ALLSTATE INSURANCE GROUP
PRIVATE PASSENGER AUTO
COLORADO

The following addresses the concerns outlined by the letter received from the Division of Insurance on 03/18/2016. The questions are restated below in bold font and immediately followed by our response.

1. What specific characteristics are used to assign each policy to a micro-segment? In the rate filing it states that a micro-segment is defined by the unique combination of the following characteristics: territory, birthdate of oldest operator, years with prior carrier and gender of oldest operator but in the phone call on February 2, 2016, Allstate stated that these characteristics were arbitrary.

In discussing any specific structural component of Complementary Group Rating (CGR), it's helpful to think about the structure as a whole and what it's designed to accomplish before focusing on any individual aspect. CGR was designed to solve a problem that insurers have been encountering more and more over time – how to incorporate new, different, but more predictive loss models in an efficient manner.

For the purposes of this discussion the new loss model is not simply a refit wherein the same variables, levels of variables, and structure as the existing loss model are used to develop updated parameters/factors on a more recent data set. To fully illustrate the benefits of CGR, the new loss model should be thought of as a much more substantial overhaul wherein there are different variables (new or removed), levels of variables (more or less granularity), and/or structure (how variables are considered, interactions of variables) than the existing loss model. CGR enables Allstate to charge actuarially sound rates that incorporate the latest loss model learnings in a much less disruptive and costly manner than prior methods.

Exhibit 1 contains a number of Figures that Allstate has provided to assist in the discussion of CGR for this response. Figure 1 shows an example of an existing traditional rating plan – a number of multiplicative rating steps, all of which have defined levels and factors for each considered variable which may include interactions of variables. The traditional approach of incorporating a new loss model is shown by moving over to Figure 2 – there are different multiplicative rating steps (both in number and the steps themselves), all of which have defined levels and factors which may be similar or different to the existing rating plan (for illustration Step_2c shows that the interaction of variables is now different with different factors). In the past, rating plan (loss model) overhauls have been done by simply putting the new rating plan in place, either in a new underwriting company (which is not practical in the long run) or in an existing underwriting company (which is disruptive to customers, and results in long delays between loss cost estimate improvements).

Figure 3 shows an alternate approach where the new rating plan (loss model) can be incorporated while keeping the existing rating plan from Figure 1. This is accomplished through adding a granular adjustment factor to the end of the rating plan. The adjustment factor can be determined

on a granular enough basis to exactly replicate the traditional rating plan overhaul shown in Figure 2. Said another way – the granular adjustment factor can be used in combination with the existing rating plan to reproduce the premiums from any potential future loss model. This is an extremely powerful concept that allows more frequent improvements to loss models that are no longer confined to the structure of the prior model.

Logistically, if one wanted to charge the exact rating plan 2 premium, the granular adjustment factor to arrive at a target premium is calculated by dividing the target premium by the premium from the existing rating plan (shown in Figure 3 as Premium_2/Premium_1, which when applied to the existing rating plan results in exactly the premium from implementing the traditional rating plan overhaul). The main challenge of using one adjustment factor rating step (in combination with the existing rating plan) to reproduce the premium from a different rating plan is – the adjustment needs to be developed at a granular enough basis to capture all of the potential differences in predicted loss from the two rating plans in consideration. There are dozens of rating steps in use between the two rating plans, and each rating step can contain anywhere from one to thousands of levels. The required adjustment factor to reproduce the new rating plan must be granular enough to represent and capture all possible differences in every single rating characteristic and associated factors between the two rating plans. While this will be discussed in more detail in a later question, the existing sophistication of rating plans before CGR results in a astronomically large number of risk characteristic combinations - so this level of granularity is not new with CGR. The conclusion following this line of thought is that the only way to accurately capture the differences between two rating plans for every possible situation is to compare them at the policy level. If the granular adjustment doesn't occur at the policy level, then it's not possible to reproduce the premiums from a new rating plan (loss model).

Since we've determined that the granular adjustment needs to take place at a policy level to fully capture all the differences in dozens of characteristics and the associated factor predictions for the levels within each, an approach can be developed that achieves the goal. The first part of Figure 4 shows a structure where a granular adjustment (the adjustment factor) is assigned to each policy number (the granular identifier that links the predictions between two rating plans or loss models) and then used in the rating of the policy to produce the target premium. If policy number is used as the linking identifier for the granular adjustment shown in Figure 3's rating plan, it's possible to reproduce every single premium from the new rating plan in Figure 2 while keeping the existing rating plan structure from Figure 1. This accomplishes the goal described at the beginning of this response – incorporating a new, different, but more predictive loss model efficiently. For discussion's sake this hypothetical rating plan with a policy level granular adjustment will be referred to as RP1_alt.

Up until this point the discussion has revolved around hypothetical rating plans to present many of the key ideas of rating plan design with CGR. CGR accomplishes the exact concepts described above and shown in the referenced Figures (RP1_alt), but has to do so with a few deviations that while necessary because of technology constraints, unfortunately make the structure a little more difficult to grasp.

Figure 4 outlines the differences in how CGR's granular adjustment works in comparison to the hypothetical adjustment from RP1_alt described above, but essentially accomplishes the same thing.

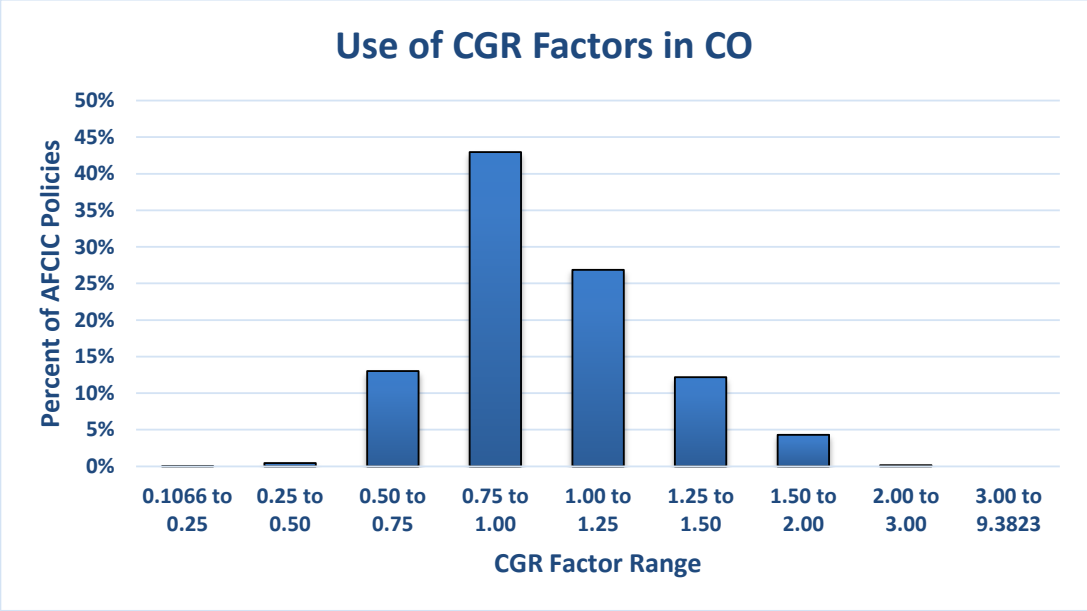
- In both cases there is an adjustment factor – RP1_alt has the Granular Adjustment while CGR has the Complementary Group Factor.
    - While the Granular Adjustment in RP1_alt could theoretically take on any magnitude in value or number of decimal places, because of technology constraints the Complementary Group Factor is restricted to 1000 possible values that are established in 0.5% increments. This provides sufficient range to capture the possible adjustment factor values, with enough delineation in values to approximate any possible value extremely closely.
    - CGR also has the Complementary Group which is just a three digit representation of the factor value, and is used because of technology constraints. There is an unchanging one-to-one relationship between the three digit representation and the adjustment factor, so they can be thought of as equivalent information. In Figure 4 these components for both RP1_alt and CGR are accomplishing the exact same result.
- In both cases the adjustment factor is linked to a policy through some mechanism and is then used in calculating the premium for that policy. The use of an adjustment factor with the existing rating plan is key to the idea of efficiently incorporating new rating plans (loss models).
- In both cases there is a linking identifier between the adjustment factor and the rating of the policy – RP1_alt has policy number while CGR has the micro-segment.
    - Because of technology constraints, the policy number was not used as the linking identifier in CGR. Instead, Allstate designed something that approximates the effect of using policy number to achieve the level of granularity needed for the goals described above.
    - The micro-segment is defined as the unique combination of four characteristics – territory, birthdate of the oldest operator, years with prior carrier, and gender of the oldest operator. By evaluating these characteristics for each individual policy (which is the sole method of assigning a policy to a micro-segment), the micro-segment can be thought of as something effectively equivalent to policy number. Rather than use policy number directly, the micro-segment approximates policy number as an identifier.

