Draft date: 3/2/23

Virtual Meeting
(in lieu of meeting at the 2023 Spring National Meeting)

CASUALTY ACTUARIAL AND STATISTICAL (C) TASK FORCE
Tuesday, March 7, 2023
12:00 – 1:30 p.m. PT / 1:00 – 2:30 p.m. MT / 2:00 – 3:30 p.m. CT / 3:00 – 4:30 p.m. ET

ROLL CALL

Chris Nicolopoulos, Chair	New Hampshire	Troy Downing	Montana
Chlora Lindley-Myers, Vice Chair	Missouri	Joseph Rios Jr.	N. Mariana Islands
Mark Fowler	Alabama	Eric Dunning	Nebraska
Lori K. Wing-Heier	Alaska	Scott Kipper	Nevada
Ricardo Lara	California	Marlene Caride	New Jersey
Andrew N. Mais	Connecticut	Jennifer Catechis	New Mexico
Karima M. Woods	District of Columbia	Mike Causey	North Carolina
Michael Yaworsky	Florida	Judith L. French	Ohio
Dana Popish Severinghaus	Illinois	Glen Mulready	Oklahoma
Amy L. Beard	Indiana	Andrew R. Stolfi	Oregon
Doug Ommen	Iowa	Michael Humphreys	Pennsylvania
Vicki Schmidt	Kansas	Michael Wise	South Carolina
James J. Donelon	Louisiana	Cassie Brown	Texas
Timothy N. Schott	Maine	Kevin Gaffney	Vermont
Kathleen A. Birrane	Maryland	Mike Kreidler	Washington
Anita G. Fox	Michigan	Allan L. McVey	West Virginia
Grace Arnold	Minnesota		

NAIC Support Staff: Kris DeFrain

AGENDA

1. Consider Adoption of its Jan. 31, 2023; Jan. 27, 2023; Jan. 10, 2023; Jan. 3, 2023; Dec. 9, 2022; and 2022 Fall National Meeting Minutes —*Christian Citarella (NH)* — Attachment One, Attachment Two

2. Consider Adoption of its Working Group Reports and Minutes
    A. Actuarial Opinion (C) Working Group—*Miriam Fisk (TX)* — Attachment Three
    B. Statistical Data (C) Working Group—*Sandra Darby (ME)* — Attachment Four

3. Consider Adoption of the Generalized Additive Model (GAM) Appendix —*Christian Citarella (NH)* — Attachment Five

4. Consider the Elimination of the NAIC Expense Constant Forms
   —*Larry Steinert (IN)*
   https://content.naic.org/industry_rates_forms_loss_cost.htm

5. Discuss a Communication Plan for the Adopted Loss Cost Multiplier (LCM) Forms—*Christian Citarella (NH)*

6. Hear Activity and Research Reports from the Actuarial Standards Board (ASB), the American Academy of Actuaries (Academy), the Casualty Actuarial Society (CAS), and the Society of Actuaries (SOA) —*Christian Citarella (NH)*   Attachment Six

7. Discuss Any Other Matters Brought Before the Task Force
   —*Christian Citarella (NH)*
   A. Discussion/Drafting Group on the Second Exposure Draft of the *Actuarial Standard of Practice (ASOP) 29: Expense Provisions for Prospective Property/Casualty Risk Transfer and Risk Retention* will meet March 30 with a May 1 comment deadline. Contact Kris DeFrain (kdefrain@naic.org) to attend.
   B. Please send any Book Club topics you wish to request to Sam Kloese (SKloese@naic.org).
   C. NAIC Staff are creating Generalized Linear Model (GLM) training using modules to explain what to look for in a filing, how to read the filing graphs and understand the content, and how to assess the model in the filing.
   D. Big Data and Artificial Intelligence (H) Working Group will discuss the Base Model Questions at the Spring National Meeting.
   E. P/C regulatory actuaries will have an informal gathering at the Spring National Meeting. The current plan is to meet Thursday, March 23, 2:30-3:30. Contact Kris DeFrain (kdefrain@naic.org) to attend.
   F. Next Rate Filing Issues Regulator-Only Meeting: March 14, 1pm CT.
   G. Next Book Club Webinar: "Penalized Regression—Between Credibility and GBM" is April 25, 1pm CT.

8. Adjournment

Draft: 2/2/23

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Casualty Actuarial and Statistical (C) Task Force
E-Vote
January 31, 2023

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The Casualty Actuarial and Statistical (C) Task Force conducted an e-vote that concluded Jan. 31, 2023. The following Task Force members participated: Mike Kreidler, Chair, represented by Eric Slavich (WA); Andrew N. Mais represented by Wanchin Chou (CT); Karima M. Woods represented by David Christhilf (DC); TBD represented by Christina Huff (FL); Doug Ommen represented by Travis Grassel (IA); Dana Popish Severinghaus represented by Reid McClintock (IL); Amy L. Beard represented by Larry Steinert (IN); Vicki Schmidt represented by Nicole Boyd (KS); Kathleen A. Birrane represented by Robert Baron (MD); Timothy N. Schott represented by Sandra Darby (ME); Troy Downing represented by Mari Kindberg (MT); Mike Causey represented by Richard Kohan (NC); Eric Dunning represented by Michael Muldoon (NE); Chris Nicolopoulos represented by Christian Citarella (NH); Marlene Caride represented by Carl Sornson (NJ); Jennifer Catechis represented by Anna Krylova (NM); Judith L. French represented by Tom Botsko (OH); Glen Mulready represented by Andrew Schallhorn (OK); Michael Wise represented by Will Davis (SC); Cassie Brown represented by J'ne Byckovski (TX); Kevin Gaffney represented by Rosemary Raszka (VT); and Allan L. McVey (WV).

1. <u>Adopted the Competition Report</u>

The Task Force conducted an e-vote to consider adoption of the *2021 Competition Database Report* (Competition Report). The motion passed unanimously.

Having no further business, the Casualty Actuarial and Statistical (C) Task Force adjourned.

SharePoint/NAIC Support Staff Hub/Member Meetings/C CMTE/2023_Spring/CASTF/013123 Competition evote min.docx

Draft: 1/31/23

Casualty Actuarial and Statistical (C) Task Force
E-Vote
January 27, 2023

The Casualty Actuarial and Statistical (C) Task Force conducted an e-vote that concluded Jan. 27, 2023. The following Task Force members participated: Mike Kreidler, Chair, represented by Eric Slavich (WA); Andrew N. Mais represented by Wanchin Chou (CT); Karima M. Woods represented by David Christhilf (DC); TBD represented by Christina Huff (FL); Doug Ommen represented by Travis Grassel (IA); Dana Popish Severinghaus represented by Reid McClintock (IL); Amy L. Beard represented by Larry Steinert (IN); Vicki Schmidt represented by Nicole Boyd (KS); James J. Donelon represented by Nichole Torblaa (LA); Kathleen A. Birrane represented by Robert Baron (MD); Timothy N. Schott represented by Sandra Darby (ME); Anita G. Fox represented by Kevin Dyke (MI); Chlora Lindley-Myers represented by Julie Lederer (MO); Troy Downing represented by Mari Kindberg (MT); Mike Causey represented by Richard Kohan (NC); Chris Nicolopoulos represented by Christian Citarella (NH); Marlene Caride represented by Carl Sornson (NJ); Jennifer Catechis represented by Anna Krylova (NM); Judith L. French represented by Tom Botsko (OH); Glen Mulready represented by Cuc Nguyen and Andrew Schallhorn (OK); Andrew R. Stolfi represented by David Dahl (OR); Michael Wise represented by Will Davis (SC); Cassie Brown represented by J'ne Byckovski (TX); Kevin Gaffney represented by Rosemary Raszka (VT); and Allan L. McVey (WV).

1. Adopted the 2019/2020 Auto Report

The Task Force conducted an e-vote to consider adoption of the *2019/2020 Auto Insurance Database Report* (Auto Report). The motion passed unanimously.

Having no further business, the Casualty Actuarial and Statistical (C) Task Force adjourned.

SharePoint/NAIC Support Staff Hub/Member Meetings/C CMTE/2023_Spring/CASTF/012723 Auto evote min.docx

Draft: 1/23/23

Casualty Actuarial and Statistical (C) Task Force
Virtual Meeting
January 10, 2023

The Casualty Actuarial and Statistical (C) Task Force met Jan. 10, 2023. The following Task Force members participated: Mike Kreidler, Chair, represented by Eric Slavich (WA); Grace Arnold, Vice Chair, represented by Phil Vigliaturo (MN); Mark Fowler represented by Charles Hale (AL); Ricardo Lara represented by Mitra Sanandajifar and Lynne Wehmueller (CA); Michael Conway represented by Mitchell Bronson (CO); Andrew N. Mais represented by Wanchin Chou (CT); David Altmaier represented by Greg Jaynes (FL); Colin M. Hayashida represented by Randy Jacobson (HI); Dana Popish Severinghaus represented by Reid McClintock and Judy Mottar (IL); Vicki Schmidt represented by Nicole Boyd (KS); James J. Donelon represented by Nichole Torblaa and Arthur Schwartz (LA); Kathleen A. Birrane represented by Walter Dabrowski (MD); Chlora Lindley-Myers represented by Cynthia Amann and Julie Lederer (MO); Chris Nicolopoulos represented by Christian Citarella (NH); Marlene Caride represented by Sam Sackey (NJ); Russell Toal represented by Anna Krylova (NM); Barbara D. Richardson represented by Gennady Stolyarov (NV); Judith L. French represented by Tom Botsko (OH); Glen Mulready represented by Andrew Schallhorn (OK); Andrew Stolfi represented by David Dahl and Ying Liu (OR); Michael Humphreys represented by Michael McKenney (PA); Michael Wise represented by Will Davis (SC); Cassie Brown represented by J'ne Byckovski (TX); Kevin Gaffney represented by Rosemary Raszka (VT); and Allan L. McVey represented by Juanita Wimmer (WV).

1. Exposed the Draft GAM Appendix

Sam Kloese (NAIC) presented about Generalized Additive Models (GAMs) (Attachment �). He said the draft GAM appendix to the white paper *Regulatory Review of Predictive Models* has tracked changes showing how the GAM appendix would differ from the already-adopted Generalized Linear Model (GLM) appendix (Attachment �). At the chair's request, the appendix was exposed for a 45-day public comment period ending Feb. 24. No members objected.

Having no further business, the Casualty Actuarial and Statistical (C) Task Force adjourned.

