Actuarial Research Working Group

Meeting Summary

To: Participants of the Actuarial Research Working Group
Date: November 27, 2023

RE: Summary of November 9, 2023 Meeting

Discussion Topics
At the meeting, the following topics were discussed.

A.   Retrospective Rating Plan Updates

The Working Group was reminded that, as part of a multi-year comprehensive review of the California Retrospective Rating Plan (Plan), the WCIRB has finalized the simulation methodology and database. The last decision to be finalized before the Plan can be updated in its entirety is to update the classification Retro Hazard Groups (RHGs).

Staff reminded the Group that the RHGs are used for purposes beyond their use in WCIRB Advisory Plans, including classification ratemaking and experience rating.

Staff presented an update of the prior RHG selection methodology, which serves as the primary basis for this update. It was noted that the selection is based on cluster analysis, with simulated classification loss elimination ratios (LERs) at $500,000 as the variable to be clustered. Staff noted that in the classification LER calculation, all simulated classification data below $500,000 was used. Simulated classification frequency excess $500,000 was used as well, with simulated severities replaced with the excess severity of the class's current RHG. This classification LER was then credibility weighted, using the LER of the class's current RHG as the complement of credibility.

Staff noted that the credibility used in the classification LER calculation relies on the idea of a "reasonable" number of simulated excess claims. Staff noted that first the classification size was determined by claim volume, such that all classifications with at least that claim volume had an excess claim simulation in all 100 simulations. Simulated excess claim count shares from these classifications served as the bounds for what constituted reasonable. Staff noted that each class's share of simulations with a reasonable share served as an empirical credibility value. These values were then smoothed using logistic regression to determine the credibility used in the classification LER calculation. A Group member asked what credibility a classification that never experienced an excess simulation would have. Staff noted that this classification would have 0% empirical, i.e., pre-smoothed, credibility and its selected credibility would be based on the smoothed credibility for its claim volume.

Staff explained the clustering algorithms that were tested and how they differed. Staff then presented the criteria used to choose an algorithm and noted that the Ward's linkage algorithm was selected. Staff further noted that no additional changes were made to classification RHGs past this point in the prior update.

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Staff noted a few potential issues that were under further investigation including the lowest credibility classifications essentially being bound to their current RHG, volatile experience underlying the indications for small classifications, and large indicated RHG changes. Staff explained an attempt to use cluster analysis iteratively so that small classifications would have further opportunities to change hazard groups once the data from the other classifications had been regrouped. Staff noted that since this approach effectively removed the impact of credibility weighting for most classifications, which resulted in many more extreme changes in RHG and is the reason that staff did not select this approach.

Staff presented a summary of its investigation into classifications with an indicated RHG change of 3 groups. Staff noted that in all 15 such cases, the large change was driven by the complete absence of excess claims in either the prior or current starting database that underlies the claim simulations. To vet the reasonableness of large indicated changes, staff presented a potential alternative RHG selection methodology that relies on USR data over a longer time period. Staff used USR data at a classification level for consecutive pro-forma starting databases consisting of USR data at report levels 5, 4, and 3. Staff noted that the most recent of these is the starting database used in the current update. Staff also noted that a second grouping of data using USR data from three policy years all at report level 5 was compiled, however this produced nearly identical results and was not used.

Staff noted that many severity and excess share metrics were considered for the USR-based approach with a focus on using measures that did not to rely on credibility-weighting and were less sensitive to thin data volume. Staff noted the measures selected were claim count excess shares at $250,000 and $500,000 along with the 95th and 99th percentiles of incurred loss. Staff explained that for each year and each measure, a classification could be assigned to the RHG with results closest to the class. Staff noted that the average RHG indication from these four measures over the most recent five years served as a potential alternative RHG.

Staff noted that the indicated RHG from the cluster analysis would provide the most differentiation in the simulation database and the intent of the alternative was to override the cluster indication only when long-term data showed it was inappropriate. Staff noted that a RHG move of one was considered normal movement for a classification and also that a move of one might happen when a class's experience was stable, but the RHG centers had changed from the prior update. Staff noted that the alternative was considered when the indicated RHG move using the cluster analysis was 2 or more. Finally, staff noted that the alternative was only used when it served to temper the change in a class's RHG.

Staff noted that LERs at the RHG level had changed significantly since the prior update and that there was minimal difference between LERs using the indicated cluster RHGs and the final proposed RHGs.

Finally, staff noted that WCIRB classification experts were reviewing the proposed RHG assignments and that based on their findings staff would conduct a secondary review of impacted classifications. A Group member noted that there were dual wage classifications where the high wage classification had a much more severe RHG assignment than the corresponding low wage class. Staff noted that a secondary review would be performed for these classifications.

The Group was generally supportive of staff's recommendations.

B.   Classification Ratemaking – Loss Limitations

The Working Group was reminded that, as part of a multi-year comprehensive review of the classification ratemaking process, the WCIRB is exploring ways to improve the performance of the loss limitation methodology such as applying lower loss limitations for classifications with a smaller volume of experience.