In prior discussions with the Division, Allstate did express how the micro-segment variables used were somewhat arbitrary. For clarification, the intended meaning of such statements were to convey how the selected variables used to define the micro-segment (territory, birthdate of the oldest operator, years with prior carrier, and gender of the oldest operator) were somewhat arbitrary. For example, Allstate could have defined the micro-segment as a combination of the # of operators on the policy, # of vehicles on the policy, model year of the oldest vehicle on the policy, or any of the dozens of characteristics known for each policy. The purpose of the micro-segment is to provide an identifier granular enough to approximate the policy number, which as discussed above is necessary to fully reflect the differences between two rating plans. With a given set of variables that define the micro-segment, the actual values for an individual policy are used to relate the adjustment factor to the rating of a policy. The values of the selected

variables that define the micro-segment are not arbitrary, but have no impact other than to serve as an identifier that links an assigned adjustment factor to the rating of a policy.

2. Every microsegment is assigned a Complement Group with a corresponding CGR within the actuarially sound range. The CGR factors listed for Colorado range between 0.1066 and 9.3823. Please explain how a CGR factor is assigned to each policyholder when the selection of CGR factors is so broad? Are policyholders with a similar risk profile assigned the same CGR factor?

As described in the response to question #1, the CGR factor is used to capture the differences between two rating plans (loss models) at a very granular level. When applied in combination with the existing rating plan structure, the CGR factor results in an actuarially sound premium that considers the new loss model. Figures 1-3 in Exhibit 1 demonstrate the concept of using a granular adjustment factor with an existing rating plan to incorporate a new rating plan (or loss model). Because of technology constraints, Allstate needed to define a set number of possible values for the adjustment factor (CGR factor), which ranges from 0.1066 to 9.3823 in fixed increments. Wanting to ensure that the factor could encompass the differences between the existing rating plan and any potential future innovation in loss model development, Allstate established a wide range beyond what is currently needed or used to incorporate the new loss model. A histogram of the CGR factors used for existing Allstate Fire and Casualty Insurance Company (AFCIC) insureds as of filing R28779 is shown below.



It can be observed from this histogram that while there is a wide range of CGR factors available for use in the CGR structure, a relatively small portion is actually being used. There are very small amounts of policies in the CGR factor buckets further from 1.00, and none in the greater than 3.00 bucket.

In discussing how the CGR factor is assigned for a given micro-segment (which again serves as a structural approximation for policy number), it's important to remember what the CGR factor is designed to encompass. The CGR factor is used to capture the differences in two actuarially sound estimates of rate. Those differences are the result of the loss characteristics for a given policy and what the two different rating plans (loss models) say about how those characteristics affect the estimated loss. The CGR factor represents differences in loss estimates (which are driven by the effect of all loss characteristics), not any specific grouping of loss characteristics.

Figure 5 in Exhibit 1, carrying forward the example from Figures 1-4, outlines how the concept of two actuarially sound estimates of rate is translated into a selected CGR factor. The first section shows two actuarially sound estimates, one from the existing rating plan (Premium_1) and one from the new rating plan (or loss model, Premium_2). Since both Premium_1 and Premium_2 are actuarially sound estimates, it follows widely accepted actuarially practices that a selection between those two estimates is also actuarially sound. The range between these two estimates form the boundaries of what we define as the actuarially sound range of premium.

The bounds of the actuarially sound range can also be thought of in terms of the CGR factor (adjustment factor) rather than premiums. CGR_Factor_1 bounds one side of the range, and CGR_Factor_2 bounds the other side. Any CGR factor between those two actuarially sound estimates is defined as actuarially sound. The width of this range is dependent on the loss characteristics of the policy, how those characteristics translate to estimated loss for each of the rating plans (or loss models) being considered, and the difference in the estimates.

Given the complexity and granularity of both the existing rating plan and the new loss model, it's very difficult to make any generalizations that certain characteristics are associated with a certain difference in loss estimates (in direction or magnitude). With dozens of rating steps in calculating each loss estimate, individual rating steps containing up to thousands of different levels and associated factors, there are too many influences on the estimates (and differences between them) to make any direct associations to specific characteristics. Two policies with similar differences in loss estimates do not necessarily have any shared characteristics – the only thing that can be said for sure is that their characteristics and resulting loss estimates produced similar difference in loss estimates from two separate class based analysis.

Unless the two loss estimates (Premium_1 and Premium_2) are very close to each other or exactly the same, there can be multiple CGR factors within the actuarially sound range. Allstate uses an objective method in determining which of the actuarially sound CGR factors is selected for each micro-segment:

- The selected CGR factor is within the actuarially sound range for each micro-segment. This ensures that the rate being charged for each micro-segment is appropriate and based on two actuarially sound loss estimates from class based analysis.
- The resulting percent impact as a result of applying the selected CGR factor for each micro-segment is within a defined range. Depending on the width of the actuarially sound range, this can further restrict the range of possible CGR factor selections.
- The overall rate level of the entire book is maintained. This ensures that applying the CGR factor to each micro-segment does not change the overall amount of premium (rate

level) for the book. Any such changes will always be filed with the division with accompanying rate level indication support.
- The overall estimated retention of the book is maximized. The estimated retention is calculated as the expected number of vehicles that will retain through the upcoming policy period, and is estimated using two class based retention models that have been discussed previously with the Division.

