Post-Reform Ratemaking: Adjustment of Pre-Reform to Post-Reform Loss Development Patterns

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Objective Ratemaking data, particularly loss development patterns, for a state which has enacted major workers compensation reform is not available for a number of years following reform. As a result adjustment, or actuarial judgment, needs to be applied to historical pre-reform data to reflect expected post-reform loss development patterns. The adjusted pattern can then be incorporated into traditional ratemaking methodolgies.This paper offers a model to calculate actuarially appropriate adjustments for this situation.

Background Colorado enacted workers compensation reform SB 218 effective July 1, 1991. This reform resulted in a savings of 32.8% in indemnity loss costs based on the initial pricing by National Council On Compensation Insurance (NCCI). The bulk of the quantified savings came from Permanent Total and Permanent Partial benefits. The law memo in the June 27, 1991 Colorado filing outlines the details of SB 218.

Data

- Ratemaking utilizes aggregate data from annual financial calls to derive rate level (loss costs) adequacy. These calls, while comprised of more recent data, do not provide detailed breakdown of benefits by injury type. Financial data is currently reported to a thirteenth report.
- Unit Statistical Plan (USP) data, which lags financial data in reporting, contains claim counts and incurred (paid+case) losses by benefit type. The benefit types are Fatal (F), Permanent Total (PT), Permanent Partial - major (PP-major), Permanent Partial - minor (PP-minor) and Temporary Total (TT).
  The USP data is reported from a first to fifth reporting.

Assumptions under SB 218 From the actuarial law memo analyzing SB 218, the following assumptions are incorporated into the model :

1) Fatal: No impact.
2) Permanent Total: Tightened definition of PTs, hence severity not impacted, but frequency reduced by 75%.
   The claims that used to be PT under pre-reform will now shift to PP-major.
3) Permanent Partial - major: These are considered Non-Scheduled benefits. SB 218 impacted both severity and frequency.
   Some PP-major claims would shift to PP-minor (Scheduled) benefits.
4) Permanent Partial - minor: These are considered Scheduled benefits. There is a frequency increase from PP-major, but no severity change.
5) Physician Choice: Reduces PP and TT severity by 1.4%.
6) Overall claim counts do not change.
7) There is no reform impact on development (for paid+case outstading reserves) beyond fifth report. It is assumed that the cases are adequately reserved beyond this report.

Methodology The derivation of adjustments is accomplished in five steps. The model is outlined on Exhibit A.

Step One: *Compilation of data.*

USP data was compiled for the latest five policy periods ending with period 3/89-2/90. All of this data is pre-reform and includes paid plus case losses.

From this data ultimate claim counts (frequency) and severity were calculated for policy period 3/89-2/90. (Note that the severity reconciles with that in the 1993 Annual Statistical Bulletin, Exhibit XI, page 282.)

The data was tabulated by benefit type and reporting age, i.e. at first report, second report, etc. The pre-reform claim counts represent the three-year average excluding high/low data points from the latest five periods of data.

Step Two: *Incorporation of SB 218 assumptions.*

The impact of SB 218 by type of benefit is applied to pre-reform frequency and severity to obtain corresponding post-reform frequency and severity.

Exhibit A displays the assumptions and procedure.

Based on the assumptions stated, PT frequency is reduced by 75%.

The PP-major frequency is reduced by 35%. Extracted from Exhibit IV of the law memo, this figure is derived from the number of claims shifting from Non-Scheduled (193 claims) to Scheduled (363 claims). This results in a decrease in frequency of 35% [0.65 = 363/(363+193)].

These PP-major claims shift to PP-minor thus resulting in an increase in frequency of 35% (from 3,450 PP-minor claims to 4,639 claims. This difference comes from the 35% decrease of PP-major claims (0.35 x 3,397 = 1,189).

The overall impact on all benefits is 32.8%. The impact on combined PP (major + minor) is 26.3%. Thus the missing piece, the severity component of PP-major, is determined by a trial-and-error approach to ensure that the overall savings of 32.8% and about 26% of PP savings are obtained. A decrease in severity of 6% yields these desired impacts.