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Draft: 1/6/23

Casualty Actuarial and Statistical (C) Task Force
E-Vote
January 3, 2023

The Casualty Actuarial and Statistical (C) Task Force conducted an e-vote that concluded Jan. 3, 2023. The following Task Force members participated: Mike Kreidler, Chair, represented by Eric Slavich (WA); Grace Arnold, Vice Chair, represented by Phil Vigliaturo (MN); Ricardo Lara represented by Lynne Wehmueller (CA); Michael Conway represented by Mitchell Bronson (CO); Andrew N. Mais represented by Wanchin Chou (CT); Karima M. Woods represented by David Christhilf (DC); David Altmaier represented by Christina Huff (FL); Colin M. Hayashida represented by Randy Jacobson (HI); Dana Popish Severinghaus represented by Reid McClintock (IL); Amy L. Beard represented by Larry Steinert (IN); Timothy N. Schott represented by Sandra Darby (ME); Chlora Lindley-Myers and Julie Lederer (MO); Troy Downing represented by Mari Kindberg (MT); Chris Nicolopoulos represented by Christian Citarella (NH); Marlene Caride represented by Carl Sornson (NJ); Judith L. French represented by Tom Botsko (OH); Glen Mulready represented by Andrew Schallhorn (OK); Cassie Brown represented by J'ne Byckovski (TX); and Allan L. McVey (WV).

1. Adopted the 2021 Profitability Report

The Task Force conducted an e-vote to consider adoption of the 2021 *Report on Profitability by Line by State* (Profitability Report). The motion passed unanimously.

Having no further business, the Casualty Actuarial and Statistical (C) Task Force adjourned.

SharePoint/NAIC Support Staff Hub/Member Meetings/C CMTE/2023_Spring/CASTF/010323 evote min.docx

Draft: 1/6/23

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Casualty Actuarial and Statistical (C) Task Force
E-Vote
December 9, 2022

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The Casualty Actuarial and Statistical (C) Task Force conducted an e-vote that concluded Dec. 9, 2022. The following Task Force members participated: Mike Kreidler, Chair, represented by Eric Slavich (WA); Grace Arnold, Vice Chair, represented by Phil Vigliaturo (MN); Ricardo Lara represented by Lynne Wehmueller (CA); Michael Conway represented by Mitchell Bronson (CO); Andrew N. Mais represented by Wanchin Chou (CT); Karima M. Woods represented by David Christhilf (DC); David Altmaier represented by Christina Huff (FL); Colin M. Hayashida represented by Randy Jacobson (HI); Doug Ommen represented by Travis Grassel (IA); Dana Popish Severinghaus represented by Judy Mottar (IL); Amy L. Beard represented by Larry Steinert (IN); Vicki Schmidt represented by Nicole Boyd (KS); Timothy N. Schott represented by Sandra Darby (ME); Chlora Lindley-Myers represented by Julie Lederer (MO); Troy Downing represented by Mari Kindberg (MT); Russell Toal and Anna Krylova (NM); Judith L. French represented by Tom Botsko (OH); Glen Mulready represented by Andrew Schallhorn (OK); Andrew R. Stolfi represented by David Dahl (OR); Michael Humphreys represented by Michael McKenney (PA); Michael Wise represented by Will Davis (SC); Cassie Brown represented by J'ne Byckovski (TX); and Allan L. McVey and Juanita Wimmer (WV).

1. Adopted the 2020 Homeowners Report

The Task Force conducted an e-vote to consider adoption of the 2020 *Dwelling, Fire, Homeowners Owner-Occupied, and Homeowners Tenant and Condominium/Cooperative Unit Owner's Insurance Report* (Homeowner Report). The motion passed unanimously.

Having no further business, the Casualty Actuarial and Statistical (C) Task Force adjourned.

SharePoint/NAIC Support Staff Hub/Member Meetings/C CMTE/2023_Spring/CASTF/120922 evote min.docx

Draft: 11/23/22

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Casualty Actuarial and Statistical (C) Task Force
Virtual Meeting (*in lieu of meeting at the 2022 Fall National Meeting*)
November 8, 2022

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The Casualty Actuarial and Statistical (C) Task Force met Nov. 8, 2022. The following Task Force members participated: Mike Kreidler, Chair, represented by Eric Slavich (WA); Grace Arnold, Vice Chair, represented by Phil Vigliaturo (MN); Ricardo Lara represented by Mitra Sanandajifar and Lynne Wehmueller (CA); Michael Conway represented by Mitchell Bronson (CO); David Altmaier represented by Greg Jaynes (FL); Colin M. Hayashida represented by Randy Jacobson (HI); Doug Ommen represented by Travis Grassel (IA); Amy L. Beard represented by Larry Steinert (IN); Vicki Schmidt represented by Nicole Boyd (KS); James J. Donelon represented by Nichole Torblaa (LA); Timothy N. Schott represented by Sandra Darby (ME); Chlora Lindley-Myers represented by Julie Lederer (MO); Troy Downing represented by Mari Kindberg (MT); Russell Toal represented by Anna Krylova (NM); Barbara D. Richardson represented by Gennady Stolyarov (NV); Judith L. French represented by Tom Botsko (OH); Glen Mulready represented by Kate Yang (OK); Andrew R. Stolfi represented by David Dahl and Ying Liu (OR); Michael Humphreys represented by Michael McKenney (PA); Michael Wise represented by Karl Bitzky (SC); Cassie Brown represented by Miriam Fisk (TX); and Kevin Gaffney represented by Mary Richter (VT).

1. <u>Adopted its Oct. 18 and Summer National Meeting Minutes</u>

Slavich said the Task Force met Oct. 18 and Aug. 10. During its Oct. 18 e-vote, the Task Force adopted its 2023 proposed charges.

The Task Force also met Oct. 18 in regulator-to-regulator session, pursuant to paragraph 3 (specific companies, entities, or individuals) of the NAIC Policy Statement on Open Meetings, to discuss rate filing issues.

The Task Force held Predictive Analytics Book Club meetings on Oct. 25 and Aug. 30. On Oct. 25, Sam Kloese (NAIC), Dorothy L. Andrews (NAIC), and Roberto Perez Santiago (NAIC) presented on "P-Values and Alternatives." On Aug. 30, Ryan McMahon (Cambridge Mobile Telematics—CMT) presented on "Current Trends in Telematics."

Vigliaturo made a motion, seconded by Botsko, to adopt the Task Force's Oct. 18 (Attachment One) and Aug. 10 (*see NAIC Proceedings – Summer 2022, Casualty Actuarial and Statistical (C) Task Force*) minutes. The motion passed unanimously.

2. <u>Adopted the Report of the Actuarial Opinion (C) Working Group</u>

Krylova said the Actuarial Opinion (C) Working Group met Sept. 26, Sept. 15, and Sept. 8. The Working Group conducted the Sept. 26 e-vote and adopted 2022 Regulatory Guidance. During its Sept. 15 meeting, the Working Group adopted a comment letter to the Actuarial Standards Board (ASB) regarding the *Actuarial Standard of Practice (ASOP) No. 36, Statements of Actuarial Opinion Regarding Property/Casualty Loss, Loss Adjustment Expense, or Other Reserves Exposure Draft*.

Krylova said changes to the Regulatory Guidance were relatively minor. She said they replaced specific ASOPs with a recommendation to use the ASB's ASOP Applicability Guidelines; replaced the 2018 and 2019 description of changes to the instructions with a brief summary of the latest changes to the instructions; removed two sections that discussed the qualified actuary definition and the continuing education (CE) logging procedure that the Task Force eliminated; added some prospective information about plans to modify qualification documentation and deadlines; and streamlined the section on COVID-19.

Krylova said the Working Group will continue discussion on its referral from the Financial Analysis (E) Working Group regarding predictive analytics in a reserve setting.

Krylova made a motion, seconded by Vigliaturo, to adopt the report of the Actuarial Opinion (C) Working Group, including its Sept. 26 (Attachment Two), Sept. 15, and Sept. 8 minutes (Attachment Three). The motion passed unanimously.

3.   Adopted the Report of the Statistical Data (C) Working Group

Darby said the Statistical Data (C) Working Group met Oct. 26 and Sept. 28. During these meetings, the Working Group discussed proposed changes to the *Report on Profitability by Line by State* (Profitability Report) and the *Competition Database Report* (Competition Report). She said the Working Group discussed which proposed changes would improve the usefulness of the reports. Discussion will continue regarding the proposed changes for these reports, as well as potential changes to the *Auto Insurance Database Report* (Auto Report) and the *Dwelling, Fire, Homeowners Owner-Occupied, and Homeowners Tenant and Condominium/Cooperative Unit Owner's Insurance Report* (Homeowners Report). Darby said any adopted changes to the reports will not be implemented until 2023.

The Working Group will meet Nov. 17 in regulator-to-regulator session to review and consider adoption of the 2020 Homeowners Report and the 2021 Profitability Report. The 2019/2020 Auto Report and the 2021 Competition Report will be considered for adoption, likely with an e-vote, at the end of November. After adoption, these reports will be sent to the Task Force for review and adoption before being released publicly.

Darby said the Working Group adopted accelerated timelines for the submission of the Homeowners Report and Auto Report. Collection of 2021 premium and exposure data is underway, with a due date of Dec. 1 for both reports.

Darby made a motion, seconded by Botsko, to adopt the report of the Statistical Data (C) Working Group, including its Oct. 26 (Attachment Four) and Sept. 28 (Attachment Five) minutes. The motion passed unanimously.

4.   Adopted Updated LCM Form and Instructions

Slavich said the idea to create an updated loss cost multiplier (LCM) form was brought forward at the Spring National Meeting, after which Steinert led a Subgroup to update and combine the NAIC's numerous LCM forms. The initial proposal was exposed for a public comment period ending Feb. 7. The Subgroup produced a revised form and presented it July 12. Steinert noted there is also a memorandum that should accompany the form. The Task Force exposed the revised memorandum and the revised LCM form together for a 45-day public comment period. After that comment period, one comment letter was received (Attachment Six). The LCM form was updated in response to the comment.

Vigliaturo made a motion, seconded by McKenney, to adopt the updated LCM form and accompanying memorandum (Attachment Seven). The motion passed unanimously with two abstentions.