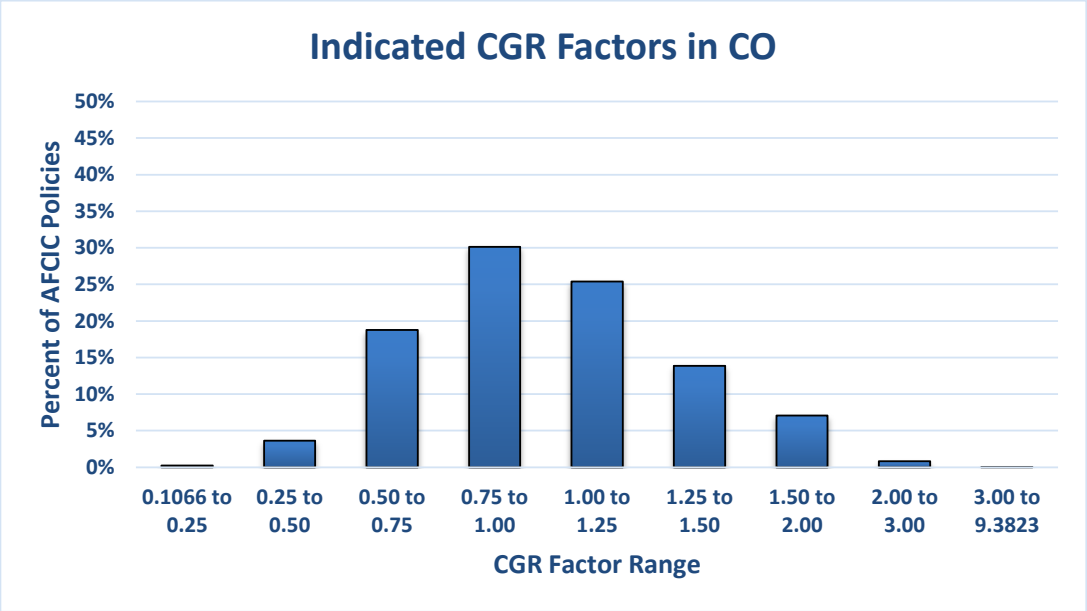
To recap:
- The range of possible CGR factors needed to be established for technology purposes, but only a narrow subset of the possible values have been used to date.
- Two actuarially sound class based estimates of loss are used to define the actuarially sound range of CGR factors.
- The width of the range of actuarially sound CGR factors is caused exclusively by the loss characteristics and class based factor predictions from the respective rating plans (loss models).
- The assignment of a CGR factor to a micro-segment is based solely on an objective analysis that can only result in an actuarially sound premium that also maximizes the retention of the whole book of business.

3. Allstate provided the selected and indicated rate relativity for each Complementary Group. Please explain why some Complementary Groups receive full indication while some Complementary Groups show an indicated rate relativity change over 100% and have a selected rate relativity change of 0%? How will the policyholders in these Complementary Groups ever reach full indication?

While the terminology used in describing elements of CGR can understandably be difficult to grasp, Allstate feels it is important to make some clarifications to ensure that all parties are correctly interpreting the provided information (for prior communications as well as this one). To clarify, Allstate has in the past provided the indicated and selected percent changes for each micro-segment. As the micro-segment is an approximation of policy number and representative of the loss estimate from the complete set of class based characteristics, it is an appropriate comparison to make. Allstate has not provided a similar view for each Complementary Group, as they are merely a three digit representation of the CGR factor. Complementary Groups are not classes or identifiers representing a set of loss characteristics (such as policy number or micro-segment), and should not be analyzed as such.

The actuarial profession and insurers have continuously sought to improve predictions of loss through the use of more advanced analytical techniques, incorporating more detailed data, and increased computing power that makes it possible. While standard practice when predicting loss for personal auto insurance continues to utilize class based analysis, the end result of applying a class based model is an estimate for an individual risk (policy or vehicle). With any new loss model, there are significant differences in the estimates of loss for individual risks compared to the prior model. This can be attributed to differences in modeling data, differences in analytical techniques, substantial effects from new variables/interactions/classification granularity, the cumulative effect of many smaller differences predictive effects, and more than likely a combination of all of the above. It is extremely common for the differences between loss models

to resemble something that looks like a bell curve. For example, a histogram of the indicated CGR factors (which fully captures the differences between the existing rating plan and the new loss model) for existing Allstate Fire and Casualty Insurance Company (AFCIC) insureds as of filing R28779 is shown below.



Again while this histogram shows the indicated CGR factor between the existing rating plan and the new loss model, it truly is representative of the typical differences from any new loss model developed in remotely recent times. Insurers used to struggle with the disruption caused from these differences in loss estimates once every 5-10 years (the frequency of building and implementing new loss models). While there are likely many causes (healthy and competitive market for auto insurance, advancements in analytical techniques, computing power, innovation, etc), there has been a trend towards more frequent and substantial revisions in loss models. It's not unrealistic that the timeframe of building and using new loss models could be happening once every 1-3 years going forward, which further exacerbates the problem of directly implementing loss estimates that are substantially different from the prior estimate.

An insurer's prediction of loss for a given risk, while a best estimate and continually improving, are ultimately just estimates that will change over time. Directly implementing a new loss model whenever it is developed would be extremely disruptive, and could likely result in policyholders experiencing oscillating rate changes of different magnitudes and direction every few years from solely a revision in loss estimate that will continue to change over time. As a result, insurers typically rely on making judgmental, subjective factor selections when incorporating a new loss model estimate, rather than charging exactly or completely reaching the new estimate since it will likely change again. CGR provides a significant improvement over traditional factor selection as described in this response.

Many of these ideas and goals have been built into the design of CGR and the process used to assign CGR factors (granular adjustment factors) to micro-segments (approximation of policy

level identifier). The idea of CGR and using a granular adjustment factor is the direct result of recognizing the increased frequency of loss model advancements along with the significant implementation costs and disruptions that follow. This structure allows for the direct implementation of the updated loss estimates from a new loss model, or implementing an actuarially sound rate that uses the updated loss estimate to as a key piece of information. As described in the response to question #2, the process for assigning a CGR factor to each micro-segment is:

- The selected CGR factor for each micro-segment is within the actuarially sound range – defined as those between the current rating plan and the new loss model. This addresses the goal of incorporating an updated loss estimate from a new class based loss model as a more accurate prediction of loss.
- The resulting percent impact as a result of applying the selected CGR factor for each micro-segment is within a defined range – which depending on the width of the actuarially sound range can further restrict the range of possible CGR factor selections. This addresses the goal of limiting policy disruption as the result of an updated loss estimate, since the loss estimate will likely be revised again and potentially substantially different within a few years.
- The overall rate level for the entire book is maintained. While this doesn't connect directly to the goals described above, it does ensure that the analysis and changes between overall book rate level and more granular risk classification rates are kept separate.
- The overall estimated retention of the book is maximized as estimated using class based retention models. This criteria is an objective implementation of what has been done subjectively in the past with factor selection to address policy disruption and changing loss estimates.

All CGR factors are assigned to micro-segments using exclusively these criteria. Examining the selected and indicated percent changes for any individual micro-segment is explained within these criteria. The range of CGR factor options for any individual micro-segment is the overlap of the actuarially sound range and defined percent impact range. Once the range of CGR factor options is established, the actual selection is based on two things:

1. Ensuring that the selection of CGR factors for all micro-segments result in the correct overall rate level.
2. Simultaneously considering the estimated retention for all micro-segments for all CGR factor options.

