3 comment letters were received in response to the exposure of the RGLM Appendix:

- Akur8
  - Thomas Holmes, FCAS
  - Mattia Casotto
- Allstate
- Milliman
  - Peggy Brinkmann, FCAS, MAAA
  - Paul Rosing, FCAS
  - Gabriele Usan

All comments received are copied below:

Commentator	Section	Comment	NAIC Remarks
Milliman	A.3.a	It may not be possible to on-level premiums at such a granular level in all situations, due to lack of data availability or other reasons. We suggest adding language to clarify that an insurer may pursue a temporal control variable (as mentioned in Generalized Linear Models for Insurance Ratemaking, section 5.1.3) when necessary.	A.3.a was copied from the original GLM appendix without changes. It is unchanged so that it does not become inconsistent with the other white paper appendices.
Akur8	B.1.a	Recommended additional comment: A main drawback of GLMs is assigning full credibility to the data, and a main benefit of penalized regression is the assignment of partial credibility to the data. The ability of RGLMs to help avoid overfitting through the assignment of partial credibility is expected to be a core reason for their adoption.	The suggested commentary was added to the "Comments" column for B.1.a
Akur8	B.1.b	Recommended additional comment: Sections 6.3 Relativity Plots and 6.4 Review by Variable Type of the CAS Monograph "Penalized Regression and Lasso Credibility" have an extensive discussion on the materiality of the complement of credibility in various situations, and these considerations can be used to help prioritize review in situations where the complement is under additional scrutiny. Note that this monograph has not been published at the time that these comments were sent, but a pre-read has been sent to the NAIC Predictive Modeling Task Force. We reference this document because we have tried and failed to condense our comments to help the evaluation of nonstandard complements into a reasonable size for the appendix.	Section B.1.b is asking for the regulator to obtain a basic understanding of how the complement of credibility was set. This would likely be accomplished with a short description in the filing memo. Examples of possible complement of credibility include: the prior approved model, the countrywide model (as opposed to a statewide model being built), or relativities indicated by bureau rates. Sections 6.3 and 6.4 of the text referenced focus on relativity plots, which are a way of visualizing the indicated changes by variable. This is addressed in separate information element B.5.e. Section B.5.e has been expanded to include some summarized considerations from Section 6.3 and 6.4 of the upcoming CAS Monograph "Penalized Regression and Lasso Credibility".

Akur8	B.1.h	Clarification requested: Can the comment more clearly define what is in scope for this item and the depth required? Upon first read, we assumed that this question asks if there were variables that were included in the model but removed through penalization. However, the comments describe statutory or regulatory limitations that are outside of the scope of penalization. If this item is asking for variables considered but not included, could it be more clearly differentiated from item B.3.b?	References to “candidate variable” and “prior to the model building” have been removed to reduce ambiguity. B.1.h and B.3.b are similar. B.1.h is mostly focused on variables considered and eliminated early in the modeling process. B.3.b is focused on variables considered and eliminated after consideration in the model. B.3.b states, “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…”
Allstate	B.1.h	Allstate believes the definition of 'candidate variable' is ambiguous and requires further clarification. Allstate defines a 'candidate variable' as a variable that has been included in the final modeling dataset for exploration during the model-building process. A candidate variable may or may not be included in the final model. Allstate also recommends removing the phrase 'prior to the model building' from the information element description, as it is outside the scope of 'candidate variables' and adds unnecessary ambiguity.	References to “candidate variable” and “prior to the model building” have been removed to reduce ambiguity. The sentences in the comments have been reordered so that the modeler’s selection process is discussed before the automated variable selection through penalization is discussed.
Akur8	B.1.i	Recommended additional comment: In Derivative Lasso, AGLM, and similar techniques, the granularity of ordinal variables should attempt to avoid "pre-binning" that removes the algorithm's ability to define a breakpoint where there should be one. An example of poor granularity would be a very wide bin with large exposure that could clearly be split up into credible subsets. Ideal ordinal granularity is either narrow bins with large exposure or wide bins with few exposure. Note that an extremely large number of bins may be too computationally intensive to be feasible.	This additional comment was added with some modifications. The added comment now states, “In Derivative Lasso, AGLM, and similar techniques, the granularity of ordinal variables should avoid ‘pre-binning’ that removes the algorithm's ability to define a breakpoint where there should be one. The bin width should consider the amount of exposures in each bin, in order to obtain credible bins. The number of bins may need to be constrained since an extremely large number of bins may be too computationally intensive.”
Akur8	B.2.g	We recommend that B.2.g be split into two items. First, we recommend removing the request for the lasso/ridge/elastic net penalty parameter or setting it to a level 4 request. This value is meaningless by itself as the optimal penalty value depends on properties such as the signal to noise ratio of the dataset and likelihood calculations. We are concerned that B.2.g currently implies that the penalty parameter value should be evaluated directly and that there is an appropriate range of penalty parameters across all models when this is not	Original Information element B.2.g was split into 2 information elements. The new complexity hyperparameter information element is a level 4 item. The new additional hyperparameter information element remains at the prior level 2.