5.   Exposed the Potential Elimination of the Expense Constant Supplement

The Task Force discussed the potential elimination of the NAIC Expense Constant Supplement for perceived lack of need. To investigate for any unknown need, the Task Force agreed to expose the proposal to eliminate the NAIC Expense Constant Supplement for a 45-day public comment period ending Dec. 22. Slavich said comments to keep the form or eliminate the form are welcome. Steinert said elimination of the NAIC form does not preclude a state from using a similar form on its own.

6. Heard Reports from Professional Actuarial Organizations

The American Academy of Actuaries' (Academy's) Committee on Property and Liability Reporting (COPLFR) and Casualty Practice Council (CPC), the Actuarial Board for Counseling and Discipline (ABCD), and the Casualty Actuarial Society (CAS) provided reports on current activities. The Society of Actuaries (SOA) provided a written report.

Having no further business, the Casualty Actuarial and Statistical (C) Task Force adjourned.

SharePoint/NAIC Support Staff Hub/Member Meetings/C CMTE/2022_Fall/CASTF/1108 Min.docx

Draft: 1/30/23

Actuarial Opinion (C) Working Group
Virtual Meeting
January 26, 2023

The Actuarial Opinion (C) Working Group of the Casualty Actuarial and Statistical (C) Task Force met Jan. 26, 2023. The following Working Group members participated: Miriam Fisk, Chair (TX); Anna Krylova, Vice Chair (NM); Amy Waldhauer (CT); David Christhilf (DC); Chantel Long and Judy Mottar (IL); Sandra Darby (ME); Julie Lederer (MO); Tom Botsko (OH); Andrew Schallhorn (OK); and James DiSanto (PA). Also participating was: Arthur Schwartz (LA).

1. Discussed Draft Changes to the Actuarial Opinion Instructions

Krylova said the Working Group has discussed changing the qualification documentation requirement from annual submission to submission once every five years. Michelle L. Iarkowski (Deloitte Consulting LLP) said feedback at the American Academy of Actuaries' (Academy's) Actuarial Opinion Reserve Seminar was that a change to requiring submission once every five years would increase the administrative burden and that most participants said they would continue to submit it annually.

Ralph Blanchard (The Travelers Companies) said that once every five years might make the Board pay more attention to the document. Long said the regulatory burden of the qualification document has, so far, outweighed the benefit. Iarkowski said seminar participants still do not understand why the requirement to provide qualification documentation to the Board has been imposed and point out that there is no similar requirement for life and health actuaries.

The Working Group suggested two editorial corrections be made by NAIC staff but said that the Working Group would not propose any substantive changes to the 2023 Statement of Actuarial Opinion (SAO) instructions for property/casualty (P/C) and title.

Long gave a preview of some proposed changes for 2024 actuarial opinions: 1) remove the address of the appointed actuary from the signature block. Some actuaries are working from home and may not feel comfortable using their home address and have no other address to provide; and 2) within the "change in actuary" section, add an additional example to encompass disagreements outside of the scope of the opinion.

2. Discussed a Financial Analysis (E) Working Group Referral on Predictive Analytics in Reserving

The Working Group discussed a draft response to a referral from the Financial Analysis (E) Working Group asking for discussion of the use of predictive analytics in reserving and consideration of drafting guidance. Lederer drafted a potential response to the referral, including some potential questions to ask about reserving models. Long said the proposed response contains a good description of the issues that occurred in the case that prompted the Financial Analysis (E) Working Group's referral. Lederer suggested the Working Group reach out to other actuarial regulators to find someone who has reviewed a reserve model's answer in a financial examination.

Regarding the questions to ask during an exam, Schwartz said he would need more technical information (e.g., goodness of fit metrics for variables and the model as a whole; a list of variables; amount of data on which the model is based) to evaluate the model. Both Lederer and Krylova said they are concerned that state departments of insurance (DOIs) examiners may not have staff that would be able to evaluate responses to in-depth, technical questions. Fisk offered to share additional resources containing lists of questions that could be applicable.

Having no further business, the Actuarial Opinion (C) Working Group adjourned.

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Draft: 02/28/23

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Statistical Data (C) Working Group
Virtual Meeting
February 23, 2023

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The Statistical Data (C) Working Group of the Casualty Actuarial and Statistical (C) Task Force met Feb. 23, 2023. The following Working Group members participated: Sandra Darby, Chair (ME); Qing He, Vice Chair, George Bradner, and Wanchin Chou (CT); David Christhilf (DC); Arthur Schwartz and John Sobhanian (LA); Cynthia Amann (MO); Christian Citarella (NH); Alexander Vajda (NY); Tom Botsko (OH); and David Dahl and Ying Liu (OR). Also participating were: Luciano Gobbo (CA); David Dombrowski (MT); and Chris Aufenthie (ND).

1. Adopted the Auto Insurance Average Premium Supplement

Darby said this Working Group adopted a new timeline that would have written premium and exposure data for the *Auto Database Report* (Auto Report) reported about six months earlier. She said this speeds up the reporting of average premiums, but earned premium, earned exposures, and loss data cannot be reported on the same faster timeline. She said this would leave a large gap in the years of data provided and that the earned premium and loss data would now be published later than it would have been on the previous timeline. Justin Cox (NAIC) said the new timeline creates a couple of issues. He said the first issue is that if this Working Group plans to release the full Auto Report in the spring as dictated by the new timeline, the only updates to the report would be the written premium and exposure as the other data would not have changed from the report released in February 2023. He said the second issue is the two year gap between the reported written premiums and the reported earned premiums going forward. He said the best solution to these issues is to release an Auto Insurance Average Premium Supplement in the spring that would include only the written premium and exposure information that is reported by the statistical agents on December 1 following the end of the data year. Then, the statistical agents would provide the full premium, exposure and loss data set on the original timeline, with the full Auto Report being released at the end of the year.

Darby asked if the statistical agents that provide the data are agreeable to providing two data sets throughout the year to allow for the release of an average premium supplement. Laura Panesso (Insurance Services Office—ISO), Lori Munn (American Association of Insurance Services—AAISO), Albert Burton (Independent Statistical Service—ISS), and Jeff Patterson (National Independent Statistical Service—NISS) said they would not have a problem providing the data twice during the year.

Amann made a motion, seconded by Citarella, to adopt the creation of the Auto Insurance Average Premium Supplement. The motion passed unanimously.

Cox said NAIC staff is working to draft language to accompany the supplement and that language will be distributed to the Working Group for comment. Amann suggested adding information on the timeline issues to the language to explain the need for the creation of the supplement.

2. Discussed Proposed Changes to NAIC Statistical Reports

Schwartz said his first proposed change to the Dwelling Fire, Homeowners Owner-Occupied, and Homeowners Tenant and Condominium/Cooperative Unit Owner's Insurance Report (Homeowners Report) is to change the name to the NAIC Home Insurance Database or the NAIC Residential Insurance Database. He said this is similar to his proposals for the other reports and that all of the reports should have common names. He said including the word database in the report title will give people a better understanding of what is included in the report. He said

the current name is too long. Botsko said the word database implies a store of data on which reports can be run. He said he would be hesitant to change the title to include the word database since this is a static report. Darby agreed that the name was long and it may be a good idea to change it. She suggested calling it a data report instead of a database. Schwartz said he would like a title that makes it clear that it is a report of the data. Amann said she agrees with streamlining the name of the report, but there should be an indication early on in the report of what coverage are included in this report. Birny Birnbaum (Center for Economic Justice—CEJ) said the Homeowners Report title is accurate and provides a complete description.

Schwartz said one of his proposals is also to have all the reports available in a downloadable .CSV format. Darby said the .CSV versions of the reports are already available to regulators by requesting access from NAIC staff.

Schwartz said his next proposal is to include a table showing average premium per amount of insurance. He said the report should also take into consideration the large differences in home prices based on location and other factors. Darby said the data is provided in the buckets shown in the report by the statistical agents so the table Schwartz is trying to create would not currently be possible. Libby Crews (NAIC) confirmed that the data is aggregated into the buckets before it is sent to the NAIC by statistical agents. Schwartz suggested using the midpoint of each bucket to determine the average premium per insurance range. He said it would also be useful to include the median home price per state. Birnbaum said taking the midpoint of the insurance range would not be accurate and would not be possible for the range to this $500,000 and over.

Darby said she would like to reevaluate the current insurance ranges since home prices, and therefore coverage, have gone up significantly since these ranges were first determined. She said the distribution of premiums and exposures in the lower ranges is significantly less than it was years ago. She said they should also look at adding additional ranges over $500,000 since many states have large premium and exposure amounts in that range. Dahl said he agrees there should be additional ranges above $500,000 and that they should also considering breaking out some of the current ranges into smaller ranges to get more detail. Brian Sullivan (Risk Information) said it is clear that when the ranges where created, they were trying to capture information about the ranges with the most exposures. He said since then, the lower ranges have had less exposures while the highest ranges have increased. He said the ranges need to be reset so there is granularity in the ranges with the most exposure. He said the reporting of the data should be set up in a way that it is not difficult to change the ranges in the future if necessary. Qing He asked what the criteria was when the insurance ranges were set up. Crews said she would look into past meeting minutes to determine how the Working Group initially determined the ranges.

Darby asked the participating statistical agents how they currently collect the insurance range information and if they have raw data or if they collect it in the determined insurance ranges. All participating statistical agents said they have the raw data on the insured value and they map that data to each insurance range that is requested by the NAIC.

Darby said she would create a spreadsheet to gather data from the statistical agents the premium and exposures for smaller insurance ranges. She said the Working Group would then be able to determine the distribution of exposures at a more granular level and they could then decide which ranges of insurance make sense to publish in the report.

Darby said the Working Group will continue to discuss changes to these reports in future meetings.

3. Discussed 2023 Work Plan

Darby said this Working Group received an initial look at dashboards created by NAIC staff during a regulator only meeting in January 2023. She said NAIC staff is developing dashboards for the Profitability Report, Homeowners

Report and Auto Report. She said this Working Group will spend the year reviewing and developing these dashboards. She said this will provide a good look at the type of data regulators currently have available which will inform future discussions about updates to the statistical handbook, including what data regulators need and the most efficient way to collect and analyze that data. She said since these dashboards will be looking at company level data, as well as data from specific statistical agents, the majority of the Working Group discussions will be regulator only. She said they will work towards developing training on the use of this data for regulators which they hope to present at the NAIC Insurance Summit in September. She said once the Working Group has determined how regulators can utilize the data currently available, they can pivot into how they can update the statistical handbook to gather data that regulators are looking for.

Having no further business, the Statistical Data (C) Working Group adjourned.