There is no mechanism in this process to prioritize or force movement of micro-segments to fully indicated or any specified magnitude. CGR is not designed to immediately or over a specified amount of time move the rate for policyholders to the updated estimate of loss – it's designed to efficiently incorporate the new loss estimate as a key piece of information in offering updated actuarially sound rates. Just as with traditional factor selections, this can result in different policyholders being moved by varying degrees (or not at all) towards indicated. Exhibit 2 contains a hypothetical example of revising class level factors towards an updated view of indicated by class, and the resulting range of impacts (in both magnitude and direction) relative to indicated. This example has been shared with the Division before (conference call on 3/25/2015 with a copy provided electronically on 3/31/2015), but is included here for reference.

Please note that CGR represents a major improvement over the traditional factor selection approach shown in this example, as while factor selection results in policy premiums moving in the opposite direction of the indicated loss, CGR does not.

4. In the Colorado filing, it states that one requirement of CGR is that for each micro-segment, the resulting impact must be within a set range. In this filing, each micro-segment's impact must be within -20% and +20%. Does Allstate consider this a form of rate capping? If so, how does this rate capping comply with Bulletin B-5.32?

Allstate is charging the filed manual rate for all customers, and is not using any capping mechanism that would vary premiums charged from the manual rate. Allstate does not consider the percent impact criteria of assigning CGR factors to micro-segments to be a form of rate capping. It has been considered a widely accepted practice to incorporate judgment and business considerations when making selections for rates – whether how far to move towards an aggregate rate level, how far to move towards an updated factor estimate for the same loss model structure, or how far to move a collection of factor changes to limit the combined impact to limit policyholder disruption. The use of the percent impact and retention criteria discussed above are merely objective implementations of the considerations that have been historically considered and implemented subjectively on a case by case basis.

The selected CGR factor for each micro-segment meets the criteria discussed in the prior responses as of a data evaluation date, and is provided to the division in a rate filing. The assigned CGR factors are fixed and unchanging unless Allstate submits a filing with revised assignments. The rates for policyholders do not automatically move at each renewal or any other time period. Allstate performs a loss cost based analysis wherein an individual CGR factor is selected, filed, and charged just like any other rating plan factor selection.

5. For the issue of credibility, Allstate stated that the new loss and retention models are class based and therefore credible. How are the Complementary Groups considered credible if there are some Complementary Groups with only one or a few policyholders?

Many years ago, the rates offered to customers through early versions of classification ratemaking were essentially a table of a rates for a combination of a small number of characteristics. For example – risks within a certain age range and a certain # of accidents in the prior 3 years would be offered a rate. Classification ratemaking evolved into identifying credible levels of characteristics that have a consistent, predictive, multiplicative effect on losses. Modern rating plans have identified dozens of characteristics with up to thousands of levels within a given characteristic, all used to produce an estimate of loss. To accompany this discussion, actual information about the rating plan in place in CO Allstate Fire & Casualty Insurance Company (AFCIC) excluding the introduction of CGR will be referenced.

AFCIC's existing rating plan contains 43 multiplicative rating steps, with each step ranging from one to thousands of levels. The basis of this rating plan was a credible class based loss model built on multiple years of countrywide policy experience - a GLM that fit parameters (factors) for each specified characteristic levels to as closely as possible reproduce the actual losses experienced. There is a substantial amount of effort in building, testing, and validating GLMs

that are beyond the scope of this response. But the end result is a credible specified factor for different levels of characteristics that when combined multiplicatively, produce credible loss estimates for that unique combination of characteristics. This is a very important concept in interpreting class based loss models (rating plans) – while the factors are fit for each specified class (levels defined for a given characteristic), the output is an estimate for the cumulative effect of all applicable loss characteristics. Loss models do not fit a factor to capture the loss potential of an individual risk, but by fitting many characteristic levels that each capture a predictive multiplicative effect, there is a unique loss estimate for any given set of loss characteristics.

It's easy to underestimate the sophistication and number of price points produced from a traditional class based rating plan. Continuing the example of the existing AFCIC rating plan:

- There are 43 multiplicative rating steps (excluding CGR).
- The rating steps range from one level (the "Rate Adjustment Factor" which is used as an efficient way of increasing all base rates), to tens of levels (the "Safe Driving Club Factor" which varies based on the # of operators that meet an incident criteria compared to the total # of operators), to thousands of levels (the steps which reflect the amount of insurance purchased for different coverages).
- Ignoring some of the more complex steps of the rating plan (geometric averaging, vehicle level characteristics, etc.), the combined effect of these 43 multiplicative rating steps results in over $6*10^{32}$ combinations of rating characteristics in the rating plan. This approximation significantly underrepresents the total number of combinations because of the complexity of several excluded rating steps from this calculation.

In building the loss model used for the existing rating plan (prior to CGR), Allstate did not develop factors or try to predict the losses for $6*10^{32}$ types of risk. But this level of granularity is the result of any class based loss model (rating plan) with any degree of modern sophistication – number of rating steps and number of defined levels within each.

In examining its rating plans and loss models, Allstate has yet to find two policies in any given state (including CO) that share a complete set of risk characteristics. A difference in any of the risk characteristics between two policies produces a different definition of risk and a different estimate of loss. Given the number of rating steps, the number of defined levels within each, and the number of potential policies in a book of business, with all of the provided information it's relatively easy to see how there are no two identical risks (policies with the same risk characteristics). While more sophistication in a risk classification system (rating plan or loss model) makes the likelihood of there being two identical risks even more remote, it's still very unlikely to find two identical risks through the lens of what would be considered an extremely simple rating plan by today's standards. For example – using only a handful of the existing rating plan steps result in a unique identification of risk characteristics for each policy in this CO book of business. Any class based model estimate is not developed at the individual policy level, but the effect of using multiple classes in developing and scoring the model result in unique loss estimates for unique combinations of risk characteristics.

One can use the number of rating steps as an approximation of rating sophistication and granularity for illustrative purposes, although it is not perfect since not all rating steps are equal in granularity. A cursory look at recent filings of the top personal auto insurers in CO show that

Allstate's primary competitors have rating plans that are primarily in the 40-50 step range, with the lowest being 24 and highest being 60. Again this isn't a perfect representation of sophistication because of the varying granularity of individual rating steps (ranging from simpler than Allstate's approach to dramatically more complex in some cases), but it does establish that prominent insurers are all in a somewhat similar position – an astronomically large number of risk characteristic combinations, and likely no two identical risks.

In personal auto insurance, the prediction of loss for a given risk is generally derived from the combined effect of many class based effects, but the prediction is unique to that complete set of risk characteristics. The responses to the prior questions discuss the significant differences between loss models in both how they are built (characteristics, levels of characteristics, interactions) and the resulting predictions (the effects of how it is built, factor predictions that produce total loss estimates). Just as it has become increasingly difficult to think of risk as an individual characteristic level (since there are dozens of characteristics that define a risk), it has also become difficult to compare different loss models (rating plans) at an individual characteristic level (since there are dozens of characteristics that define a risk in different manners between the loss models).