Step Three: *Pre-reform loss development.*

Claim counts by type of benefit at each report are then multiplied by pre-reform severity. This produces the amount of losses at that particular report. For example, the 54 Fatal claims at first report are multiplied by the Fatal severity of $220,780 amounting to $11,920,000 (rounded to the nearest thousand) of Fatal losses at first report. Likewise, at second report the Fatal losses amount to $13,688,000 (62 x $220,780).

The losses by benefit are aggregated at each report. This produces *pre-reform* report-to-report loss development factors, i.e. from 1st-to-2nd (1:2), 2:3, 3:4 and 4:5.

Step Four: *Post-reform loss development.*

(a) Claim counts from pre-reform are adjusted by the SB 218 impacts. These adjusted claims are then multiplied by the adjusted (post-reform) severity amount to obtain the losses at each report by benefit type.

For example, PT claims were reduced by 75%, with no severity impact. Thus, at first report, the 35 pre-reform PT claims are reduced by 75% from 35 to 9. Likewise, at second report the 90 pre-reform PT claims are reduced by 75% to 23 claims, etc. These claims are then multiplied by PT post-reform severity (unchanged) of $327,791 generating PT losses of $2,950,000 (9 x $327,791) and $7,539,000 (23 x $327,791) at first and second reports, respectively. This process is continued for the other reportings, up to the fifth report.

For PP-major, the 2,179 claims at first report are adjusted by the 35% decrease in frequency (0.65 x 2,179 = 1,416) and the shifted PT claims (75% of 35 = 26) are added to obtain post-reform claims of 1,442 (1416 + 26). These 1,442 PP-major claims are finally multiplied by the post-reform severity of $73,222 producing PP-major losses at first report of $105,586,000.

(b) The losses by benefit are aggregated at each report. This produces *post-reform* report-to-report loss development factors, i.e. from 1st-to-2nd (1:2), 2:3, 3:4 and 4:5.

Step Five: *Pre- and post-reform loss development comparison.*

As can be seen on Exhibit A, the pre-reform and post-reform loss development factors (LDF) at each report can now be compared. Post-reform development patterns can now be derived by adjusting the 1st-to-2nd loss development factor (1:2 LDF) by -6.8%, 2:3 LDF by -2.8%, 3:4 LDF by -1.1%, and 4:5 LDF by 0.6%. The resultant report-to-ultimate adjustments to pre-reform LDF are -10.4% for 1:ULT, -3.9% for 2:ULT, -1.1% for 3:ULT and 0.6% for 4:ULT. By assumption (7), there is no impact on development beyond fifth report.

Application of LDF adjustments

The report-to-report loss development factors (LDF) adjustments are applied to pre-reform loss development patterns from the aggregate financial calls. Loss development factors are as follows:

Indemnity Paid+Case Loss Development Factors

Policy Year	1:2	2:3	3:4	4:5	5:ULT
1984				1.036	
1985			1.057	1.052	
1986		1.149	1.069	1.058	
1987	1.307	1.162	1.090	1.038	
1988	1.312	1.155	1.061	1.016	
1989	1.310	1.137	1.045		
1990	1.281	1.139			
1991	1.235				
5-year average	1.289	1.148	1.064	1.040	1.130
5-year ex hi/lo average	1.299	1.148	1.062	1.042	1.130
latest 2-year average	1.258	1.138	1.053	1.027	1.123
Pre-reform LDF selected	1.300	1.145	1.060	1.040	1.125
Adjustment Factor	0.932	0.972	0.983	1.006	1.000
Post-reform LDF	1.122	1.113	1.042	1.046	1.125

Report-to-ultimate	1:ULT	2:ULT	3:ULT	4:ULT	5:ULT
Pre-reform	1.844	1.419	1.240	1.170	1.125
Post-reform	1.651	1.363	1.225	1.176	1.125
% change	-10.3%	-3.9%	-1.2%	0.5%	0%

Conclusion

As experience unfolds under the post-reform environment, assumptions underlying the model and the original pricing can be tested and re-evaluated. So far, these assumptions have proven valid, or have not been conclusively disproven, by special aggregate financial calls collected to monitor this reform.

