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12/19/91 - app's come in for 7/1/91 rates

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Draft

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Re: Adverse Selection in Group Rating -- Suggestions to Minimize Potential for Manipulation

Dear Jim:

You asked us to provide comments and suggestions on group rating. This letter describes the current method of group rating and discusses how the current method is susceptible to manipulation. An alternative method which uses more current experience of a group to establish premium charges is outlined in the final section of this report.

Discussion of Current Group Rating Method and Causes of Adverse Selection

The current method of group rating uses four years of loss experience for the individual members of a group to obtain a combined experience rating factor. For private employers, the group rating factor for rates effective 7-1-91 combines the loss experience for accident years 1986 to 1989 to obtain the group rating factor. This loss experience can be analyzed by the members before applications for group rating are made (although reserves are subject to changes). Groups could be established in various ways so that potential members with higher than average losses could be placed in lower credibility groups or even eliminated from membership in "preferred groups".

We have used a simulation model to forecast the potential for "manipulation" of experience to obtain additional rate credits. By "manipulation" we mean the selection of employers who have better than average loss experience for the period used to calculate experience rating factors. A technical description of the model and its results are included in a "Methodology" section of this report.

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The results of our model indicate that the potential for manipulation is considerable, and that employers with average expected losses can potentially obtain credits of over 50% from their current rates by arranging their experience to their advantage. The (actuarially) unwarranted credits must be offset by increases in base rates, which cause rate increases for employers who are not members of a group.

Discussion of Probable Additional Adverse Selection For Group Rating Renewals

Another problem will surface when groups are re-arranged for their second experience modification calculation. Members of an existing group can form "splinter groups", which can cause more adverse selection, additional increases in base rates, and additional manipulation of experience modification factors. Consider a group (call it group "A") which was formed for the rating year effective 7-1-91. Some members of group A could form another group (call this group "B", for the rating year effective 7-1-92). The rules for group rating require that the 1987 to 1990 loss experience for members of group B will be used to compute the experience modification factor for group B and this experience will also be included in group A. If group B has relatively lower loss experience, this better than average experience will end up being counted twice.

The problem of "double counting" better than average experience could be eliminated by a rating rule which eliminates the experience of "splinter groups" with better than average experience from the calculation of the experience modification factor of the "parent" group. We suggest this change be implemented.

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Summary of Actuarial Problems Associated with Current Method of Group Rating

We think the current method of group rating significantly reduces the "actuarial" equity in workers' compensation rates for employers in the State of Ohio. Some problems with the current method are:

- The credibility assigned to an individual employer's experience is no longer actuarially correct. Rates are therefore less accurate. Some employers are paying more than their experience justifies, while others are receiving more credit than they deserve (by virtue of associating with a group).
- Base rates will need to be "artificially" higher to offset the additional credits caused by group rating.
- "Splinter groups" will cause additional inequities.

"Philosophical" Problems Associated with Current Method of Group Rating

Group rating was designed to encourage additional safety and loss control efforts. However, since past loss experience can be manipulated to reduce current rates, the emphasis on additional safety efforts may be minimal compared to the efforts to arrange past loss experience to the group's advantage.

Reduced loss experience in the current policy period has no effect on rates for several years. Membership in a group carries with it no risk or obligation to continue. Hence, over a period of time, groups with higher than average loss experience will likely disband, but the groups with better than average experience will continue to enjoy additional credits.

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Suggestion -- Change Group Rating to be "Retrospective" and Use Current Loss Experience of Group to Determine Current Rates

We suggest that the current experience of a group be used to determine the group's current rating modification. Many private insurers offer so-called "safety group" rating plans which use this concept. These plans have proven to be effective in encouraging additional safety and loss control efforts. Using current experience of the group emphasizes current safety efforts, and is not subject to "artificial" manipulation.

The basic idea is to retrospectively calculate each group's experience, and to use the experience to the extent that it is statistically credible. For example, a group's loss experience for the policy period effective 7-1-92 is used to determine its premiums for this same policy period.

It is possible to design the programs to include options such as loss limits, maximum and minimum premiums, etc. Each group can theoretically design its own plan using tables which are actuarially determined based on the group's size and the rating options selected.

As an example of possible rating values, the Bureau's current retrospective minimum premium charges can be referenced for the expected minimum premiums for a group which selects the various options for loss limitations. The current method of determining group rating modification factors could be used to determine an "expected return premium (dividend)", and the actual loss experience would be evaluated at various future evaluation dates to determine actual return premiums.

Additional features could be implemented which would encourage additional safety efforts and add to the credibility and equity of the plan. For instance, it is possible to add many years to the calculations, which would increase the reliability of the group's experience. Having

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many years in the plan also allows more accurate evaluations of the group's loss experience.

We will be available to discuss the concepts of group retrospective rating, or group dividend plans, and we can provide additional calculations of appropriate rating values. Please let us know when you would like to discuss these concepts in more detail.