SharePoint/NAIC Support Staff Hub/Member Meetings/C CMTE/2023_Spring/CASTF/SDWG/StatDataWGmin_0223

Significant Changes Summary

1   The introduction has been clarified to reflect that this appendix is for GAMs only.

2   Information elements discussing p-values and concurvity metrics have an asterisk and a related footnote. The footnote explains that if a certain variety of GAM can't produce these measures, requests should focus on satisfying the purpose of this element through other methods.

3   The correlation matrix information element now requests both the parametric variables and the inputs for the smoothed variables. This is to help identify relationships between the parametric variables and non-parametric variables.

4   The commentary about lower approximate p-value thresholds now includes an example. "For example, if a regulator typically applies a 0.05 threshold to a GLM, they may want to consider applying a 0.03 threshold to the smoothed terms within a GAM."

5   The commentary about evaluating smoothed term plots now discusses the "horizontal line test." The regulatory reviewer should review whether the plot passes the "horizontal line test". The "horizontal line test" checks whether a horizontal line could be drawn in the plot through the confidence intervals. If so, this implies that the smoothed variable is not measuring significant differences across the target variable.

6   Added a statement that the review of multiple concurvity metrics may be beneficial.

Most of the other changes improve the clarity of the wording without revising the original meaning.

Comments Received

Organization	Commentor	Comment Regarding	Change
NAIC	Kris DeFrain	Introduction	Yes
AKUR8	Thomas Holmes	Introduction	Yes
		B.3.d B.4.c B.4.e B.4.f B.4.h B.4.m	Yes
		B.4.d	Yes
California Department of Insurance	Lynne Wehmueller Mitra Sanandajifar	B.2.d	No
		B.2.e	Yes
		B.3.c B.3.d	Yes

		B.4.c	Yes
		B.4.f	Yes
		B.4.h	No
		B.4.k	No
		B.4.m	Yes
		C.1.b	Yes
Arizona Department of Insurance and Financial Institutions	Tom Zuppan	B.1.a	Yes

APPENDIX B-GAM – INFORMATION ELEMENTS AND GUIDANCE FOR A REGULATOR TO MEET BEST PRACTICES' OBJECTIVES (WHEN REVIEWING GENERALIZED ADDITIVE MODELS)

This appendix identifies the information a state insurance regulator may need to review a Generalized Additive Model (GAM) used by an insurer to support a personal automobile or home insurance rating plan. GAM models are similar to Generalized Linear Models (GLMs) but feature smoothed terms in addition to traditional parametric terms. The list is lengthy but not exhaustive. It is not intended to limit the authority of a regulator to request additional information in support of the model or filed rating plan. Nor is every item on the list intended to be a requirement for every filing. However, the items listed should help guide a regulator to sufficient information that helps determine if the rating plan meets state-specific filing and legal requirements.

Documentation of the design and operational details of the model will help ensure the business continuity and transparency of the models used. Documentation should be sufficiently detailed and complete to enable a qualified third party to form a sound judgment on the suitability of the model for the intended purpose. The theory, assumptions, methodologies, software, and empirical bases should be explained, as well as the data used in developing and implementing the model. Relevant testing and ongoing performance testing need to be documented. Key model limitations and overrides need to be pointed out so that stakeholders understand the circumstances under which the model does not work effectively. End-user documentation should be provided and key reports using the model results described. Major changes to the model need to be documented and shared with regulators in a timely and appropriate manner. Information technology (IT) controls should be in place, such as a record of versions, change control, and access to the model.[1]

Many information elements listed below are probably confidential, proprietary, or trade secret and should be treated as such, in accordance with state laws and/or regulations. Regulators should be aware of their state laws and/or regulations on confidentiality when requesting data from insurers that may be proprietary or trade secret. For example, some proprietary models may have contractual terms (with the insurer) that prevent disclosure to the public. Without clear necessity, exposing this data to additional dissemination may compromise the model's protection.[2]

Although the list of information is long, the insurer should already have internal documentation on the model for more than half of the information listed. The remaining items on the list require either minimal analysis (approximately 25%) or deeper analysis to generate for a regulator (approximately 25%). The definition of GAM is quite broad and the available information elements will differ depending on the basis functions used in the GAM as well as the method of penalization. This broad definition of a GAM means that a reviewer should be looking for analogous information in the case where certain necessary information elements are not available. For example, p-values will not be produced for some varieties of GAM. If p-values are being evaluated to confirm the significance of variables included in the model, the reviewer may start a dialogue on how variable significance was evaluated in this particular GAM to obtain the information necessary to satisfy this area of review. In this way, a reviewer can use the information elements below to review wide varieties of GAM.

The "Level of Importance to the Regulator's Review" is a ranking of information a regulator may need to review which is based on the following level criteria:

Level 1 – This information is necessary to begin the review of a predictive model. These data elements pertain to basic information about the type and structure of the model, the data and variables used, the assumptions made, and the goodness of fit. Ideally, this information would be included in the filing documentation with the initial submission of a filing made based on a predictive model.

Level 2 – This information is necessary to continue the review of all but the most basic models, such as those based only on the filer`s internal data and only including variables that are in the filed rating plan. These data elements provide more detailed information about the model and address questions arising from review of the information in Level 1. Insurers concerned with speed to market may also want to include this information in the filing documentation.

Level 3 – This information is necessary to continue the review of a model where concerns have been raised and not resolved based on review of the information in Level 1 and Level 2. These data elements address even more detailed aspects of the model. This information does not necessarily need to be included with the initial submission, unless specifically requested by a particular state, as it is typically requested only if the reviewer has concerns that the model may not comply with state laws and/or regulations.

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[1] Bourdeau, M., 2016. "Model Risk Management: An Overview," The Modeling Platform, Issue 4, December. Accessed online at https://www.soa.org/globalassets/assets/library/newsletters/the-modeling-platform/2016/december/mp-2016-iss4.pdf.

[2] There are some models that are made public by the vendor and would not result in a hindrance of the model's protection.

Level 4 – This information is necessary to continue the review of a model where concerns have been raised and not resolved based on the information in Level 1, Level 2, and Level 3. This most granular level of detail is addressing the basic building blocks of the model and does not necessarily need to be included by the filer with the initial submission, unless specifically requested by a particular state. It is typically requested only if the reviewer has serious concerns that the model may produce rates or rating factors that are excessive, inadequate, and/or unfairly discriminatory.

Appendix B-GAM is focused on Generalized Additive Models (GAMs). This appendix should not be referenced in the review of other model types. GAMs have significant differences from GLMs. This Appendix B-GAM is intended to provide state guidance for the review of rate filings based on Generalized Additive Models.

A. SELECTING MODEL INPUT

Section	Information Element	Level of Importance to the Regulator's Review	Comments
1. Available Data Sources			
A.1.a	Review the details of sources for both insurance and non-insurance data used as input to the model (only need sources for filed input characteristics included in the filed model).	1	Request details of data sources, whether internal to the company or from external sources. For insurance experience (policy or claim), determine whether data are aggregated by calendar, accident, fiscal, or policy year and when it was last evaluated. For each data source, get a list of all data elements used as input to the model that came from that source. For insurance data, get a list all companies whose data is included in the datasets. Request details of any non-insurance data used (customer-provided or other), whether the data was collected by use of a questionnaire/checklist, whether data was voluntarily reported by the applicant, and whether any of the data is subject to the federal Fair Credit Reporting Act (FCRA). If the data is from an outside source, find out what steps were taken to verify the data was accurate, complete, and unbiased in terms of relevant and representative time frame, representative of potential exposures, and lacking in obvious correlation to protected classes. **Note**: Reviewing source details should not make a difference when the model is new or refreshed; refreshed models would report the prior version list with the incremental changes due to the refresh.
A.1.b	Reconcile aggregated insurance data underlying the model with available external insurance reports.	4	Accuracy of insurance data should be reviewed. It is assumed that the data in the insurer's data banks is subject to routine internal company audits and reconciliation. "Aggregated data" is straight from the insurer's data banks without further modification (i.e., not scrubbed or transformed for the purposes of modeling). In other words, the data would not have been specifically modified for the purpose of model building. The company should provide some form of reasonability check that the data makes sense when checked against other audited sources.

Section	Information Element	Level of Importance to the Regulator's Review	Comments
A.1.c	Review the geographic scope and geographic exposure distribution of the raw data for relevance to the state where the model is filed.	2	Many models are developed using a countrywide or a regional dataset. The company should explain how the data used to build the model makes sense for a specific state. The regulator should inquire which states were included in the data underlying the model build, testing, and validation. The company should provide an explanation where the data came from geographically and that it is a good representation for a state; i.e., the distribution by state should not introduce a geographic bias. However, there could be a bias by peril or wind-resistant building codes. Evaluate whether the data is relevant to the loss potential for which it is being used. For example, verify that hurricane data is only used where hurricanes can occur.
2. Sub-Models			
A.2.a	Consider the relevance of (i.e., whether there is bias) of overlapping data or variables used in the model and sub-models.	1	Check if the same variables/datasets were used in the model, a sub-model, or as stand-alone rating characteristics. If so, verify the insurance company has processes and procedures in place to assess and address double-counting or redundancy.
A.2.b	Determine if the sub-model was previously approved (or accepted) by the regulatory agency.	1	If the sub-model was previously approved/accepted, that may reduce the extent of the sub-model's review. If approved, obtain the tracking number(s) (e.g., state, SERFF) and verify when and if it was the same model currently under review.
			Note: A previous approval does not necessarily confer a guarantee of ongoing approval; e.g., when statutes and/or regulations have changed or if a model's indications have been undermined by subsequent empirical experience. However, knowing whether a model has been previously approved can help focus the regulator's efforts and determine whether the prior decision needs to be revisited. In some circumstances, direct dialogue with the vendor could be quicker and more useful.