It's been established in this discussion that the existing widely accepted class based rating plans (loss models) produce estimates for an astronomically large number of risks (unique risk characteristic combinations). It follows that the only way to fully capture the differences between the two rating plans (loss models) is to either implement the rating plan structure directly, or use a very granular adjustment factor. As discussed in the response to question #1, all of the structure and terminology associated with CGR is designed to enable a granular adjustment factor to incorporate the updated loss estimate from a new class based loss model within the existing rating plan. The new loss model that defines the updated loss estimate (which will be discussed in more detail in a later question) is conceptually the same as the existing rating plan in that - it is a credible class based loss model built on multiple years of countrywide policy experience, but different in the manner that any new loss model is different through structure and predictive effects.

In assigning the CGR factor for an individual micro-segment (approximation for policy), two credible and actuarially sound loss estimates are used to define the actuarially sound range. The two estimates are calculated from two credible class based loss models (rating plans) that capture different predictive multiplicative effects from credible characteristic levels, but as discussed in detail the resulting estimate is unique for a unique combination of risk characteristics. Again, Allstate did not develop loss models to fit a factor to an individual risk, but the result of a class based model with any degree of sophistication results in a credible prediction that is unique for each individual risk. An objective process then selects a rate between these two credible, class based loss estimates.

Micro-segments, Complementary Groups, and CGR factors are not classes and were not used as a part of any loss model to calculate or develop estimates of loss. As discussed throughout this response, these are structural elements of CGR that allow the selection of an actuarially sound rate for a risk based on two credible actuarially sound estimates of loss from class based analysis.

6. Some factors in the retention model are not loss or expense based. Are these factors and other retention adjustments applied at an individual policy level?

With any class based model (loss or retention), large datasets are used to identify predictive characteristic levels and fit parameters (factors) to capture the effects that in total most closely match actual experience. After the development phase, class based models are then used by taking individual policies and scoring (running through the already built model) their individual characteristics to obtain a predicted estimate. While class based models are designed to capture predictive proportional effects associated with the specified classes, the results are always a prediction for the individual policy. With this understanding, every characteristic from every class based model is applied at the individual policy level, although the predictive effects are built using a credible class based analysis.

One of the advantages of using a granular adjustment factor to incorporate a new loss model is the flexibility and efficiency it provides going forward. When Allstate develops a newer loss model with more accurate estimates of loss, the CGR process can be updated relatively easily to use that model for the source of the indicated rate (one of the two actuarially sound estimates that define the actuarially sound range). This is in stark contrast to the traditional process of implementing a new loss model through the use of a new underwriting company or struggling with the significant complications and disruption from implementing it directly in an existing book of business.

In addition to the flexibility in incorporating new loss estimates, the structural design of CGR also allows for flexibility in many of the other criteria used in the process of assigning CGR factors – including the retention model. A modified or new class based retention model can be incorporated in the process of assigning CGR factors. In fact – Allstate is currently in the process of developing a new class based retention model that will be used developing future CGR factor assignments in CO AFCIC. This new retention model is being fit on more recent data, and is designed to only include classes related to loss, expense, or premium change.

7. Please provide a list of what states:

- **Filed/Approved the Allstate filing with no issues**
- **Have ongoing questions/discussions with Allstate about the filing**
- **Requested Allstate to revise the filing prior to it being filed/approved**
- **Allstate has withdrawn the filing**
- **Allstate has not made a filing**

<u>States filed/approved as-is (no issues or no active/recent discussions)</u>
Arizona
Arkansas
Delaware
Idaho
Illinois
Iowa
Kansas

Michigan
Missouri
Nebraska
New Hampshire
Oklahoma
Oregon
Tennessee
Texas
Utah
West Virginia
Wisconsin
Wyoming

States with ongoing questions/discussions
Colorado
Maryland
Minnesota
Ohio

States that requested revisions (before or after filing/approval)
Indiana
Kentucky
Montana
Nevada
New Mexico
South Carolina
Virginia

States withdrawn
Alabama
Florida
Georgia
Louisiana
Maine
Pennsylvania
Rhode Island

States not filed
Alaska
California
Connecticut
District of Columbia
Hawaii
Massachusetts
Mississippi

New Jersey
New York
North Carolina
North Dakota
South Dakota
Vermont
Washington

8. In the instances that Allstate has revised a filing, please describe what sections or factors were removed from the filing.

In states where a Department has requested revisions, Allstate has modified CGR in the following ways:

- Impose a minimum amount of movement towards indicated potentially beyond what would have been selected from the objective assignment process.
- Remove the retention models as an input in the assignment process to either use CGR as a means to move rates towards indicated in a uniform manner.
- Remove the new loss model and retention models as inputs, and simply uniformly limit the rate impact of rating factor changes.
- Modify assignments to limit policyholder impacts.
- Remove variables from the existing retention model not related to loss, expense, or premium change.
- Override some loss model indicated factors with judgmental selections.
- Modify the assignment for micro-segments with no existing Allstate Fire and Casualty Insurance Company policyholders.
- Modify assignments so impacts result in the exact (or less than) targeted percent change rather than closest to the targeted percent change.

9. For Allstate's most recent filing, please provide the following information relating to Allstate's Colorado Private Passenger book of business:

a. The total number of insurance policies.

As of the most recent Complementary Group assignment table update filing (R28779 which went effective on 10/3/2015), there were 112,721 policyholders in Allstate Fire and Casualty Insurance Company (AFCIC).

b. The number of classes after the class based loss model is applied. For each class, please list the indicated rate and the number of insurance policies in each class.

The estimated loss from a rating plan or loss model is the product of a number of multiplicative rating steps, with each rating step contributing proportional predictive effects for risk classification levels that in combination with all other rating steps produce a rate (loss estimate) for an individual risk. Any view of risk (premium, rate, loss estimate, listing of characteristics)

cannot be fully described by an individual class (risk classification level), but the combination of all applicable classes.

Allstate's existing rating plan before the application of CGR contains:

- 43 multiplicative rating steps.
- With a simplistic view (excluding some of the more complex rating steps) of the rating plan, there are over 1,400 classes (classification levels within the rating steps).
- Continuing with a simplistic view, the combined effect of the rating steps and classification levels within each result in over $6*10^{32}$ combinations of rating characteristics.

Allstate's new loss model used to calculate the indicated rate in the CGR assignment process contains:

- 70 rating variables used across 114 multiplicative rating steps.
- Continuing with a simplistic view, there are over 1,800 classes (classification levels within the rating steps).
- Continuing with a simplistic view, the combined effect of the rating steps and classification levels within each result in over $4*10^{72}$ combinations of rating characteristics.

Allstate is committed to assisting the Division in their review of CGR and providing the information useful in that regard. When reviewing rates, Allstate does not believe that the Division will gain any value from reviewing average rates on a univariate, class-by-class basis. This is because any rate is determined (and developed) from the full combination of classes that a policy belongs to, and any single class that a policy belongs to is only one small piece of how their rate is determined. Said another way - a univariate class-by-class view of average rates does not reflect the multivariate nature of how risk is assessed through class based rating plan development. We are therefore providing what we feel is truly useful information to the Division in this reply, rather than a creating a view that would be extremely time consuming and inefficient for both Allstate to produce and the Division to review.

Exhibit 3 contains for each risk – which is defined as the unique combination of risk characteristics – the indicated rate as calculated from the new class based loss model as of the most recent Complementary Group assignment table filing (R28779). Rather than list out the complete set of risk characteristics for every combination that exist in the CO AFCIC book of business, an identifier for each policy is listed as representation of all the risk characteristics. While the identifier is not the micro-segment, it is similar in concept and equivalent to a listing of policy numbers.