Sincerely,



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METHODOLOGY FOR FORECASTING MANIPULATION IN GROUP RATING

Our methodology for forecasting the possible effects of the current method of group rating uses a simulation model to predict the possible distribution of loss experience for individual employers. By forecasting the distribution of loss experience of individual employers, we are able to forecast how the loss experience could be manipulated to provide advantageous experience rating modifications for the group.

Exhibit 1 summarizes the results of the model. As an example, we assumed a group of 200 employers, each with estimated annual premiums of approximately \$14,500. This annual premium contemplates an average of 23 to 24 employees for each employer. We assumed that the expected annual number of lost time claims per employer was .5, and the expected number of medical only claims was 4.

We then ran a simulation model which provided the possible distribution of annual losses for each of the 200 employers. The losses for each employer were randomly generated using assumptions of the distribution of the possible number of claims experienced for each employer and assumptions for the possible sizes for each of the claims. We randomly generated forecasts for each employer's losses for each year from 1986 to 1991, and then summarized the expected combinations of experience period losses which would be used for group rating modification calculations.

Exhibits 1 and 2 provide summaries of the expected distributions of losses before and after "manipulation". "Manipulation" was accomplished by assuming that the members of the group used a decision rule to include only members who had better than average experience for the rating period. For instance, the randomly generated expected losses for all employers (call the group of 200 group "A") for the years 1986 to 1989 averaged \$58,656. If the group "arbitrarily" included only those employers with randomly-generated losses less than \$58,656, there would be 150 employers whose "manipulated" average losses would be only \$24,644. We will call the 150 members with "manipulated" experience group "B", and these are the members who presumably apply for group rating. These members will

receive an "undeserved" credit of approximately 50% from their "actuarially correct" rates since they have the same expected losses for the 1991 rating year as the 250 employers who were eliminated from the group.

Group B still has the same expected losses for 1991 as group A, but by "manipulation", they have received a large rate credit which will need to be made up in the base rates. The 1986 to 1989 losses entering the calculation of group B's modification factor for the 1991 rating year would be less than half of the expected average losses per employer, even though the underlying loss potential for each employer was assumed to be "average". This example illustrates the "random" nature of each employer's experience, and quantifies the effects of selecting a subset of the experience which has been (randomly) better than average.

Exhibit 1 also continues the process by forecasting the 1987 to 1990 experience for the 150 group B employers who theoretically applied for group rating for the 1991 rating period. If a "splinter group" (call this group "C") is formed using only the members of group B who had (random) experience for the 1987 to 1990 period that was lower than average, there would be 98 employers in group C, and the losses entering the group rating for group C would be \$17,722 (for four years) per employer, even though the "expected" losses for the four years were over \$58,000.

If the process continues another year, we would forecast a new group "D" being formed, with 52 members, who would again receive an additional rate credit as a result of "manipulation".

The simulations attempt to quantify the random nature of loss experience and to show the potential for manipulation by selection of employers who were more fortunate and "luckier" than their counterparts. The simulations are run assuming that each employer has the same potential for losses. Because of the fortuitous nature of loss experience, most employers will have better than average experience, and some employers will have the unfortunate experience of having worse than expected experience.

Indeed, there are "real" differences in the potential, or probability, of losses between employers which are not measured by the current rating system. However, an attempt should be made to refine the current system using methods which are not so susceptible to manipulation as the current method of group rating.

FORECAST OF EFFECTS OF "MANIPULATION" IN GROUP RATING

	Example # 1 200 Employers in "Potential" <u>Group</u>	Example # 2 1000 Employers in "Potential" <u>Group</u>
<u>Assumptions:</u>		
1. Manual class base rate =	2.90	2.90
2. Average payroll/employee =	22,000	22,000
3. Manual class premium =	70,000,000	70,000,000
4. Group A number of employers =	200	1,000
5. Group A average employees/employer =	23.0	23.0
6. Group A base premium =	2,934,800	14,674,000
7. Average annual losses/employer in class and in group A	14,664	14,664
8. Average losses/employer in class for experience period '86-89	58,656	58,656
9. Average Credibility for Group A	0.20	0.20
10. Number of employers in Group B	150	750
11. Group B base rate premiums	2,201,100	11,005,500
12. Group B (subset of potential group) exp. period avg. losses	24,644	24,644
13. Avg. Mod. for individual members of Group B	0.88	0.88
14. Actuarial Premium for individual members of Group B	1,945,836	9,729,180
15. Group B's exp. mod (100% credibility)	0.42	0.42
16. Manipulated Premium for Group B before off balance	924,780	4,623,901
17. Revised Manual class premium with new off balance	71,395,329	75,105,279
18. % increase in base rate	2.0%	11.1%
19. Number of employers in Group C	98	490
20. Group C base rate premiums	1,438,052	7,190,260
21. Group C exp. period avg. losses	17,722	17,722
22. Avg. Mod. for individual members of Group A	0.86	0.86
23. Actuarial Premium for individual members of Group A	1,237,339	6,186,693
24. Group A's exp. mod (100% credibility)	0.30	0.30
25. Manipulated Premium for Group B before off balance	434,485	2,172,425
26. Number of employers in Group (B-C)	52	260
27. Group (B-C) exp. period avg. losses	37,689	37,689
28. Actuarial Premium for individual members of Group (B-C)	708,497	3,542,487
29. Manipulated Premium for Group (B-C) before off balance	320,590	1,602,952
30. Group C + (B-C) manipulated mod.	0.34	0.34
31. Revised Manual class premium with new off balance	71,632,649	79,206,258
32. % increase in base rate	2.3%	13.2%

Notes:

Simulation model used the following assumptions:

Annual Lost time claim frequency is poisson, expected number per employer = .5

Lost time claims were assumed to be a Pareto distribution, $q = 1.001$; $\alpha = \$5,000$.