Section	Information Element	Level of Importance to the Regulator's Review	Comments
A.2.c	Determine if the sub-model output was used as input to the GAM; obtain the vendor name, as well as the name and version of the sub-model.	1	To accelerate the review of the filing, it may be desirable to request (from the company), the name and contact information for a vendor representative. The company should provide the name of the third-party vendor and a contact in the event the regulator has questions. The "contact" can be an intermediary at the insurer (e.g., a filing specialist), who can place the regulator in direct contact with a subject-matter expert (SME) at the vendor._ Examples of such sub-models include credit/financial scoring algorithms and household composite score models. Sub-models can be evaluated separately and in the same manner as the primary model under evaluation. A sub-model contact for additional information should be provided. Sub-model SMEs may need to be brought into the conversation with regulators (whether in-house or third-party sub-models are used).
A.2.d	If using catastrophe model output, identify the vendor and the model settings/assumptions used when the model was run.	1	To accelerate the review of the filing, get contact information for the SME that ran the model and an SME from the vendor. The "SME" can be an intermediary at the insurer (e.g., a filing specialist), who can place the regulator in direct contact with the appropriate SMEs at the insurer or model vendor. For example, it is important to know hurricane model settings for storm surge, demand surge, and long-term/short-term views.
A.2.e	Obtain an explanation of how catastrophe models are integrated into the model to ensure no double-counting.	1	If a weather-based sub-model is input to the GAM under review, loss data used to develop the model should not include loss experience associated with the weather-based sub-model. Doing so could cause distortions in the modeled results by double-counting such losses when determining relativities or loss loads in the filed rating plan. For example, redundant losses in the data may occur when non-hurricane wind losses are included in the data while also using a severe convective storm model in the actuarial indication. Such redundancy may also occur with the inclusion of fluvial or pluvial flood losses when using a flood model or inclusion of freeze losses when using a winter storm model.
A.2.f	If using output of any scoring algorithms, obtain a list of the variables used to determine the score and provide the source of the data used to calculate the score.	1	Any sub-model should be reviewed in the same manner as the primary model that uses the sub-model's output as input. Depending on the result of item A.2.b, the importance of this item may be decreased.

Section	Information Element	Level of Importance to the Regulator's Review	Comments
3. Adjustments to Data			
A.3.a	Determine if premium, exposure, loss, or expense data were adjusted (e.g., developed, trended, adjusted for catastrophe experience, or capped). If so, how? Do the adjustments vary for different segments of the data? If so, identify the segments and how the data was adjusted.	2	The rating plan or indications underlying the rating plan may provide special treatment of large losses and non-modeled large loss events. If such treatments exist, the company should provide an explanation how they were handled. These treatments need to be identified and the company/regulator needs to determine whether model data needs to be adjusted. For example, should large bodily injury (BI) liability losses in the case of personal automobile insurance be excluded, or should large non-catastrophe wind/hail claims in home insurance be excluded from the model's training, test and validation data? Look for anomalies in the data that should be addressed. For example, is there an extreme loss event in the data? If other processes were used to load rates for specific loss events, how is the impact of those losses considered? Examples of losses that can contribute to anomalies in the data are large losses or flood, hurricane, or severe convective storm losses for personal automobile comprehensive or home insurance.
A.3.b	Identify adjustments that were made to aggregated data (e.g., transformations, binning and/or categorizations). If any, identify the name of the characteristic/variable and obtain a description of the adjustment.	1	
A.3.c	Ask for aggregated data (one dataset of pre-adjusted/scrubbed data and one dataset of post-adjusted/scrubbed data) that allows the regulator to focus on the univariate distributions and compare raw data to adjusted/binned/transformed/etc. data.	4	This is most relevant for variables that have been "scrubbed" or adjusted. Though most regulators may never ask for aggregated data and do not plan to rebuild any models, a regulator may ask for this aggregated data or subsets of it. It would be useful to the regulator if the percentage of exposures and premium for missing information from the model data by category are provided. This data can be displayed in either graphical or tabular formats.
A.3.d	Determine how missing data was handled.	1	This is most relevant for variables that have been "scrubbed" or adjusted. The regulator should be aware of assumptions the modeler made in handling missing, null, or "not available" values in the data. For example, it would be helpful to the reviewer if the modeler were to provide a statement as to whether there is any systemic reason for missing data. If adjustments or recoding of values were made, they should be explained. It may also be useful to the regulator if the percentage of exposures and premium for missing information from the model data are provided. This data can be displayed in either graphical or tabular formats.

Section	Information Element	Level of Importance to the Regulator's Review	Comments
A.3.e	If duplicate records exist, determine how they were handled.	1	
A.3.f	Determine if there were any material outliers identified and subsequently adjusted during the scrubbing process.	3	Look for a discussion of how outliers were handled. If necessary, the regulator may want to investigate further by getting a list (with description) of the types of outliers and determine what adjustments were made to each type of outlier. To understand the filer's response, the regulator should ask for the filer's materiality standard.
4. Data Organization			
A.4.a	Obtain documentation on the methods used to compile and organize data, including procedures to merge data from different sources or filter data based on particular characteristics and a description of any preliminary analyses, data checks, and logical tests performed on the data and the results of those tests.	2	This should explain how data from separate sources was merged and/or how subsets of policies, based on selected characteristics, are filtered to be included in the data underlying the model and the rationale for that filtering.
A.4.b	Obtain documentation on the insurer's process for reviewing the appropriateness, reasonableness, consistency, and comprehensiveness of the data, including a discussion of the rational relationship the data has to the predicted variable.	2	An example is when by-peril or by-coverage modeling is performed; the documentation should be for each peril/coverage and make rational sense. For example, if "murder" or "theft" data are used to predict the wind peril, the company should provide support and a rational explanation for their use.
A.4.c	Identify material findings the company had during its data review and obtain an explanation of any potential material limitations, defects, bias, or unresolved concerns found or believed to exist in the data. If issues or limitations in the data influenced modeling analysis and/or results, obtain a description of those concerns and an explanation of how modeling analysis was adjusted and/or results were impacted.	1	"None" or "N/A" may be an appropriate response.

B. BUILDING THE MODEL

Section	Information Element	Level of Importance to the Regulator's Review	Comments
1. High-Level Narrative for Building the Model			
B.1.a	Identify the type of model underlying the rate filing (e.g., GAM, GLM, decision tree, Bayesian GLM, gradient- boosting machine, neural network, etc.). Understand the model's role in the rating system and provide the reasons why that type of model is an appropriate choice for that role.	1	It is important to understand if the model in question is a GAM and, therefore, these information elements are applicable; or if it is some other model type, in which case other reasonable review approaches may be considered. There should be an explanation of why the model (using the variables included in it) is appropriate for the line of business. If by-peril or by-coverage modeling is used, the explanation should be by-peril/by-coverage. **Note**: If the model is not a GAM, the information elements in this white paper may not apply in their entirety.
B.1.b	Identify the software used for model development. Obtain the name of the software vendor/developer, software product, and a software version reference used in model development.	3	Changes in software from one model version to the next may explain if such changes, over time, contribute to changes in the modeled results. The company should provide the name of the third-party vendor and a "contact" in the event the regulator has questions. The "contact" can be an intermediary at the insurer (e.g., a filing specialist) who can place the regulator in direct contact with the appropriate SME at the vendor. Open-source software/programs used in model development should be identified by name and version the same as if from a vendor.
B.1.c	Obtain a description how the available data was divided between model training, test, and/or validation datasets. The description should include an explanation why the selected approach was deemed most appropriate, whether the company made any further subdivisions of available data, and reasons for the subdivisions (e.g., a portion separated from training data to support testing of components during model building). Determine if the validation data was accessed before model training was completed and, if so, obtain an explanation of why that came to occur. Obtain a discussion of whether the model was rebuilt using all the data or if it was only based on the training data.	1	The reviewer should be aware that modelers may break their data into three or just two datasets. Although the term "training" is used with little ambiguity, "test" and "validation" are terms that are sometimes interchanged, or the word "validation" may not be used at all. It would be unexpected if validation and/or test data were used for any purpose other than validation and/or test, prior to the selection of the final model. However, according to the CAS monograph, "Generalized Linear Models for Insurance Rating": "Once a final model is chosen, … we would then go back and rebuild it using all of the data, so that the parameter estimates would be at their most credible." The reviewer should note whether a company employed cross-validation techniques instead of a training/test/validation dataset approach. If cross-validation techniques were used, the reviewer should request a description of how cross-validation was done and confirm that the final model was not built on any particular subset of the data, but rather the full dataset.

Section	Information Element	Level of Importance to the Regulator's Review	Comments
B.1.d	Obtain a brief description of the development process, from initial concept to final model and filed rating plan.	1	The narrative should have the same scope as the filing.
B.1.e	Obtain a narrative on whether loss ratio, pure premium, or frequency/severity analyses were performed and, if separate frequency/severity modeling was performed, how pure premiums were determined.	1	
B.1.f	Identify the model's target variable.	1	A clear description of the target variable is key to understanding the purpose of the model. It may also prove useful to obtain a sample calculation of the target variable in Excel format, starting with the "raw" data for a policy, or a small sample of policies, depending on the complexity of the target variable calculation.
B.1.g	Obtain a description of the variable selection process.	1	The narrative regarding the variable selection process may address matters such as the criteria upon which variables were selected or omitted, identification of the number of preliminary variables considered in developing the model versus the number of variables that remained, and any statutory or regulatory limitations that were taken into account when making the decisions regarding variable selection. The modeler should comment on the use of automated feature selection algorithms to choose predictor variables and explain how potential overfitting that can arise from these techniques was addressed.
B.1.h	In conjunction with variable selection, obtain a narrative on how the company determined the granularity of the rating variables during model development.	3	The narrative should include discussion of how credibility was considered in the process of determining the level of granularity of the variables selected.
B.1.i	Determine if model input data was segmented in anyway (e.g., by-coverage, by-peril, or by-form basis). If so, obtain a description of data segmentation and the reasons for data segmentation.	1	The regulator would use this to follow the logic of the modeling process.
B.1.j	If adjustments to the model were made based on credibility considerations, obtain an explanation of the credibility considerations and how the adjustments were applied.	2	Adjustments may be needed, given that models do not explicitly consider the credibility of the input data or the model's resulting output; models take input data at face value and assume 100% credibility when producing modeled output.
2. Medium-Level Narrative for Building the Model			
B.2.a	At crucial points in model development, if selectionswere made among alternatives regarding model assumptions or techniques, obtain a narrative on the judgment used to make those selections.	3	

