CR Auto Reliability Ratings Methodology Bulletin: November 18, 2021 -
New Driver Age Adjustment

Beginning with the publication of CR’s 2022 New Car Reliability Ratings, CR will be adjusting for vehicle owner age in its auto reliability statistical model, in addition to other adjustments we already make for mileage and new vehicle month of purchase. The owner age adjustment, described in more detail below, is part of our continuous improvement process and reflects findings from two recent pilot studies with non-CR members in which reported problem rates were consistently higher than those reported by CR members. Analysis indicated that vehicle owner age was a significant driver of the difference in problem rates, with younger vehicle owners more likely to report problems with their vehicles. While this pattern was very consistent across brands and vehicles, and therefore did not materially impact CR’s published comparative ratings, it does point to an area where we can improve the precision of our predicted problem rates.

In that spirit, we have developed and implemented an age-adjusted model to account for the older age (and therefore consistently lower reported vehicle problem rates) of CR members. This adjustment normalizes any skew in owner age across models to ensure particular models with significantly high or low mean owner age are not unduly advantaged or disadvantaged in our comparative ratings. A secondary benefit of the age adjustment is that CR will be positioned to more easily integrate external, non-member samples into auto reliability ratings at a future date if desired.

How does CR adjust for driver age in auto reliability ratings?

The age adjustment is based on three key findings from the pilot studies:

1. Driver age influences the overall weighted reported problem rate for vehicles, with younger drivers consistently reporting higher problem rates than older drivers of comparable vehicles.
2. The influence of age is evident in most of the 17 trouble spots that combine to create CR’s weighted overall problem rate, indicating the influence of age is not confined to one or two specific trouble spots.
3. That said, the influence of age varies enough by trouble spot to warrant adjusting for age at the trouble spot, rather than overall problem rate, level.

To begin the process, we translated CR’s existing reliability ratings methodology into a complex statistical model, which was developed separately at each of the 17 trouble spots that combine to make up the weighted overall problem rate. This enabled the application of an age adjustment to all trouble spots relative to the influence of vehicle owner age on their likelihood of reporting that problem (as indicated in prior analyses). For trouble spots where driver age shows no or little influence, the age adjustment is zero or negligible.
The statistical model predicts trouble spot problem rates for each combination of:

1. Make,
2. Model,
3. Model Year,
4. Mileage Group.¹

These predicted trouble spot problem rates then roll up into the weighted overall problem rate for each vehicle, at which point we implement our previous reliability calculations.

The revised model includes a continuous respondent age covariate appropriate to each trouble spot. This revised model adjusts problem rates for each trouble spot, which together roll up to make up the weighted overall problem rate, at a specified respondent age.

The final step combines predictions from the two models (age-adjusted and not age-adjusted) to create an adjustment ratio by dividing the predictions from the age-adjusted model by the predictions from the original models. This enables us to provide an age adjustment without substantially altering CR’s existing reliability analysis.

¹ Mileage Group is modeled as a categorical variable with three levels: low, medium, and high. The mileage group levels are created separately for each model year since mileage is highly correlated with vehicle age. This approach creates a normalized scale which minimizes the correlation between vehicle age and mileage group and allows us to minimize any complications with model fitting. As in 2021 CR auto reliability ratings calculations, the predictions for each mileage group were averaged to give a single predicted value for each separate combination of Make, Model, and Model Year.
Predictions resulting from the new age-adjusted model were evaluated to ensure the model performed as expected. Given the finding that younger owners tend to report more problems with their vehicles than do older owners with comparable make/model/year/mileage vehicles, the model would be expected to decrease problem rates for vehicles with a younger median owner age, and increase problem rates for vehicles with older median owner age. The model performed as expected.

Impact of Age Adjustment on Weighted Overall Problem Weights
As Figure 2 below shows, when the age-adjusted model is applied to current CR member auto reliability data, the weighted overall problem rate for most vehicle models moves only marginally (tenths of a point) from what it would be without an age-adjustment. Overall, changes in vehicles’ weighted overall problem rates due to the age adjustment ranged from a decrease of .4 to an increase of 1.7, with the weighted problem rates for model years 2019-2021 ranging from 0 to 42. Problem rate changes of this size do not impact reliability ratings or overall scores for the vast majority of models.

Figure 2: Count of Models by Change in Weighted Overall Problem Rate due to Age Adjustment