Medical only claims were assumed to average 4 per year,

and were assumed to be lognormal distribution with $cv = 3$; $avg = \$1,000$.

Formulas by line:

7. From simulation results.
8. Line 7 times 4 years.
9. From credibility table.
10. From simulation results.
11. $(10)/(4)^*(6)$
12. From simulation.
13. $(15)^*(9)+((1-(9))^*1.00)$
14. $(13)^*(11)$
15. $(12)/(8)$
16. $(15)^*(11)$
17. $(1+(18))^*(3)$
18. $((13)*K\$9)+1.00-K\$9/((15)*K\$9)-K\$9+1)-1$; k\$9 is % of class in group
19. From simulation results.
20. $(19)/(4)^*(6)$
21. From simulation results.
22. $[(24)^*(9)]+[(1)-(9)]^*1$
23. $(22)^*(20)$
24. $(21)/(8)$
25. $(24)^*(20)$
26. $(10)-(19)$
27. $\{[(10)^*(12)]-[(21)^*(19)]/(26)$
28. $\{[(27)/(8)^*(9)]+[1-(9)]^*1\}*(26)^*(2)^*(1)/100^*(5)$
29. $(26)/(10)^*(16)$
30. $[(25)+(29)]/(11)$
31. $(1+(32))^*(3)$
32. $\{[(13)*K\$9]+1.00-K\$9\}/\{[(30)*K\$9]-K\$9+1)-1$; k\$9 is % of class in group

OHIO BUREAU OF WORKERS' COMPENSATION SIMULATION DISTRIBUTION OF 4 YEAR LOSSES

<u>LOSS RANGE</u>	<u># of Employers in Loss Range</u>		
	<u>'86-'89</u>	<u>'87-'90</u>	<u>'88-'91</u>
0	0	0	0
\$1-\$9,999	89	90	83
\$10,000-\$19,999	234	215	207
\$20,000-\$29,999	187	191	198
\$30,000-\$39,999	115	132	118
\$40,000-\$99,999	238	228	239
\$100,000-\$199,999	72	74	90
\$200,000-\$9,999,999	<u>65</u>	<u>70</u>	<u>65</u>
Totals	1,000	1,000	1,000

OHIO BUREAU OF WORKERS' COMPENSATION

SIMULATION OF LOSSES BY EXPERIENCE PERIOD

<u>EMPLOYER NUMBER</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>86-89</u>	<u>87-90</u>	<u>88-91</u>
281	3,664	435	316	706	159	697	11,694	5,120	1,616	1,878
725	1,844	1,769	880	1,146	958	425	2,663	5,639	4,753	3,410
592	1,384	1,896	1,516	627	1,120	470	15,497	5,423	5,160	3,733
425	4,366	3,769	1,113	1,133	432	1,216	4,165	10,381	6,448	3,895
856	294	8,449	2,082	128	963	822	1,816	10,953	11,622	3,995
567	3,837	2,256	1,449	85	1,895	641	3,337	7,626	5,685	4,070
784	1,978	2,236	32	1,665	1,729	692	77,111	5,912	5,662	4,117
53	1,360	17,111	1,631	835	1,581	102	972	20,939	21,160	4,150
258	11,594	13,553	652	453	3,110	427	14,580	26,251	17,767	4,642
615	6,409	0	1,480	470	2,890	46	3,359	8,359	4,840	4,887
721	6,524	5,750	1,628	1,667	1,473	331	1,189	15,568	10,517	5,098
478	1,938	769	1,787	1,164	976	1,197	1,675	5,658	4,696	5,124
383	8,363	994	1,214	879	924	2,131	4,786	11,451	4,011	5,148
756	2,607	11,519	1,422	2,350	998	806	8,906	17,898	16,289	5,576
713	5,358	24,321	1,987	1,766	1,755	89	865	33,432	29,828	5,596
468	6,233	4,093	2,351	3,133	224	234	1,186	15,810	9,802	5,943
945	9,545	1,109	1,383	454	2,281	1,836	26,543	12,492	5,228	5,954
226	28,895	5,595	3,541	656	1,766	0	40,071	38,687	11,558	5,963
283	5,031	3,479	799	1,102	3,230	1,038	1,203	10,411	8,610	6,169
769	1,692	4,085	488	2,795	661	2,345	1,281	9,061	8,029	6,289
AVERAGE	12,318	12,945	14,116	15,968	13,032	14,448	14,691	55,347	56,061	57,564

NOTE: AVERAGE IS BASED ON 1,000 EMPLOYERS