Section	Information Element	Level of Importance to the Regulator's Review	Comments
B.2.b	If post-model adjustments were made to the data and the model was rerun, obtain an explanation on the details and the rationale for those adjustments.	2	Evaluate the addition or removal of variables and the model fitting. It is not necessary for the company to discuss each iteration of adding and subtracting variables, but the regulator should gain a general understanding of how these adjustments were done, including any statistical improvement measures relied upon.
B.2.c	Obtain a description of the testing that was performed during the model-building process, including an explanation of the decision-making process to determine which interactions were included and which were not.	3	There should be a description of the testing that was performed during the model-building process. Examples of tests that may have been performed include univariate testing and review of a correlation matrix. The number of interaction terms that could potentially be included in a model increases far more quickly than the number of "main effect" variables (i.e., the basic predictor variables that can be interacted together). Analyzing each possible interaction term individually can be unwieldy. It is typical for interaction terms to be excluded from the model by default, and only included where they can be shown to be particularly important. So, as a rule of thumb, the regulator's emphasis should be on understanding why the insurer included the interaction terms it did, rather than on why other candidate interactions were excluded. In some cases, however, it could be reasonable to inquire about why a particular interaction term was excluded from a model—for example, if that interaction term was ubiquitous in similar filings and was known to be highly predictive, or if the regulator had reason to believe that the interaction term would help differentiate dissimilar risks within an excessively heterogenous rating segment.
B.2.d	For the GAM, identify the link function used. Identify which distribution was used for the model (e.g., Poisson, Gaussian, log-normal, Tweedie). Obtain an explanation of why the link function and distribution were chosen. Obtain the formulas for the distribution and link functions, including specific numerical parameters of the distribution. If changed from the default, obtain a discussion of applicable convergence criterion.	1	Solving the GAM is iterative and the modeler can check to see if fit is improving. At some point, convergence occurs; however, when it occurs can be subjective or based on threshold criteria. If the software's default convergence criteria were not relied upon, an explanation of any deviation should be provided. If the GAM did not reach convergence, an explanation should be provided.
B.2.e	Obtain a narrative on the formula relationship between the data and the model outputs, with a definition of each model input and output. The narrative should describe all parametric (non-smoothed terms represented as coefficients) and smoothed terms necessary to evaluate the predicted pure premium, relativity, or other value, for any real or hypothetical set of inputs.	2	GAMs can have both parametric terms similar to those available in GLMs (e.g., those terms associated with coefficients) and smoothed terms. The smoothed terms are the sum of multiple basis functions which can take on a variety of types. The narrative should describe the relationships captured between the terms in the model (parametric and non-parametric) and the model output.

Section	Information Element	Level of Importance to the Regulator's Review	Comments
B.2.f	If there were data situations in which GAM weights were used, obtain an explanation of how and why they were used.	3	Investigate whether identical records were combined to build the model.
3. Predictor Variables			
B.3.a	Obtain a complete data dictionary, including the names, data types, variable fit types, definitions, and uses of each predictor variable, offset variable, control variable, proxy variable, geographic variable, geodemographic variable, and all other variables in the model used on their own or as an interaction with other variables (including sub-models and external models).	1	Data types of variables might be continuous, discrete, Boolean, etc. Definitions should not use programming language or code. Variable fit types include parametric (non-smoothed) and smoothed. For any variable(s) intended to function as a control or offset, obtain an explanation of its purpose and impact. Also, for any use of interaction between variables, obtain an explanation of its rationale and impact.
B.3.b	Obtain a list of predictor variables considered but not used in the final model, and the rationale for their removal.	4	The purpose of this requirement is to identify variables the company finds to be predictive but ultimately may reject for reasons other than loss-cost considerations (e.g., price optimization). Also, look for variables the company tested and then rejected. This item could help address concerns about data dredging. The reasonableness of including a variable with a given significance level could depend greatly on the other variables the company evaluated for inclusion in the model and the criteria for inclusion or omission. For instance, if the company tested 1,000 similar variables and selected the one with the lowest p-value of 0.001, this would be a far, far weaker case for statistical significance than if that variable was the only one the company evaluated. **Note**: Context matters.
B.3.c	Obtain a correlation matrix for all predictor variables included in the model and sub-model(s). The variables used as parametric terms and the variables used as inputs to the smooth functions should all be included.	3	While GAMs accommodate collinearity, the correlation matrix provides more information about the magnitude of correlation between variables. The company should indicate what statistic was used (e.g., Pearson, Cramer's V). The regulatory reviewer should understand what statistic was used to produce the matrix but should not prescribe the statistic.
B.3.d	Obtain concurvity metrics for all smoothed predictor variables included in the model and sub-models.	**3**	GAMs can suffer from high concurvity in addition to high collinearity. Concurvity is the degree to which the smoothed terms move together. The company should indicate what concurvity metrics were used. The regulatory reviewer should understand what metric was used to produce the concurvity metrics but should not prescribe the type of metrics. The review of multiple concurvity metrics may be beneficial.*

Section	Information Element	Level of Importance to the Regulator's Review	Comments
B.3.e	Obtain a rational explanation for why an increase in each predictor variable should increase or decrease frequency, severity, loss costs, expenses, or any element or characteristic being predicted.	3	The explanation should go beyond demonstrating correlation. Considering possible causation may be relevant, but proving causation is neither practical nor expected. If no rational explanation can be provided, greater scrutiny may be appropriate. For example, the regulator should look for unfamiliar predictor variables and, if found, the regulator should seek to understand the connection that variable has to increasing or decreasing the target variable.
B.3.f	If the modeler made use of one or more dimension-ality reduction techniques, such as a principal component analysis (PCA), obtain a narrative about that process, an explanation why thattechnique was chosen, and a description of the step- by-step process used to transform observations (usually correlated) into a set of (usually linearly un-correlated) transformed variables. In each instance, obtain a list of the pre- transformation and post-transformation variable names, as well as an explanation of how the results ofthe dimensionality reduction technique was used within the model.	2	
4. Adjusting Data, Model Validation, and Goodness-of-Fit Measures			
B.4.a	Obtain a description of the methods used to assess the statistical significance/goodness-of-fit of the model to validation data, such as lift charts and statistical tests. Compare the model's projected results to historical actual results and verify that modeled results are reasonably similar to actual results from validation data.	1	For models that are built using multistate data, validation data for some segments of risk is likely to have low credibility in individual states. Nevertheless, some regulators require model validation on state-only data, especially when analysis using state-only data contradicts the countrywide results. State-only data might be more applicable but could also be impacted by low credibility for some segments of risk. **Note**: It may be useful to consider geographic stability measures for territories within the state.

Section	Information Element	Level of Importance to the Regulator's Review	Comments
B.4.b	For all parametric (non-smoothed) variables, review the appropriate parameter values and relevant tests of significance, such as confidence intervals, chi-square tests, p-values, or F tests. Determine if model development data, validation data, test data, or other data was used for these tests.	1	Typical p-values greater than 5% are large and should be questioned. Reasonable business judgment can sometimes provide legitimate support for high p-values. Reasonableness of the p-value threshold could also vary depending on the context of the model; e.g., the threshold might be lower when many candidate variables were evaluated for inclusion in the model. Overall lift charts and/or statistical tests using validation data may not provide enough of the picture. If there is concern about one or more individual variables, the reviewer may obtain, for each discrete variable level, the parameter value, confidence intervals, chi-square tests, p-values, and any other relevant and material tests. For variables that are modeled continuously, it may be sufficient to obtain statistics around the modeled parameters; e.g., confidence intervals around each level of an AOI curve might be more than what is needed.

Section	Information Element	Level of Importance to the Regulator's Review	Comments
B.4.c	For all smoothed variables, including interactions between smoothed variables, review plots representing the smooths and relevant tests of significance, such as approximate confidence intervals, chi-square tests, approximate p-values, or F tests. Determine if model development data, validation data, test data, or other data was used for these tests.	1	Smoothed terms in a GAM can have many coefficients based on the number of basis functions. It is difficult to interpret the impact of the smoothed term based on the coefficients. Instead, regulators can review plots representing the cumulative effect of smoothed terms. The company could provide variable value on the x-axis and partial effects on the y-axis. The company could alternatively provide variable value on the x-axis and model prediction for the base risk on the y-axis. A base risk is a specific rating class and is often defined as the risk where each predictor variable is set at the base level (where the indicated factor is 1.000). The company should provide confidence interval lines regardless of the type of plot. The regulatory reviewer should assess whether the plot has an intuitive shape and whether the curve extrapolates well, especially to areas of the curve representing thinner data. The regulatory reviewer should review whether the plot passes the "horizontal line test". The "horizontal line test" checks whether a horizontal line could be drawn in the plot through the confidence intervals. If so, this implies that the smoothed variable is not measuring significant differences across the target variable.
			Smoothed interaction terms should also be expressed as plots. Heat map contour plots or 3D perspective plots may be useful.
			GAMs are a form of penalized regression which complicates the calculation of p-values. The p-values for the smoothed terms output by the modeling software are generally approximate p-values for GAMs. Approximate p-values should be reviewed at the smoothed variable level. The regulatory reviewer may want to select a smaller threshold for smoothed terms than they used for the parametric term p-value threshold. For example, if a regulator typically applies a 0.05 threshold to a GLM, they may want to consider applying a 0.03 threshold to the smoothed terms within a GAM.*

Section	Information Element	Level of Importance to the Regulator's Review	Comments
B.4.d	For all smoothed variables, request details about the basis functions comprising each smoothed function.	4 or 2	Smooth functions are based on a sum of basis functions. The company should provide the number of basis functions for each smooth and discuss how the number was chosen. There are many types of smooth functions that can be applied. Examples include thin plate splines, cubic splines, and cyclic splines. The company should provide the type of each smooth and a narrative on why that type of smooth is appropriate for the variable. If the GAM is built using a basis function significantly different from those available in the MGCV package in R, this information element may have a higher level of significance (2). The goal of requesting details of the basis function would be to help identify any metrics that may be interpreted similarly to the MGCV package's concurvity metrics and gain a better understanding of the GAM building process. In these cases, it is not necessary that a reviewer request the exact mathematical formula for the basis function. Instead, a written or visual example of how the basis function creates a final factor curve for a variable may be requested to aid model review.
B.4.e	Identify the threshold for statistical significance and explain why it was selected. Obtain a reasonable and appropriately supported explanation for keeping the variable for each discrete variable level where the p-values were not less than the chosen threshold.	1	The explanation should clearly identify the thresholds for statistical significance used by the modeler. Typical p-values greater than 5% are large and should be questioned. Reasonable business judgment can sometimes provide legitimate support for high p-values. Reasonableness of the p-value threshold could also vary depending on the context of the model; e.g., the threshold might be lower when many candidate variables were evaluated for inclusion in the model. Overall lift charts and/or statistical tests using validation data may not provide enough of the picture. If there is concern about one or more individual variables, the reviewer may obtain, for each discrete variable level, the parameter values for parametric terms, plots representing smoothed terms, confidence intervals, chi-square tests, p-values, and any other relevant and material tests.*
B.4.f	For overall discrete variables, review type 3 chi-square tests, p-values for parametric terms, approximate p-values for non-parametric terms, F tests and any other relevant and material test. Determine if model development data, validation data, test data, or other data was used for these tests.	2	Typical p-values greater than 5% are large and should be questioned. Reasonable business judgment can sometimes provide legitimate support for high p-values. Reasonableness of the p-value threshold could also vary depending on the context of the model; e.g., the threshold might be lower when many candidate variables were evaluated for inclusion in the model. Overall lift charts and/or statistical tests using validation data may not provide enough of the picture. If there is concern about one or more individual

