2007	0.0132	0.0138	0.0125
	2008	0.0082	0.0046	0.0118
	2009	-0.0026	-0.0048	-0.0005
	2010	-0.0040	-0.0026	-0.0053
	2011	-0.0012	0.0004	-0.0028
7 Point	2005	-0.0079	-0.0088	-0.0070
	2006	-0.0084	-0.0055	-0.0112
	2007	0.0168	0.0179	0.0158
	2008	0.0103	0.0069	0.0137
	2009	-0.0021	-0.0042	0.0000
	2010	-0.0050	-0.0038	-0.0062
	2011	-0.0038	-0.0025	-0.0051
8 Point	2004	0.0147	0.0147	0.0147
	2005	-0.0162	-0.0172	-0.0154
	2006	-0.0147	-0.0118	-0.0175
	2007	0.0126	0.0137	0.0116
	2008	0.0082	0.0048	0.0116
	2009	-0.0021	-0.0042	0.0000
	2010	-0.0029	-0.0017	-0.0041
	2011	0.0004	0.0017	-0.0009
9 Point	2003	0.0017	-0.0025	0.0059
	2004	0.0138	0.0160	0.0117
	2005	-0.0169	-0.0162	-0.0177
	2006	-0.0152	-0.0111	-0.0192
	2007	0.0123	0.0141	0.0105
	2008	0.0081	0.0050	0.0112
	2009	-0.0020	-0.0043	0.0002
	2010	-0.0027	-0.0021	-0.0033
	2011	0.0008	0.0011	0.0006
10 Point	2002	0.0191	0.0152	0.0231
	2003	-0.0068	-0.0092	-0.0044
	2004	0.0069	0.0105	0.0034
	2005	-0.0222	-0.0205	-0.0241
	2006	-0.0189	-0.0141	-0.0237
	2007	0.0102	0.0124	0.0080
	2008	0.0076	0.0046	0.0105
	2009	-0.0010	-0.0034	0.0015
	2010	0.0000	0.0001	0.0000
	2011	0.0051	0.0044	0.0057

INDEMNITY Expon'l RESIDUALS	Policy Year	Loss Ratio Average (Pd & Inc)	Loss Ratio (Incur)	Loss Ratio (Pd-25)
4 Point	2008	0.0036	0.0035	0.0037
	2009	-0.0040	-0.0044	-0.0035
	2010	-0.0024	-0.0013	-0.0035
	2011	0.0028	0.0022	0.0034
5 Point	2007	0.0019	0.0043	-0.0004
	2008	0.0017	-0.0006	0.0041
	2009	-0.0049	-0.0064	-0.0033
	2010	-0.0024	-0.0013	-0.0035
	2011	0.0037	0.0041	0.0032
6 Point	2006	-0.0141	-0.0121	-0.0161
	2007	0.0132	0.0139	0.0126
	2008	0.0086	0.0052	0.0121
	2009	-0.0022	-0.0041	-0.0002
	2010	-0.0037	-0.0024	-0.0051
	2011	-0.0014	-0.0002	-0.0028
7 Point	2005	-0.0085	-0.0099	-0.0073
	2006	-0.0085	-0.0056	-0.0112
	2007	0.0171	0.0184	0.0160
	2008	0.0108	0.0077	0.0140
	2009	-0.0016	-0.0035	0.0003
	2010	-0.0048	-0.0035	-0.0060
	2011	-0.0040	-0.0030	-0.0050
8 Point	2004	0.0139	0.0134	0.0144
	2005	-0.0162	-0.0172	-0.0153
	2006	-0.0141	-0.0110	-0.0171
	2007	0.0135	0.0149	0.0121
	2008	0.0090	0.0060	0.0121
	2009	-0.0016	-0.0035	0.0003
	2010	-0.0030	-0.0019	-0.0041
	2011	-0.0006	0.0001	-0.0014
9 Point	2003	0.0006	-0.0044	0.0054
	2004	0.0136	0.0156	0.0118
	2005	-0.0164	-0.0156	-0.0173
	2006	-0.0142	-0.0098	-0.0185
	2007	0.0134	0.0156	0.0112
	2008	0.0090	0.0063	0.0117
	2009	-0.0016	-0.0036	0.0005
	2010	-0.0030	-0.0025	-0.0035
	2011	-0.0005	-0.0008	-0.0003
10 Point	2002	0.0177	0.0127	0.0224
	2003	-0.0069	-0.0098	-0.0042
	2004	0.0077	0.0113	0.0042
	2005	-0.0209	-0.0187	-0.0230
	2006	-0.0173	-0.0120	-0.0225
	2007	0.0117	0.0144	0.0090
	2008	0.0085	0.0060	0.0112
	2009	-0.0008	-0.0031	0.0015
	2010	-0.0010	-0.0011	-0.0009
	2011	0.0026	0.0014	0.0038