Since the Division is requesting data on the indicated rates themselves, we believe Exhibit 3 is the most useful way for Allstate to provide the information to the Division. It fully captures the predictions of the new loss model for each type of risk (complete set of risk characteristics) without the significant issues that come with evaluating rates as an average on a univariate class-by-class basis. However to assist the Division in its review Allstate is providing a more summarized view that is described in the response to question #9.c.

If the Division wants more information on the classes utilized in new class-based loss model, a view of the indicated rating factors (as opposed to average rates) would be the most useful view for the Division – we would be happy to provide this information at the Divisions request or any other information the Division is interested in such as descriptions of the modeling process, goodness of fit views and metrics for variables or in aggregate, or a complete listing of all classes and corresponding parameters (factors) used in calculating the predicted estimates.

c. For each class, please list the current and proposed rate for each insurance policy in the class after CGR and the retention model are applied.

Continuing the discussion in the response to question #9.b and the data provided in connection to filing R28779, the current rate for each risk has been provided in Exhibit 3. Please note that the current rate for each risk is defined as the rate (combination of existing rating plan and assigned CGR factor) prior to their renewal onto the updated assignment table going into effect (10/3/2015), and as discussed in that filing adjusted for overall changes to the rate level where applicable.

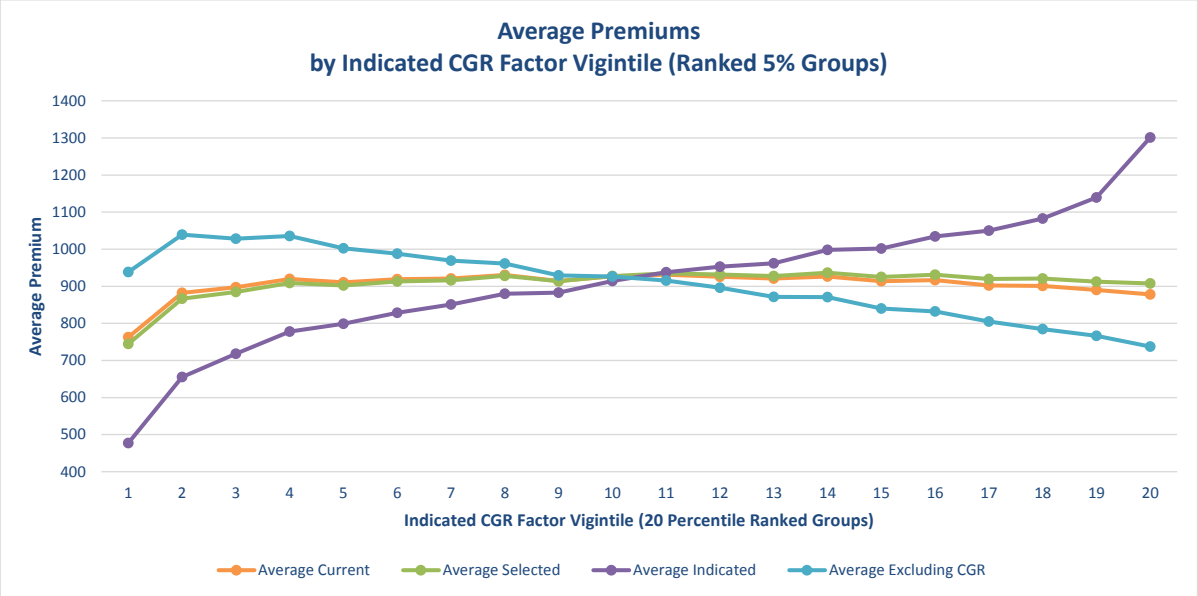
The proposed rate for each risk has also been provided in Exhibit 3, which is the result of the existing rating plan and assigned CGR factor as of that filing. As discussed in detail throughout this response, the goal of all the complexity underlying CGR is to efficiently incorporate a new estimate of loss in offering an actuarially sound rate that resides within the actuarially sound range of rates – defined between current and indicated. The proposed rates in Exhibit 3 are consistent with this goal and the described structural approach of CGR. The following are additional pieces of information that may be helpful in evaluating Exhibit 3:

- The selected rate resides within the actuarially sound range (current and indicated) for nearly all risks, other than cases where the differences are very minor (due to 0.5% increments in the available CGR factors and rounding that occurs) and an idea discussed below. This is only possible with a granular adjustment factor or the direct implementation of the new loss model.
- As discussed in filing R28779, the selected CGR factor (and as a result the selected rate) for micro-segments occupied by policies that renewed during the time the two prior Complementary Group assignment tables were in effect were not changed. This results in a larger amount of risks receiving no selected change from current than in a typical assignment table change – a decision based on the magnitude of the changes resulting from those tables.
- The use of an adjustment factor at a very granular level is key to the rating plan concepts described throughout this response and in Exhibit 1 Figures 1-5 and implemented with CGR. The micro-segment is used as the linking identifier (structural link between the new class based loss model and the rating of a policy) as an approximation of the effect of policy number, which is not used because of technology constraints. While the micro-segment and policy number provide equivalent granularity for the overwhelming majority of cases, there are a small number of situations where the micro-segment is not unique to an individual policy number. In those cases the actuarially sound range is satisfied at the micro-segment level, which may result in different impacts for the individual policies that reside in a given micro-segment.

- As described in responses to questions received from prior filings (2/24/2015 and 4/8/2015) there are a small number of cases where Allstate was, because of technology issues related to bringing together all the necessary detailed information, unable to calculate an indicated value from the new loss model for an individual risk. In those few cases where an indicated rate couldn't be calculated, no change from the current rate was selected or listed in Exhibit 2.

With the application of the CGR rating step, Allstate is offering an actuarially sound rate that in an efficient manner uses the estimate from the new loss model along with objectively applied retention considerations. There is no explicit factor or adjustment from the retention model, as the inputs in the objective CGR factor selection process are not separated or applied individually. These inputs, discussed in much greater detail throughout this response, are simultaneously reflected in the selection and application of one factor that results in a reasonable and actuarially sound rate.

While the detail included in Exhibit 3 is the most accurate manner to review our rates, we wanted to provide the below summarized view as well to assist the Division in their review. The indicated CGR factor, which is one of the two actuarially sound estimates that define the actuarially sound range, fully captures every single difference between the existing rating plan and the new loss model (including the variables used, levels within variables, interactions of variables, modeling approach, and fitted factors). Since the levels of a univariate view of the indicated CGR factor reflect the multivariate effects that go into predicting both actuarially sound estimates (the existing rating plan and the new loss model), it is a more representative (although not perfect) view of risk than what univariate views on a class by class basis would provide.



