

*Executive Summary*

Team 18

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The actuarial analysis team at Bruins Mutual performed a study of two different types of premium rating methods: “Driver Assignment” and “Driver Averaging”. The results of this study were used to compare the premium difference and also to re-evaluate the effectiveness of the current rating structure in response to any possible data error and business challenges. The rating model currently makes use of a Generalized Linear Model (GLM) of five years of data to calculate indicated factors for three groups of rating variables: policy, driver, and vehicle level. However, there are several rating factors that could be added to enhance the accuracy of calculating the premium. Based on our study, we have concluded that modification of the current rating method is necessary. Thus, we have proposed a new rating model that includes additional variables as to expand Bruins Mutual’s presence in the youth driver market and to prevent retention rates from declining.

**Methodology:**

*Premium Audits in Excel*

Our team created two premium raters, driver averaging and driver assignment, in Microsoft Excel to calculate a reasonable premium price for each profile by extracting data from the current rating algorithm. The driver averaging method finds the average of the drivers’ ratings to be multiplied with the rating for each vehicle to determine the total premium, while the driver assignment method assigns each vehicle with the primary driver as reported by the policyholder. The premium is then calculated by multiplying the rates of each vehicle with the rate of its corresponding primary driver. An assumption made for this method is that the primary driver(s) of the vehicle drive most of the time.

*Comparison Between Two Models*

Driver averaging assumes that each driver contributes equally to all vehicles while driver assignment assumes the primary driver(s) of the vehicle drive most of the time. The pros and

cons of both methods, however, are determined by the honesty of policyholders. By honesty, we refer to the integrity of the primary drivers to report the vehicle they actually used at the time. If the policyholder is honest, the driver assignment method is superior in calculating the premium than the driver averaging method as it allows for a more precise rate to be calculated, rather than the average of the variables. However, if the policyholder fabricates in reporting the true primary driver, an undervalued premium could be calculated. In this case, the driving averaging method is poses less risk compared to the assigning method as it takes the average risk for all drivers.

### *Re-evaluation of the Rating Algorithm*

The existing rating algorithm was put under re-evaluation with a GLM using data from 2014-2018. Our results show one insignificant ( $SE\% \geq 20\%$ ) factor under “Years of Driving Experience”—drivers with zero years of experience—which we believe is caused by the indeterminable risk factors of new drivers. To amend this issue, we propose adding the variable “Vehicle Use” to the rating algorithms as a means to reduce the weight of the insignificant factors.

On the other hand, in preparing to build a new rating model in the future, several additional considerations are necessary. Trends from technological advancement, road conditions, public policy, and the auto repair industry need to be followed when selecting the time duration of the data. Flexibility and accuracy of a statewide model and the convenience and universality of a countrywide model should be weighted with current situations before we devote time to the construction of a new model.

We suggest rating and non-rating adjustments to tackle emerging business challenges. Adding the variable “Good Student” into the current rating algorithm would attract younger drivers, as young drivers are likely to be students. To increase the retention rate, we propose adding the variable “Persistency with Company” to reward loyalty with the company. Other non-rating strategies, such as the implementation of an online quoting mechanism, a mobile app, and increased advertisement in college campuses are also among our proposed considerations.