While actuarial judgment, supported by claim adjusters' impressions, can be substituted to establish post-reform development patterns, this model can be employed, in addition to actuarial judgment, to determine a more statistically and actuarially appropriate pattern.

LOSS DEVELOPMENT FACTOR ADJUSTMENT MODEL : PRE-REFORM TO POST-REFORM

assumptions:
[1] frequency: no change in total claim counts; PT claims shift to PP-major; PP-major claims shift toPP-minor.
[2] severity: no change for PT; -.1.4% for PP, TT due to choice of physician; PP-major decreases by -30.3% (and -1.4% for physician choice)
[3] no LDF adjustment beyond 5th report

type of benefit	pre-reform claims	pre-reform severity	impact of reform freq	impact of reform severity	post-reform claims	post-reform severity	total cost = freq x severity (thousands) pre-reform	post-reform	impact	
Fatal	66	220,780	0.0%	0.0%	66	220,780	14,571	14,571	0.0%	
Permanent Total	267	327,791	-75.0%	0.0%	67	327,791	87,520	21,962	-74.9%	
Permanent Partial - major	3,397	77,896	-35.0%	-6.0%	2,408	73,222	264,613	176,319	-33.4%	) -25.7%
Permanent Partial - minor	3,450	10,127	34.5%	-1.4%	4,639	9,985	34,938	46,320	32.6%	)
Temporary Total	19,334	1,765	0.0%	-1.4%	19,334	1,740	34,125	33,641	-1.4%	
total	26,514	19,131	0.0%	-32.8%	26,514	12,856	435,767	292,814	-32.8%	

	claim counts ==> pre-reform @1st	@2nd	@3rd	@4th	@5th	total losses (thousands) ==> pre-reform @1st	@2nd	@3rd	@4th	@5th
Fatal	54	62	66	72	79	11,922	13,688	14,571	15,896	17,442
Permanent Total	35	90	162	219	235	11,473	29,501	53,102	71,786	77,031
Permanent Partial - major	2,179	3,012	3,172	3,062	2,913	169,735	234,623	247,086	238,518	226,911
Permanent Partial - minor	3,666	3,265	3,207	3,084	3,271	37,126	33,065	32,477	31,232	33,125
Temporary Total	20,014	21,070	22,785	23,556	24,719	35,325	37,189	40,216	41,576	43,629
total	25,948	27,499	29,392	29,993	31,217	265,580	348,066	387,453	399,008	398,138

	claim counts ==> post-reform @1st	@2nd	@3rd	@4th	@5th	total losses (thousands) ==> post-reform @1st	@2nd	@3rd	@4th	@5th
Fatal	54	62	66	72	79	11,922	13,688	14,571	15,896	17,442
Permanent Total	9	23	41	55	59	2,950	7,539	13,439	18,029	19,340
Permanent Partial - major	1,442	2,025	2,183	2,154	2,069	105,588	148,275	159,844	157,720	151,496
Permanent Partial - minor	4,929	4,390	4,312	4,147	4,398	49,216	43,834	43,055	41,408	43,914
Temporary Total	20,014	21,070	22,785	23,556	24,719	34,824	36,662	39,646	40,987	43,011
total	26,448	27,570	29,387	29,984	31,324	204,499	249,998	270,556	274,040	275,203

comparison of LDF (total)	1:2	2:3	3:4	4:5	1:ULT	2:ULT	3:ULT	4:ULT
pre-reform	1.311	1.113	1.030	0.998	1.500	1.144	1.028	0.998
post-reform	1.222	1.082	1.013	1.004	1.344	1.100	1.017	1.004
adjustment to pre-SB 218 LDF	0.932	0.972	0.983	1.006	0.896	0.961	0.989	1.006
	-6.8%	-2.8%	-1.7%	0.6%	-10.4%	-3.9%	-1.1%	0.6%

EXHIBIT A