Section	Information Element	Level of Importance to the Regulator's Review	Comments
			variables, the reviewer may obtain, for each discrete variable level, the parameter values for parametric terms, plots representing smoothed terms, confidence intervals, chi-square tests, p-values, and any other relevant and material tests.
			For variables that are modeled continuously, it may be sufficient to obtain statistics around the modeled parameters; e.g., confidence intervals around each level of an AOI curve might be more than whatis needed.*
B.4.g	Obtain evidence that the model fits the training data well, for individual variables, for any relevant combinations of variables, and for the overall model.	2	For a GAM, such evidence may be available using chi-square tests, approximate p-values, F tests and/or other means.
			The steps taken during modeling to achieve goodness-of-fit are likely to be numerous and laborious to describe, but they contribute much of what is generalized about a GAM.
			The regulator should not assume to know what the company did and ask, "How?" Instead, the regulator should ask what the company did and be prepared to ask follow-up questions.
B.4.h	For continuous variables, provide confidence intervals, chi-square tests, p-values for parametric terms, approximate p-values for non-parametric terms, and any other relevant and material test. Determine if model development data, validation data, test data, or otherdata was used for these tests.	2	Typical p-values greater than 5% are large and should be questioned. Reasonable business judgment can sometimes provide legitimate support for high p-values. Reasonableness of the p-value threshold could also vary depending on the context of the model; e.g., the threshold might be lower when many candidate variables were evaluated for inclusion inthe model.
			Overall lift charts and/or statistical tests using validation data may not provide enough of the picture. If there is concern about one or more individual variables, the reviewer may obtain, for each discrete variable level, the parameter values for parametric terms, plots representing smoothed terms confidence intervals, chi-square tests, approximate p-values and any other relevant and material tests.
			For variables that are modeled continuously, it may be sufficient to obtain statistics around the modeled parameters; for example, confidence intervals around each level of an AOI curve might be more than what is needed.*

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B.4.i	Obtain a description how the model was tested for stability over time.	2	Evaluate the build/test/validation datasets for potential time-sensitive model distortions (e.g., a winter storm in year 3 of 5 can distort the model in both the testing and validation datasets). Obsolescence over time is a model risk (e.g., old data for a variable or a variable itself may no longer be relevant). If a model being introduced now is based on losses from years ago, the reviewer should be interested in knowing whether that model would be predictive in the proposed context. Validation using recent data from the proposed context might be requested. Obsolescence is a risk even for a new model based on recent and relevant loss data. The reviewer may want to inquire as to the following: What steps, if any, were taken during modeling to prevent or delay obsolescence? What controls exist to measure the rate of obsolescence? What is the plan and timeline for updating and ultimately replacing the model? The reviewer should also consider that as newer technologies enter the market (e.g., personal automobile) their impact may change claim activity over time (e.g., lower frequency of loss). So, it is not necessarily a bad thing that the results are not stable over time.
B.4.j	Obtain a narrative on how potential concerns with overfitting were addressed.	2	
B.4.k	Obtain the value of the model complexity parameter λ and a discussion of how it was chosen.	4	GAMs are a form of penalized regression. Smaller values of λ allow the model to increase complexity and fit "wigglier" data. Larger values of λ constricts the model and increases smoothness. Multiple automated approaches exist for tuning λ including predictive approaches that optimize AIC or Bayesian approaches such as Restricted Maximum Likelihood.
B.4.l	Obtain support demonstrating that the overall GAM assumptions are appropriate.	3	A visual review of plots of actual errors is usually sufficient. The reviewer should look for a conceptual narrative covering these topics: How does this particular GAM work? Why did the rate filer do what it did? Why employ this design instead of alternatives? Why choose this particular distribution function and this particular link function? A company response may be at a fairly high level and reference industry practices. If the reviewer determines that the model makes no assumptions that are considered to be unreasonable, the importance of this item may be reduced.

Section	Information Element	Level of Importance to the Regulator's Review	Comments
B.4.m	Obtain support demonstrating that the assumptions for each smoothed term are appropriate.	3	The reviewer should look for a narrative on how the fit of the smoothed terms was checked for reasonableness. It may be useful to ask for each plot of the smoothed terms to include residuals to ensure that the smoothed line runs through the middle of the residuals. It may be useful for the company to provide tests that each smoothed term is not predictive of residual values (similar to tests achieved in the gam.check() function of the mcgv R package). These tests would ideally demonstrate that the residuals are randomly distributed across all parts of the smoothed term.*
B.4.n	Obtain 5-10 sample records with corresponding output from the model for those records.	4	

*Please note that certain statistics such as p-values, confidence intervals, and concurvity may not be available or relevant for all varieties of GAM. In these cases, requests should focus on satisfying the purpose of this information element through methodology or metrics supplied by this type of GAM.

5. "Old Model" Versus "New Model"

Section	Information Element	Level of Importance to the Regulator's Review	Comments
B.5.a	Obtain an explanation of why this model is an improvement to the current rating plan. If it replaces a previous model, find out why it is better than the one it is replacing; determine how the company reached that conclusion and identify metrics relied on in reaching that conclusion. Look for an explanation of any changes in calculations, assumptions, parameters, changes in smoothed variable plots, and data used to build this model from the previous model.	2	The regulator should expect to see improvement in the new class plan's predictive ability or other sufficient reason for the change.
B.5.b	Determine if two Gini coefficients were compared and obtain a narrative on the conclusion drawn from this comparison.	3	This information element requests a comparison of Gini coefficient from the prior model to the Gini coefficient of proposed model. It is expected that there should be improvement in the Gini coefficient. A higher Gini coefficient indicates greater differentiation produced by the model and how well the model fits that data. This is relevant when one model is being updated or replaced. The regulator should expect to see improvement in the new class plan's predictive ability. One example of a comparison might be sufficient. **Note**: This comparison is not applicable to initial model introduction. Reviewer can look toCAS monograph, "Generalized Linear Models for Insurance Rating."
B.5.c	Determine if double-lift charts were analyzed and obtain a narrative on the conclusion drawn from this analysis.	3	One example of a comparison might be sufficient. **Note**: "Not applicable" is an acceptable response.

Section	Information Element	Level of Importance to the Regulator's Review	Comments
B.5.d	If replacing an existing model, obtain a list of any predictor variables used in the old model that are not used in the new model. Obtain an explanation of why these variables were dropped from the new model. Obtain a list of all new predictor variables in the new model that were not in the prior old model.	2	It is useful to differentiate between old and new variables, so the regulator can prioritize more time on variables not yet reviewed.
6. Modeler Software			
B.6.a	Request access to SMEs (e.g., modelers) who led the project, compiled the data, and/or built the model.	4	The filing should contain a contact that can put the regulator in touch with appropriate SMEs and key contributors to the model development to discuss the model.

C. THE FILED RATING PLAN

Section	Information Element	Level of Importance to the Regulator's Review	Comments
1. General Impact of Model on Rating Algorithm			
C.1.a	In the actuarial memorandum or explanatory memorandum, for each model and sub-model (including external models), look for a narrative that explains each model and its role (i.e., how it was used) in the rating system.	1	The "role of the model" relates to how the model integrates into the rating plan as a whole and where the effects of the model are manifested within the various components of the rating plan. This is not intended as an overarching statement of the model's goal, but rather a description of how specifically the model is used. This item is particularly important, if the role of the model cannot be immediately discerned by the reviewer from a quick review of the rate and/or rule pages. (Importance is dependent on state requirements and ease of identification by the first layer of review and escalation to the appropriate review staff.)
C.1.b	Obtain an explanation of how the model was used to adjust the filed rating algorithm.	1	Models are often used to produce factor-based indications, which are then used as the basis for the selected changes to the rating plan. It is the changes to the rating plan that create impacts. The regulator should consider asking how the smoothed terms of the GAM will be implemented. The regulator should consider asking for an explanation of how the model was used to adjust the rating algorithm.
C.1.c	Obtain a complete list of characteristics/variables used in the proposed rating plan, including those used as input to the model (including sub-models and composite variables) and all other characteristics/variables (not input to the model) used to calculate a premium. For each characteristic/variable, determine if it is only input to the model, whether it is only a separate univariate rating characteristic, or whether it is both input to the model and a separate univariate rating characteristic. The list should include transparent descriptions (in plain language) of each listed characteristic/variable.	1	Examples of variables used as inputs to the model and used as separate univariate rating characteristics might be criteria used to determine a rating tier or household composite characteristic.

Section	Information Element	Level of Importance to the Regulator's Review	Comments
2. Relevance of Variables and Relationship to Risk of Loss			
C.2.a	Obtain a narrative regarding how the character-istics/rating variables included in the filed rating plan relate to the risk of insurance loss(or expense) for the type of insurance productbeing priced.	2	The narrative should include a discussion of the relevance each characteristic/rating variable has on consumer behavior that would lead to a difference in risk of loss (or expense). The narrative should include a rational relationship to cost, and model results should be consistent with the expected direction of the relationship. **Note**: This explanation would not be needed if the connection between variables and risk of loss (or expense) has already been illustrated.
3. Comparison of Model Outputs to Current and Selected Rating Factors			
C.3.a	Compare relativities indicated by the model to both current relativities and the insurer's selected relativities for each risk characteristic/variable in the rating plan.	1	"Significant difference" may vary based on the risk characteristic/variable and context. However, the movement of a selected relativity should be in the direction of the indicated relativity; if not, an explanation is necessary as to why the movement is logical.
C.3.b	Obtain documentation and support for all calculations, judgments, or adjustments that connect the model's indicated values to the selected relativities filed in the rating plan.	1	The documentation should include explanations for the necessity of any such adjustments and each significantdifference between the model's indicated values and the selected values. This applies even to models that produce scores, tiers, or ranges of values for which indications can be derived. **Note**: This information is especially important if differences between model-indicated values and selected values are material and/or impact one consumer population more than another.
C.3.c	For each characteristic/variable used as both input to the model (including sub-models and composite variables) and as a separate univariate rating characteristic, obtain a narrative regarding how each characteristic/variable was tempered or adjusted to account for possible overlap or redundancy in what the characteristic/variable measures.	2	Modeling loss ratios with these characteristics/ variables as control variables would account for possible overlap. The insurer should address this possibility or other considerations; e.g., tier placement models often use risk characteristics/ variables that are also used elsewhere inthe rating plan. One way to do this would be to model the loss ratios resulting from a process that already uses univariate rating variables. Then the model/composite variables would be attempting to explain the residuals.
4. Responses to Data, Credibility, and Granularity Issues			
C.4.a	Determine what, if any, consideration was given to the credibility of the output data.	2	The regulator should determine at what level of granularity credibility is applied. If modeling was by-coverage, by-form, or by-peril, the company should explain how these were handled when there was not enough credible data by coverage, form, or peril to model.