		the case. The value of the penalty parameter does not help to evaluate a model, as 0.1 and 0.0001 may be equally appropriate penalty parameters for models on datasets of different sizes, perils, coverages, or model types. Second, we recommend that the selection process of the hyperparameters as well as any more relevant hyperparameters (such as the number of knots in the MGCV package's GAM) remain as a level 2 item. These items, unlike the penalty value itself, can provide significant value during model validation. We agree with the author that an explanation of how these parameters were chosen is a level 2 review item. . Alternately, a note can be added: "The exact value of the ridge/lasso/elastic net penalty parameter holds no meaning, so the reviewer should not scrutinize the value, but instead confirm that the process of selecting such a parameter is sound."	
Allstate	B.2.h	Allstate recommends removing information element B.2.h from the white paper. Providing coefficients for different hyperparameter values would require significant effort while offering little to no value to the regulatory review of the filed model. Allstate believes hyperparameter selection is properly addressed within information element B.2.g and considers information element B.2.h outside the scope of traditional modeling best practices. Therefore, Allstate suggests removing it from the paper.	B.2.h is a level 4 item, which means it would only be used if there are concerns not resolved by level 1, level2, and level 3 items. This would likely be an infrequent request from regulators, mostly used when the regulator believes the complexity parameter was chosen in an unreasonable way. The comments have been expanded to reflect this. The commentary regarding a plot of coefficients has been removed, since that is just one way of showing a sensitivity analysis and there are others that could satisfy the requirement.
Akur8	B.3.a	Recommended change to comment: Include "ordinal" in the list of data types as this data type is essential in Derivative Lasso and AGLM techniques.	Ordinal has been added to the comments
Akur8	B.4.b	Recommended additional comments: The regulator should not prescribe one of these methods specifically, as they may be not applicable for some forms of RGLM. In lasso credibility, it may be reasonable for the produced bootstrap/cross validation interval to overlap with original coefficients. The binned levels of ordinal variables in Derivative Lasso or AGLM are not expected to not match exactly to the final model. These estimation ranges can be evaluated similarly to GLM continuous variable confidence intervals where the range should not include zero	The following was added to the comments: "The regulator should not prescribe one of these methods specifically, as they may be not applicable for some forms of RGLM."

		throughout its entirety or show strong new trend reversals.	
Milliman	B.4.b	We suggest that coefficient ranges could also be reviewed by-year or by-segment to assess a model's stability.	The following was added to the comments: "Coefficient ranges could also be reviewed by year or by other dataset segments to assess model stability."
Allstate	B.4.b	Allstate believes this recommended information element exceeds what is considered modeling best practices and should not be deemed necessary for review. Bootstrapping or building a standard GLM would require significant effort while offering little to no value in the regulatory review of the filed model. Regularized GLMs use penalization techniques to aid in variable selection, reduce variable spread, and prevent overfitting. Consequently, a standard GLM may not show strong p-value metrics even though a variable is useful in a regularized GLM. Allstate also believes there are several other standard model evaluation techniques that, depending on the model, would be more appropriate than what is suggested in this information element. For example, deviance metrics, univariates, and one-way lift charts on a test or holdout dataset are currently considered traditional modeling best practices to assess the stability of a model. Allstate suggests removing this element from the white paper or, at a minimum, changing its level of importance to 4.	The importance has been changed from the prior level 1 to new level 3. Univariates and one-way lift charts are included in Information Element B.4.c. Information Element B.4.c remains a Level 2 item.
Milliman	B.4.c	For small books of business, requiring at least 10 quantiles in a lift chart could lead to unstable results. We suggest revising the language to clarify that fewer quantiles may be appropriate in certain situations.	Lift charts with at least 10 quantiles, even if they look less than ideal for small books of business, are still recommended. It may be helpful for the regulator to see both decile plots and additionally quantile plots with less than 10 bins to guide their final assessment. This has been added to the comments, "Decile plots may look less stable for small books of business. In these cases, it may be helpful to obtain additional lift charts with less than 10 quantiles."
Akur8	B.4.c	Recommended additional comment: It is expected that the fit relativity will be different than the observed relativity for RGLM as the fit relativity will be penalized towards the prior assumption or null relativity. These	The recommended commentary has been added

		differences can be evaluated through the lens of credibility: items with lower exposure are expected to differ more than levels with high exposure. Low credibility datasets may see less alignment between these values in general. This credibility view is most easily applied to ordinal and categorical variables and less easily applied to continuous variables as continuous variables may extrapolate to areas with low credibility.	
Allstate	B.5.b	Allstate notes that a comparison model is not always available, making this information element potentially inapplicable for review. In instances when a model for comparison is not available, traditional modeling techniques such as those referenced in information element B.4.a are helpful in assessing the predictiveness of the filed model.	The Comments state "This comparison is not applicable to initial model introduction." No changes were made to B.5.b.
Allstate	C.6.a	Allstate notes that the granularity of the suggested metric would often produce volatile results. Allstate recommends assigning a lower level of importance to this information element and suggests relying on other model support.	Level 4 is now assigned to this Information Element. Level 4 is assigned to the same corresponding Information Element in the original GLM Appendix B.
Allstate	C.7.d & C.7.e	Allstate would like to clarify that the suggested information elements are more applicable at a state level rather than a countrywide level. Insurers can provide rate impacts at a state level as part of a standard rate filing. Comparisons at a countrywide level are less valuable for a particular state, which will be more interested in how the model impacts their policyholders as well as indicated and selected factors. Allstate recommends clarifying the language in each information element to highlight state impacts rather than countrywide model impacts.	The following was added to the comments column of C.7.d and C.7.e, "This analysis is typically done at the state level."