The indicated CGR factor, which is when applied to the existing rating plan in exactly the indicated rate from the new loss model, was ranked and divided into twenty evenly sized groups

of policies (vigintiles). The above graph then shows the following which are consistent with the goal and the described approach of CGR:

- The indicated average rate, as calculated from the new class based loss model, increases from left to right as the indicated CGR factor increases. This demonstrates that as expected the multivariate effect captured in the indicated CGR factor is directly related to the indicated rate.
- There are significant differences between the average indicated from the new loss model and the average rate from the existing rating plan excluding the application of the CGR factor (as if the CGR rating step did not exist).
- Compared to the rate from the existing rating plan excluding the CGR factor, the average current rate (prior to the updated assignment table going into effect) is closer to the indicated rate from the new loss model. This demonstrates that the existing rates charged before the referenced filing (the latest assignment table update) are closer to indicated than if the CGR factor was never used.
- The average selected rate from the referenced filing (the latest assignment table update going into effect) is even closer to the average indicated than the average current rate. This demonstrates that assignment table updates result in actuarially sound rates that are closer to indicated than what is currently in place.

Exhibit 1

Figure 1 - Traditional Rating Plan

	Rating Plan 1
	Step_1a
*	Step_1b
*	Step_1c
*	...
*	Step_1r
*	Step_1s
=	Premium_1

# of Accidents	# of Drivers	Step_1c Factor
1	1	1
2	1	1.02
3	1	1.05
1	2	1.04
2	2	1.15
...	...	...

Traditional method of incorporating a new loss model. Different structure, variables, and factors replacing the existing rating plan.

Figure 2 - Traditional Rating Plan Overhaul

	Rating Plan 2
	Step_2a
*	Step_2b
*	Step_2c
*	...
*	Step_2y
*	Step_2z
=	Premium_2

# of Accidents	Age of Youngest Driver	Step_2c Factor
1	17	1.2
2	17	1
3	17	0.95
1	18	1.17
2	18	0.98
...	...	...

Alternate approach to incorporate Rating Plan 2 while keeping the existing structure of Rating Plan 1. Significant cost savings as rating plan sophistication increases more frequently.

Figure 3 - Alternative Rating Plan "Overhaul"

	Rating Plan 1
	Step_1a
*	Step_1b
*	Step_1c
*	...
*	Step_1r
*	Step_1s
*	Granular Adjustment
=	Premium_3

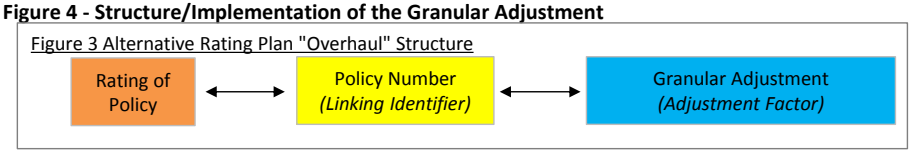
# of Accidents	# of Drivers	Step_1c Factor
1	1	1
2	1	1.02
3	1	1.05
1	2	1.04
2	2	1.15
...	...	...

If Granular Adjustment = $\frac{Premium\_2}{Premium\_1}$ *for each policy, then the resulting Premium_3 = Premium_2*

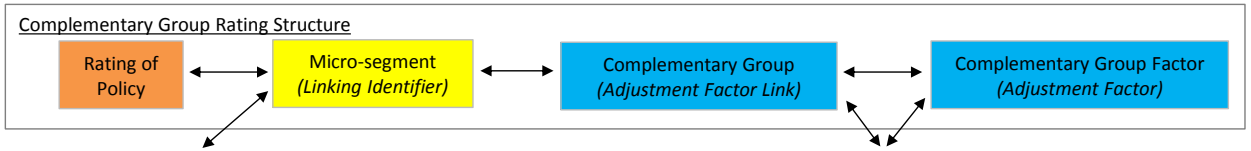
*Premium_3 = Granular Adjustment * Premium_1 =* $\frac{Premium\_2}{Premium\_1}$ ** Premium_1 = Premium_2*

Regardless of Rating Plan 2's structure, variables, or factors, the resulting premium can be achieved by keeping the existing rate plan (Rating Plan 1) and an Adjustment. The Adjustment must be very granular to capture the differences in Rating Plan 1 vs Rating Plan 2 for every unique combination of all risk characteristics (Step_1a-Step_1s and Step_2a-Step_2z). Due to the sophistication present in each of the rating plans, the required granularity to address every possible risk is policy level.

Figure 4 - Structure/Implementation of the Granular Adjustment



Although some of the interim steps of the structure are different in Complementary Group Rating, it essentially achieves the same effect as the structure outline in Figure 3 - linking a Granular Adjustment Factor to the policy for the purpose of incorporating a new rating plan while keeping the existing structure.

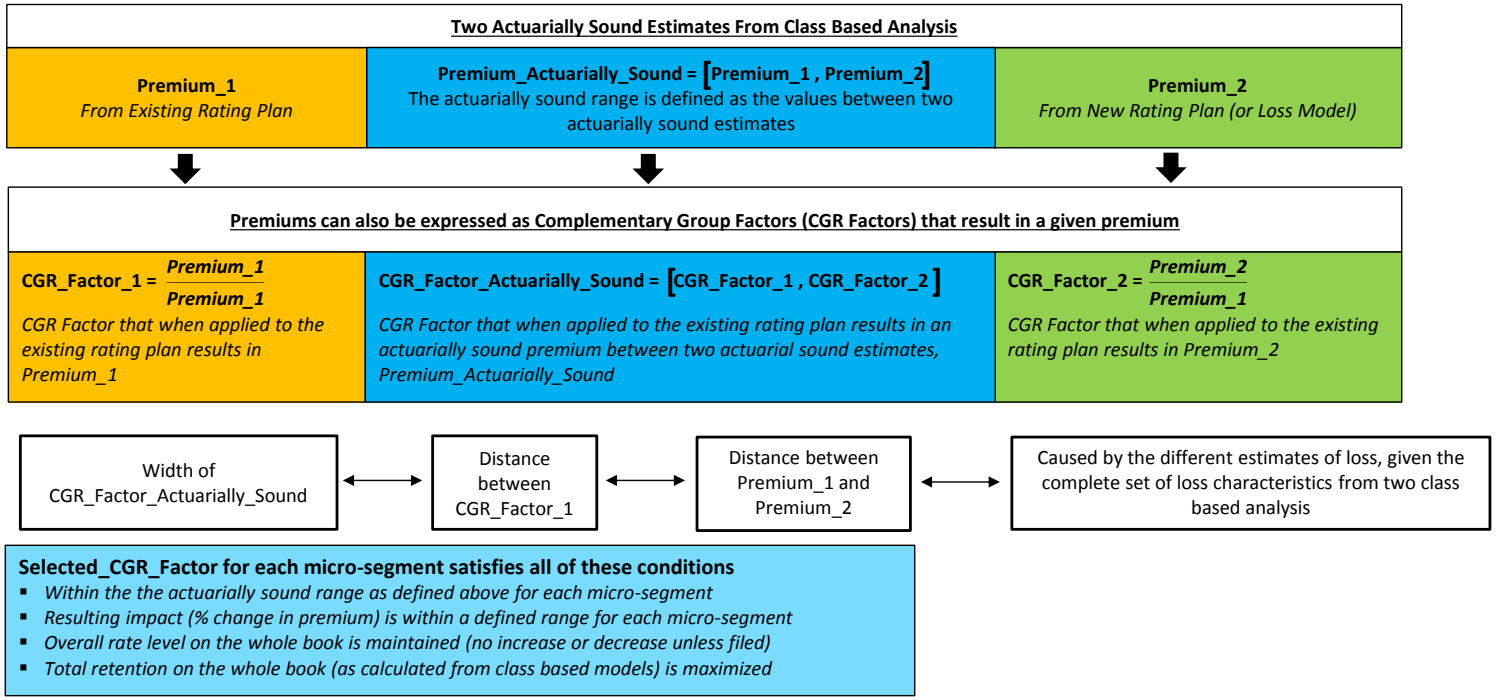


Due to technology constraints, the micro-segment is used rather than policy number. By using the unique combination of four selected characteristics, the micro-segment approximates the effect of using policy number as a granular identifier.

