Bruin Mutual - Actuarial Team 10
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Executive Summary

Introduction:

The actuarial team of Bruin Mutual set up Excel raters to accommodate premium audits performed on the system. The driver age factor was verified based on a prior Generalized Linear Model (GLM) with a log link function. The relativities derived by using driver age 40 as the base level (factor 1.000) was used along with the other factors provided in the factor tables to construct automated Excel raters. These raters integrated four coverages: Bodily Injury Liability (BI), Physical Damage Liability (PD), Comprehensive (COMP), and Collision (COLL).

Driver Averaging vs. Driver Assignment:

Two different methods were suggested when considering different drivers and their respective factors. The method of "driver averaging" used the average factor of all drivers' to calculate all vehicle factors in the policy. On the other hand, the method of "driver assignment" calculated each vehicle's rate by considering only the primary drivers level without the inclusion of other drivers. The two raters were set up for comparison.

Example Profile Analysis:

In the case of profile 1, driver 2 had higher factors than driver 1 due to young age and more driver points. However, driver 2 was the primary driver for only one of the three insured vehicles. In result. the final premium derived using "driver averaging" was higher than that of "driver assignment." Thus, the method of "driver averaging" uses driver 2's higher factors to increase the final premium while the use of "driver assignment" lowered the price significantly.

Profile 2 had three drivers and two vehicles. Drivers 1 and 3 were assigned as primary drivers for each vehicle respectively. For profile 2, the final premium obtained through "driver averaging" was higher than that of "driver assignment" due to driver 2 attaining 5 driver points, thus increasing the average factor. In the case of driver assignment, since driver 2 was not designated as a primary driver for any of the vehicles, they were not considered in the calculations.

Profile 3's policy had only one driver and one car, thus the two methods yielded identical outcomes.

As demonstrated by the comparison of these three profiles, it can be observed that both methods are flawed. For instance, if one quote involved a high risk driver not designated as a primary driver, "driver assignment" would overlook that risk entirely. In contrast, "driver averaging" fails to accommodate the situation in which one driver uses the policy vehicles far more often than the other drivers.

Evaluation of the Current Rating Structure:

Concerning collision coverage, the actuarial team evaluated the effectiveness of the current rating structure. The team had trained a GLM with 80% of data from 2014-2018 on selected variables for collision coverage. The use of GLM allows for more flexibility when dealing with multiple variables. An indicated factor outcome was considered significant if the standard error percentage is less than 20%. Accordingly, removal of Years of Driving Experience from current model factors is suggested because the variable has high standard error percentages.

Upon evaluation, the outcome for driver points factor is significant but a potential error was discovered. The factor for drivers with two points is, however, less than the factor for drivers with one point. Since more driver points generally indicate greater risk of a driver, the indicated factors of driver point factor was treated as an irregular outcome. One probable reason of such an output included the design of the driver point assessment system of the company. Further investigation is required to determine the exact cause of the issue.

Possible Improvements to the Current Model:

Aside from the model year factor of collision coverage requiring updates, the model output was mostly significant and differed from current rating factors. Most of the factors had both upper and lower bounds on the same side of 1.000, justifying their significance. Therefore, the current model year factors should be replaced by the factors indicated by the GLM.

For future model enhancement, a few alternative methodologies can be suggested. The future models should consider legal change when selecting the time period. Major changes in related regulations should be avoided for time selection because a drastic shift in data may affect data accuracy. Current evaluation implements countrywide model, as opposed to individual models by states. This is advantageous for having greater sample size, therefore the predicted factors are relatively accurate. The negative effect of countrywide model, however, is that it does not allow recognition of state-specific factors, such as geographical factors, regulation differences, etc. In the future, individual state models should also be created to help identify state-specific factors for premium rating.

Bruin Mutual is currently challenged by retention drop due to a loop of loss ratio growth and consecutive rate increase. During this process, members who are confident with their driving ability tended to choose other insurance companies. The remaining customers would then be higher risk drivers, resulting in a process called adverse selection. To address this problem, new rating factors (such as vehicle use) should be included while implementing verification measures for better client data. Thus, future ratings could offer prices based on more accurate data.

Furthermore, the company also faces the difficulty of appealing to younger drivers. One possible solution is adding a better student discount factor. The current output of good student factor by GLM model needs to be divided into more sub-factors to be effectively integrated into raters. Enhancing advertising on family plan discounts may also appeal to younger drivers, convincing them to join their family's policy.