MEDICAL Linear RESIDUALS	Policy Year	Loss Ratio Average (Pd & Inc)	Loss Ratio (Incur)	Loss Ratio (Pd-25)
4 Point	2008	0.0044	0.0036	0.0053
	2009	-0.0103	-0.0108	-0.0097
	2010	0.0073	0.0109	0.0037
	2011	-0.0014	-0.0036	0.0008
5 Point	2007	0.0166	0.0185	0.0146
	2008	-0.0121	-0.0149	-0.0094
	2009	-0.0185	-0.0201	-0.0170
	2010	0.0073	0.0109	0.0037
	2011	0.0069	0.0056	0.0081
6 Point	2006	-0.0075	-0.0075	-0.0075
	2007	0.0226	0.0245	0.0206
	2008	-0.0084	-0.0112	-0.0056
	2009	-0.0170	-0.0186	-0.0155
	2010	0.0065	0.0101	0.0029
	2011	0.0038	0.0026	0.0051
7 Point	2005	0.0042	0.0043	0.0042
	2006	-0.0104	-0.0104	-0.0103
	2007	0.0206	0.0225	0.0187
	2008	-0.0095	-0.0123	-0.0067
	2009	-0.0173	-0.0189	-0.0158
	2010	0.0071	0.0107	0.0035
	2011	0.0053	0.0041	0.0065
8 Point	2004	0.0231	0.0219	0.0243
	2005	-0.0089	-0.0081	-0.0097
	2006	-0.0203	-0.0198	-0.0207
	2007	0.0140	0.0162	0.0117
	2008	-0.0128	-0.0155	-0.0102
	2009	-0.0173	-0.0189	-0.0158
	2010	0.0104	0.0138	0.0070
	2011	0.0119	0.0103	0.0134
9 Point	2003	-0.0021	-0.0039	-0.0003
	2004	0.0241	0.0238	0.0245
	2005	-0.0081	-0.0066	-0.0096
	2006	-0.0197	-0.0186	-0.0206
	2007	0.0144	0.0169	0.0118
	2008	-0.0126	-0.0152	-0.0102
	2009	-0.0174	-0.0190	-0.0158
	2010	0.0101	0.0133	0.0069
10 Point	2002	-0.0048	-0.0051	-0.0045
	2003	0.0000	-0.0016	0.0017
	2004	0.0259	0.0257	0.0261
	2005	-0.0068	-0.0052	-0.0083
	2006	-0.0187	-0.0176	-0.0198
	2007	0.0149	0.0175	0.0123
	2008	-0.0125	-0.0150	-0.0100
	2009	-0.0177	-0.0193	-0.0161
	2010	0.0094	0.0126	0.0063
	2011	0.0102	0.0082	0.0123

MEDICAL Expon'l RESIDUALS	Policy Year	Loss Ratio Average (Pd & Inc)	Loss Ratio (Incur)	Loss Ratio (Pd-25)
4 Point	2008	0.0045	0.0036	0.0053
	2009	-0.0102	-0.0107	-0.0097
	2010	0.0073	0.0109	0.0037
	2011	-0.0014	-0.0036	0.0008
5 Point	2007	0.0169	0.0190	0.0149
	2008	-0.0118	-0.0145	-0.0092
	2009	-0.0183	-0.0198	-0.0169
	2010	0.0073	0.0109	0.0037
	2011	0.0067	0.0054	0.0081
6 Point	2006	-0.0073	-0.0072	-0.0073
	2007	0.0228	0.0248	0.0208
	2008	-0.0082	-0.0109	-0.0055
	2009	-0.0169	-0.0184	-0.0154
	2010	0.0066	0.0102	0.0030
	2011	0.0039	0.0026	0.0051
7 Point	2005	0.0044	0.0045	0.0043
	2006	-0.0102	-0.0101	-0.0102
	2007	0.0208	0.0228	0.0188
	2008	-0.0093	-0.0121	-0.0066
	2009	-0.0172	-0.0187	-0.0157
	2010	0.0072	0.0108	0.0036
	2011	0.0053	0.0041	0.0065
8 Point	2004	0.0235	0.0222	0.0248
	2005	-0.0084	-0.0076	-0.0092
	2006	-0.0197	-0.0191	-0.0203
	2007	0.0145	0.0169	0.0121
	2008	-0.0125	-0.0150	-0.0099
	2009	-0.0172	-0.0187	-0.0157
	2010	0.0102	0.0137	0.0069
	2011	0.0114	0.0097	0.0131
9 Point	2003	-0.0020	-0.0039	-0.0001
	2004	0.0245	0.0241	0.0248
	2005	-0.0077	-0.0061	-0.0092
	2006	-0.0192	-0.0180	-0.0203
	2007	0.0148	0.0175	0.0121
	2008	-0.0123	-0.0147	-0.0099
	2009	-0.0172	-0.0188	-0.0157
	2010	0.0100	0.0132	0.0069
	2011	0.0109	0.0088	0.0131
10 Point	2002	-0.0049	-0.0054	-0.0044
	2003	0.0002	-0.0015	0.0019
	2004	0.0262	0.0260	0.0264
	2005	-0.0064	-0.0047	-0.0080
	2006	-0.0183	-0.0170	-0.0194
	2007	0.0153	0.0181	0.0126
	2008	-0.0122	-0.0146	-0.0098
	2009	-0.0175	-0.0191	-0.0160
	2010	0.0094	0.0125	0.0063
	2011	0.0099	0.0077	0.0122