Rather than allowing any possible value as an adjustment factor, 1000 values in 0.5% increments were created as allowed adjustment factor values through the Complementary Group Factor. The Complementary Group serves as a three digit representation of the Complementary Group Factor, since there is an unchanging one-to-one relationship between the two.

Exhibit 1

Figure 5 - Actuarially Sound Range of CGR Factors and Selection



*Calculations conceptually accurate, but actual calculations take into account the coverage premiums that the CGR factor does/doesn't apply to.

Background: Factor Selection Process (before CGR)

Assume that a rating plan has 3 variables, each with 3 groupings:

- **Territory**
- **Claims**
- **Vehicle Type**

Illustrative Example			
Territory	**Current**	**Indicated**	**Proposed**
1	1.00	0.95	0.99
2	1.20	1.30	1.25
3	1.40	1.10	1.35
Claims	**Current**	**Indicated**	**Proposed**
0	1.00	1.00	1.00
1	1.10	1.10	1.10
2+	1.50	1.60	1.51
Vehicle Type	**Current**	**Indicated**	**Proposed**
Car	1.00	1.00	1.00
Truck	1.10	1.30	1.12
Van	1.50	1.60	1.60
Base Rate	**Current**	**Indicated**	**Proposed**
State	231.48	223.42	224.02
Overall Rate Change:		0%	

Proposed factors are between current and indicated but movement towards indicated is based on judgment or an attempt to mitigate customer impact. Business considerations have been and are an acceptable input to the pricing process.

Background: Factor Selection Process (before CGR)

If we assume there is one customer for each unique combination of rating variables, we can calculate the current, indicated, and proposed premiums using the information on the previous slide.

Example: Territory 1, 1 Claim, Truck				
		Current	Indicated	Proposed
Base Rate		$231.48	$223.42	$224.02
Territory	X	1.00	0.95	0.99
1 Claim	X	1.10	1.10	1.10
Truck	X	1.10	1.30	1.12
Premium	=	$280.09	$303.51	$273.23

Illustrative Summary of Current, Indicated, and Proposed Policy Premiums

Territory	Claims	Vehicle	Base Rate	Policies in Force	Current	Indicated	Proposed
1	0	Car	State	1	231.48	212.24	221.78
1	0	Truck	State	1	254.63	275.92	248.39
1	0	Van	State	1	347.22	339.59	354.84
1	1	Car	State	1	254.63	233.47	243.95
1	1	Truck	State	1	280.09	303.51	273.23
1	1	Van	State	1	381.94	373.55	390.33
1	2+	Car	State	1	347.22	339.59	334.88
1	2+	Truck	State	1	381.94	441.47	375.07
1	2+	Van	State	1	520.83	543.35	535.81
2	0	Car	State	1	277.78	290.44	280.02
2	0	Truck	State	1	305.56	377.57	313.62
2	0	Van	State	1	416.67	464.70	448.03
2	1	Car	State	1	305.56	319.48	308.02
2	1	Truck	State	1	336.11	415.33	344.98
2	1	Van	State	1	458.33	511.17	492.84
2	2+	Car	State	1	416.67	464.70	422.83
2	2+	Truck	State	1	458.33	604.11	473.57
2	2+	Van	State	1	625.00	743.53	676.53
3	0	Car	State	1	324.07	245.76	302.42
3	0	Truck	State	1	356.48	319.48	338.71
3	0	Van	State	1	486.11	393.21	483.87
3	1	Car	State	1	356.48	270.33	332.66
3	1	Truck	State	1	392.13	351.43	372.58
3	1	Van	State	1	534.72	432.53	532.26
3	2+	Car	State	1	486.11	393.21	456.66
3	2+	Truck	State	1	534.72	511.17	511.46
3	2+	Van	State	1	729.17	629.14	730.65
Total/Average:				27	400.00	400.00	400.00

Background: Factor Selection Process (before CGR)

Illustrative Summary of Indicated and Proposed Policyholder Impacts

Territory	Claims	Vehicle	Base Rate	Policies in Force	Current	Indicated	Proposed	Indicated	Proposed
1	0	Car	State	1	231.48	212.24	221.78	-8.3%	-4.2%
1	0	Truck	State	1	254.63	275.92	248.39	8.4%	-2.5%
1	0	Van	State	1	347.22	339.59	354.84	-2.2%	2.2%
1	1	Car	State	1	254.63	233.47	243.95	-8.3%	-4.2%
1	1	Truck	State	1	280.09	303.51	273.23	8.4%	-2.5%
1	1	Van	State	1	381.94	373.55	390.33	-2.2%	2.2%
1	2+	Car	State	1	347.22	339.59	334.88	-2.2%	-3.6%
1	2+	Truck	State	1	381.94	441.47	375.07	15.6%	-1.8%
1	2+	Van	State	1	520.83	543.35	535.81	4.3%	2.9%
2	0	Car	State	1	277.78	290.44	280.02	4.6%	0.8%
2	0	Truck	State	1	305.56	377.57	313.62	23.6%	2.6%
2	0	Van	State	1	416.67	464.70	448.03	11.5%	7.5%
2	1	Car	State	1	305.56	319.48	308.02	4.6%	0.8%
2	1	Truck	State	1	336.11	415.33	344.98	23.6%	2.6%
2	1	Van	State	1	458.33	511.17	492.84	11.5%	7.5%
2	2+	Car	State	1	416.67	464.70	422.83	11.5%	1.5%
2	2+	Truck	State	1	458.33	604.11	473.57	31.8%	3.3%
2	2+	Van	State	1	625.00	743.53	676.53	19.0%	8.2%
3	0	Car	State	1	324.07	245.76	302.42	-24.2%	-6.7%
3	0	Truck	State	1	356.48	319.48	338.71	-10.4%	-5.0%
3	0	Van	State	1	486.11	393.21	483.87	-19.1%	-0.5%
3	1	Car	State	1	356.48	270.33	332.66	-24.2%	-6.7%
3	1	Truck	State	1	392.13	351.43	372.58	-10.4%	-5.0%
3	1	Van	State	1	534.72	432.53	532.26	-19.1%	-0.5%
3	2+	Car	State	1	486.11	393.21	456.66	-19.1%	-6.1%
3	2+	Truck	State	1	534.72	511.17	511.46	-4.4%	-4.4%
3	2+	Van	State	1	729.17	629.14	730.65	-13.7%	0.2%
Total/Average:				27	400.00	400.00	400.00	0.0%	0.0%

Note that while all proposed factors moved toward indicated or were left constant, not all policies move toward indicated.

Using the same example as before (Territory 1, 1 Claim, Truck), we can see that while this policy is indicated to increase by 8.4% largely due to the indicated factor for Vehicle Type, the proposed factors result in a negative overall change.