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Staff implemented changes into the existing classification relativity process to incorporate varying loss limitations based on the size of the classification. Staff tested a loss limitation methodology with a threshold of $10 million where losses for smaller classifications are limited to $100,000 and losses for larger classifications are limited to $500,000. Staff calculated classification relativities retrospectively using the updated classification relativity process with the most current methodology for the two loss limitation alternatives, where loss limitations vary based on the size of the classification and where all losses are limited to $500,000. Staff reviewed the coefficient of variance (CV) and root mean squared errors (MSE) for classification relativities calculated using each method and the actual classification relativity based on developed USR data. Staff observed that:

- The CVs for the classification relativities are lower when losses are limited to $100,000 for the smaller classifications than when all losses are limited to $500,000. The largest improvement occurs for the smallest classifications and the overall improvement is not significant.

- The MSEs are slightly better when losses are limited to $100,000 for the smaller classifications than when all losses are limited to $500,000. However, this pattern is not consistent over time and does not hold for the smallest classifications.

- The relativities calculated with losses limited to $100,000 for the smaller classifications tended to be lower than those calculated with all losses limited to $500,000, implying an inconsistency between the empirical loss in that layer and the LERs for that layer.

Staff investigated the potential inconsistency in losses between $100,000 and $500,000 by reviewing the proposed change in the distribution of RHG assignments and in LERs under the proposed and current retrospective rating plans. Under the proposed plan, Staff observed a distribution shift of the RHG assignment to less severe groups and significant changes in the LERs throughout the distribution. Staff shared concerns about introducing new methods that rely more on the accuracy of RHG assignment and LERs. A Working Group member was concerned that years with retro hazard group changes could introduce additional volatility into the classification ratemaking process. Staff noted that the changes in LERs across RHGs is less significant at $100,000 than at $500,000 which could mitigate that impact for smaller classifications. A Working Group member asked if the CVs and MSEs should be recalculated with the proposed LERs. Staff noted that the methods were compared using only data available at the time to simulate how they would have worked.

Staff recommended to make no changes to the loss limitation methodology at this time, to continue the multi-year comprehensive review of the classification ratemaking process with a review of the credibility methodology, and to consider revisiting the loss limitation methodology with an updated credibility method at the end of that study. The Working Group supported this recommendation.

C. Review of Expected Loss Rate Methodology

Staff presented an initial analysis of the expected loss rate (ELR) projection methodology. The initial analysis included a review of the appropriate groupings to use to project the factors to adjust the indicated limited loss to payroll ratios from the classification relativities analysis to the ELR level. The current groupings of North American Industrial Classification System (NAICS) sectors as well as groupings based on RHG, loss development group (LDG), and statistical clustering of classifications are being reviewed.

Staff noted the data used in the retrospective study, including its limitations and assumptions. They discussed the clustering method employed in this study, utilizing both the Elbow and Silhouette methods to guide the determination of the number of clusters. Staff presented clustering results based on the Elbow method's recommendation of four and five groups.

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The preliminary actual vs. expected comparison across various groupings indicated smaller root mean square error (rMSE) and coefficient of variation (CV) when using the NAICS grouping. Staff also displayed the actual vs. expected comparison for a number of selected NAICS groups. Preliminary results revealed variations in rMSE across different grouping methods, and the NAICS grouping did not consistently maintain an advantage across all sectors.

The Working Group reviewed the clustering methodology and some of the initial results. The Working Group supported staff's overall direction with the study.

D.   Employee Tenure Study

Staff summarized the methodology and preliminary findings of the ongoing study on employee tenure in the California workers' compensation system. Below is feedback from the Working Group, along with context:

- For the industry groups, the Working Group asked whether high-tech manufacturing is differentiated from other manufacturing in the physical labor industry group. Staff clarified that high-tech manufacturing is not differentiated from other manufacturing operations and that both are included in the physical labor industry group. The Working Group also asked which industry group includes the trucking and package delivery industry. Staff responded that trucking and package delivery industry is in the transportation and warehousing industry, which is part of the service providing industry group.

- Staff summarized the methodology for calculating claim frequency by tenure group, which estimates the claim count by tenure group relative to the estimated California workers in the corresponding tenure group. Claim counts by tenure group are calculated by applying the tenure distribution estimated using the WCIRB indemnity transaction data to the claim count information in the WCIRB aggregate financial data. Similarly, the number of California workers by tenure group is calculated by applying the tenure distribution estimated using the Current Population Survey supplement data on employee tenure to the American Community Survey data on California workers. The Working Group supported the methodology.

- To estimate changes in indemnity claim frequency by tenure group over time, the Working Group suggested exploring changes from the pre-pandemic period. Staff agreed and shared that the WCIRB is working with the Division of Workers' Compensation to obtain claims data on tenure during the pre-pandemic period and will analyze the pre-pandemic patterns on tenure as well as the frequency changes from the pre-pandemic period. A Working Group member suggested exploring drivers for the increased frequency by tenure group in the health and education industry group, specifically if home health services have any significant impact.

- A Working Group member suggested that age might be a factor for the pattern that workers with longer tenure are more likely to have a higher share of open indemnity claims. Staff agreed to explore the age distribution for open indemnity claims.

- Staff noted that the average total incurred loss increases as tenure increases, and a Working Group member was interested in the split between indemnity and medical incurred as well as the wage differential. Staff agreed to add those to the analysis.