Section	Information Element	Level of Importance to the Regulator's Review	Comments
C.4.b	If the rating plan is less granular than the model, obtain an explanation of why.	2	This is applicable if the company had to combine modeled output in order to reduce the granularity of the rating plan.
C.4.c	If the rating plan is more granular than the model, obtain an explanation of why.	2	A more granular rating plan may imply that the company had to extrapolate certain rating treatments, especially at the tails of a distribution of attributes, in a manner not specified by the model indications. It may be necessary to extrapolate due to data availability or other considerations.

5. Definitions of Rating Variables

Section	Information Element	Level of Importance to the Regulator's Review	Comments
C.5.a	Obtain a narrative regarding adjustments made to model output (e.g., transformations, binning and/or categorizations). If adjustments were made, obtain the name of the characteristic/variable and a description of the adjustment.	2	If rating tiers or other intermediate rating categories are created from model output, the rate and/or rule pages should present these rating tiers or categories. The company should provide an explanation of how model output was translated into these rating tiers or intermediate rating categories.

6. Supporting Data

Section	Information Element	Level of Importance to the Regulator's Review	Comments
C.6.a	Obtain aggregated state-specific, book-of-business-specific univariate historical experience data, separately for each year included in the model, consisting of loss ratio or pure premium relativities and the data underlying those calculations for each category of model output(s) proposed to be used within the rating plan. For each data element, obtain an explanation of whether it is raw or adjusted and, if the latter, obtain a detailed explanation for the adjustments.		For example, were losses developed/undeveloped, trended/untrended, capped/uncapped, etc.? Univariate indications should not necessarily be used to override more sophisticated multivariate indications. However, they do provide additional context and may serve as a useful reference.
C.6.b	Obtain an explanation of any material (especially directional) differences between model indications and state-specific univariate indications.	4	Multivariate indications may be reasonable as refinements to univariate indications, but possibly not for bringing about significant reversals of those indications. For instance, if the univariate indicated relativity for an attribute is 1.5 and the multivariate indicated relativity is 1.25, this is potentially a plausible application of the multivariate techniques. If, however, the univariate indicated relativity is 0.7 and the multivariate indicated relativity is 1.25, a regulator may question whether the attribute in question is negatively correlated with other determinants of risk. Credibility of state-level data should be considered when state indications differ from modeled results based on a broader dataset. However, the relevance of the broader dataset to the risks being priced should also be considered. Borderline reversals are not of as much concern. If multivariate indications perform well against the state-level data, this should suffice. However, credibility considerations need to be taken into account as state-level segmentation comparisons may not have enough credibility.

Section	Information Element	Level of Importance to the Regulator's Review	Comments
7. Consumer Impacts			
C.7.a	Obtain a listing of the top five rating variables that contribute the most to large swings in renewal premium, both as increases and decreases, as well as the top five rating variables with the largest spread of impact for both new and renewal business.	4	These rating variables may represent changes to rating factors, be newly introduced to the rating plan, or have been removed from the rating plan.
C.7.b	Determine if the company performed sensitivity testing to identify significant changes in premium due to small or incremental change in a single risk characteristic. If such testing was performed, obtain a narrative that discusses the testing and provides the results of that testing.	3	One way to see sensitivity is to analyze a graph of each risk characteristic's/variable's possible relativities. Look for significant variation between adjacent relativities and evaluate if such variation is reasonable and credible.
C.7.c	For the proposed filing, obtain the impacts on renewal business and describe the process used by management, if any, to mitigate those impacts.	2	Some mitigation efforts may substantially weaken the connection between premium and expected loss and expense and, hence, may be viewed as unfairly discriminatory by some states.
C.7.d	Obtain a rate disruption/dislocation analysis, demonstrating the distribution of percentage and/or dollar impacts on renewal business (created by rerating the current book of business) and sufficient information to explain the disruptions to individual consumers.	2	The analysis should include the largest dollar and percentage impacts arising from the filing, including the impacts arising specifically from the adoption of the model or changes to the model as they translate into the proposed rating plan. While the default request would typically be for the distribution/dislocation of impacts at the overall filing level, the regulator may need to delve into the more granular variable-specific effects of rate changes if there is concern about particular variables having extreme or disproportionate impacts, or significant impacts that have otherwise yet to be substantiated. See Appendix D for an example of a disruption analysis.
C.7.e	Obtain exposure distributions for the model's output variables and show the effects of rate changes at granular and summary levels, including the overall impact on the book of business.	3	See Appendix D for an example of an exposure distribution.

Section	Information Element	Level of Importance to the Regulator's Review	Comments
C.7.f	Identify policy characteristics, used as input to a model or sub-model, that remain "static" over a policy's lifetime versus those that will be updated periodically. Obtain a narrative on how the company handles policy characteristics that are listed as "static," yet change over time.	3	Some examples of "static" policy characteristics are prior carrier tenure, prior carrier type, prior liability limits, claim history over past X years, or lapse of coverage. These are specific policy characteristics usually set at the time new business is written, used to create an insurance score or to place the business in a rating/underwriting tier, and often fixed for the life of the policy. The reviewer should be aware, and possibly concerned, how the company treats an insured over time when the insured's risk profile based on "static" variables changes over time but the rate charged, based on a new business insurance score or tier assignment, no longer reflect the insured's true and current risk profile. A few examples of "non-static" policy characteristics are age of driver, driving record, and credit information (FCRA-related). These are updated automatically by the company on a periodic basis, usually at renewal, with or without the policyholder explicitly informing the company.
C.7.g	Obtain a means to calculate the rate charged a consumer.	3	The filed rating plan should contain enough information for a regulator to be able to validate policy premium. However, for a complex model or rating plan, a score or premium calculator via Excel or similar means would be ideal, but this could be elicited on a case-by-case basis. The ability to calculate the rate charged could allow the regulator to perform sensitivity testing when there are small changes to a risk characteristic/variable. **Note**: This information may be proprietary. For the rating plan, the rate order of calculation rule may be sufficient. However, it may not be feasible for a regulator to get all the input data necessary to reproduce a model's output. Credit and telematics models are examples of model types where model output would be readily available, but the input data would not be readily available to the regulator.
C.7.h	In the filed rating plan, be aware of any non-insurance data used as input to the model (customer-provided or other). In order to respond to consumer inquiries, it may be necessary to inquire as to how consumers can verify their data and correct errors.	1	If the data is from a third-party source, the company should provide information on the source. Depending on the nature of the data, it may need to be documented with an overview of who owns it. The topic of consumer verification may also need to be addressed, including how consumers can verify their data and correct errors.

Section	Information Element	Level of Importance to the Regulator's Review	Comments
8. Accurate Translation of Model into a Rating Plan			
C.8.a	Obtain sufficient information to understand how the model outputs are used within the rating system and to verify that the rating plan's manual, in fact, reflects the model output and anyadjustments made to the model output.	1	The regulator can review the rating plan's manual to see that modeled output is properly reflected in the manual's rules, rates, factors, etc.
9. Efficient and Effective Review of Rate Filing			
C.9.a	Establish procedures to efficiently review rate filings and models contained therein.	1	"Speed to market" is an important competitive concept for insurers. Although the regulator needs to understand the rate filing before accepting the rate filing, the regulator should not request information that does not increase his/her understanding of the rate filing. The regulator should review the state's rate filing review process and procedures to ensure that they are fair and efficient.
C.9.b	Be knowledgeable of state laws and regulationsin order to determine if the proposed rating plan (and models) are compliant with state laws and/or regulations.	1	This is a primary duty of state insurance regulators. The regulator should be knowledgeable of state laws and regulations and apply them to a rate filing fairly and efficiently. The regulator should pay special attention to prohibitions of unfair discrimination.
C.9.c	Be knowledgeable of state laws and regulations in order to determine if any information contained in the rate filing (and models) should be treated as confidential.	1	The regulator should be knowledgeable of state laws and regulations regarding confidentiality of rate filing information and apply them to a rate filing fairly and efficiently. Confidentiality of proprietary information is key to innovation and competitive markets.

Attachment Six
Casualty Actuarial and
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3/7/2023

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CASUALTY ACTUARIAL AND STATISTICAL (C) TASK FORCE
March 2023
Society of Actuaries (SOA) Actuarial Research and Education Update

- **Highlights of Recent Research Reports**

- *Catastrophic Cyber Risk Expert Panel Discussion Series*
  - Insights from experts in the actuarial profession and beyond on framing catastrophic cyber risks, available tools and methods to address risks, and thoughts on cyber risk challenges.
  - https://www.soa.org/48fcd2/globalassets/assets/files/resources/research-report/2023/cc176-catastrophic-cyber-risk-expert-panel-discussion-1-report_.pdf

- *Actuarial Weather Extremes*
  - Reports that identify and examine unusual or extreme single-day or multi-day weather events.
  - https://www.soa.org/resources/research-reports/2019/weather-extremes/
  - Recent Special Reports include:
    - **Salinas River California Streamflow: January 2023** https://www.soa.org/48ed55/globalassets/assets/files/research/cc192-actuarial-weather-extremes-january-2023-salinas-river-ca-streamflow.pdf

- *Implications of Evolving Technology in Auto Insurance: An Expert Panel Discussion*
  - Studies how rapid advancement of technology today is impacting how humans interact with their vehicles in the near future and notes how the collection, analysis and integration of driving-related data occurs within organizations can create potential for unintended adverse outcomes.
  - https://www.soa.org/resources/research-reports/2022/evolving-tech-auto-insurance/