October 17, 2016

Kevin Fry
Chair, NAIC Investment Risk Based Capital Work Group
National Association of Insurance Commissioners
Via email: Julie Garber, NAIC staff support

RE: Response to Comments on Proposed RBC Factors for Fixed Income Securities for NAIC's Life Risk-based Capital Formula

Dear Mr. Fry:

On behalf of the C1 Work Group (C1WG) of the American Academy of Actuaries,[1] we appreciate the opportunity to respond to the comments submitted to the NAIC's Investment RBC Work Group on our August 2015 report, "Model Construction and Development of RBC Factors for Fixed Income Securities for the NAIC's Life Risk Based Capital Formula." This response addresses some of the comments submitted to the IRBC, along with some specific questions received by the C1 Work Group. We have also included the results of some sensitivity tests we performed.

In general, the questions submitted to the IRBC fell into the four categories:

1. Use of the greatest loss vs. cumulative loss in calculating the C1 base factors
2. Definition and quantification of the risk premium offset
3. Discount rate assumption
4. Applicability of factors to other asset classes (i.e., non-modeled)

Therefore, our responses were likewise grouped in Section 1 below, which also includes a brief explanation of the relationship between the base C1 factors and portfolio adjustments. Section 2 of this document addresses a few specific questions that were received by the C1WG. Section 3 describes some of the sensitivity tests that were run and includes detailed information about the average industry asset holdings and the representative portfolio.

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Section 1. General Questions

[1]The American Academy of Actuaries is an 18,500+ member professional association whose mission is to serve the public and the U.S. actuarial profession. For more than 50 years, the Academy has assisted public policymakers on all levels by providing leadership, objective expertise, and actuarial advice on risk and financial security issues. The Academy also sets qualification, practice, and professionalism standards for actuaries in the United States.

Use of the greatest loss vs. cumulative loss

The C1 factors are based on the concept of pre-funding losses (i.e., Loss Given Default or LGD) over the 10-year time horizon. More specifically, the minimum capital requirement has been established by the NAIC as pre-funding the present value of the greatest loss that occurs *at any point* in the 10-year time horizon. This capital requirement standard is consistent with the current C1 factors; the C1WG made no changes to the standard, and this definition was reaffirmed by the IRBC WG.

Some interested parties have suggested that a company may be able to survive from an impaired position. As such, a C1 requirement based on pre-funding the greatest LGD may be too conservative. Further, the C1 component is just one component of aggregate RBC, indicating that there are other sources of capital to absorb an impairment. Consequently, including this level of conservatism in the C1 component may make aggregate RBC too conservative.

The concept behind using the greatest loss is that a company must be solvent at all times, not just at the end of a specified period of time (e.g., at the end of 10 years). RBC is intended to identify companies that are potentially weakly capitalized. It is not sufficient for RBC to flag companies that might be in a weakened position after a ten year period; RBC must flag potential trouble at any point in time. For example, even if a company can survive a troubled situation (e.g., during year seven) and come out "whole" by year 10, the company needs to maintain minimum capital at all times to avoid additional regulatory scrutiny. RBC factors are set at a more conservative level based on this standard for solvency.

Definition and quantification of the risk premium offset

The C1 capital factors for life companies are based on a presumption of adequate statutory policy reserves (i.e., statutory policy reserves for future policy benefits). As such, the C1 factors were developed to establish capital requirements for losses in excess of what is included in statutory policy reserves. While not explicitly defined in current valuation standards, general actuarial consensus is that life policy reserves make provision for risks under moderately adverse conditions. Specifically, statutory policy reserves are generally thought to at least cover expected asset risks. While not a specific item in the balance sheet, effectively, RBC establishes funds to cover risks in excess of risks occurring in moderately adverse conditions.

The question to be answered for C1 modeling is how to quantify the expected asset losses included in statutory reserves. The answer is expressed as the risk premium (RP), which is the explicit assumption in the C1 bond model that represents the level of losses covered by statutory policy reserves. We defined the RP to be equal to the expected or mean LGD—roughly the 50^{th} percentile. This definition of expected or mean loss is the same as the approach used in the most recent 2001 review of the C1 RBC bond factors. Because the level of losses covered in existing reserves is not explicitly stated in the Standard Valuation Law (as is the case with PBR in the future), we chose to continue with this definition of RP.

One question is whether defining the RP at the mean of the loss distribution is too conservative. This question can be answered with two main points:

1. The C1 factor applies to all bonds, not just those bonds that support policy reserves. The RP offset is only an appropriate assumption for the required capital on those bonds backing life insurance policy reserves. Using the mean was based on judgement, but also consistent with the approach used in developing the current C1 factors.

   We acknowledge that defining the RP at the mean is more conservative than one standard deviation. An RP set at the mean or 50th percentile will result in a smaller offset to the C1 factor (and, therefore, a larger C1 factor) compared to setting the RP at one standard deviation or the 67th percentile. The "correct" answer for the RP lies between zero and the 67th percentile; we thought the 50th percentile was reasonable given the lack of an explicit quantification of the level of defaults included in statutory policy reserves.

2. In the current C1 factors, the basic Asset Valuation Reserve (AVR) factor was used as a proxy for the RP. The basic AVR factor for bonds is also defined as the mean of the loss distribution.

As requested, the C1WG performed sensitivity testing for a risk premium set at the 70th percentile rather than the mean. The results are included in Section 3 below.

Discount rate assumption

The C1 factor is based on the present value of the projected cash flows. The discount rate (DR) used in developing the current factors for bonds is 6 percent after-tax. The documentation for the existing C1 factors does not state the basis for the 6 percent, but from the code contained in the model, we infer the basis to be a risk-free U.S. Treasury rate. We note that the discount rate would have been chosen in the early 1990s. The average 10-year U.S. Treasury between 1981 and 1990 was 10.29 percent pre-tax/6.7 percent after-tax.

For the 2015 recommended factors, the DR used is 5 percent pre-tax/3.25 percent after-tax. The basis for the DR is the 10-year LIBOR swap rate. Based on the average 10-year swap rate from Dec. 31, 1993, to Dec. 31, 2013, the updated DR was determined to be 5.02 percent pre-tax/3.26 percent after-tax, rounded to 5 percent and 3.25 percent, respectively. The same DR is used for all economic simulations and does not vary over the projection period. As a reference point, the average 10-year U.S. Treasury rate over the last 20 years has been 4.57 percent pre-tax/2.97 percent after-tax.

Questions were asked about the choice of using an after-tax rate and a risk-free rate.

1. Use of an after-tax vs. a pre-tax rate

   The C1 factors are based on discounting after-tax cash flows. Basic finance principles dictate the use of an after-tax DR when valuing a stream of after-tax cash flows.

2. Use of a risk -free vs. an earned rate

The C1WG considered the use of a risk-free rate vs. an earned rate on a representative portfolio. In selecting the updated assumption, the C1WG recognized that the DR used in this exercise would be materially lower than the rate used in developing the current factors. Upon further analysis, the data and methodology justified a DR around 5 percent pre-tax. Ultimately, we settled on a DR defined as the risk-free rate. The risk-free rate is observable and no modeling changes would be needed. The key details of our deliberations follow.

For the risk-free rate, we considered using a 10-year LIBOR swap rate as a proxy for the risk-free rate. The 10-year LIBOR swap rate, averaged over the past 20 years, was 5.02 percent pre-tax/3.26 percent after-tax. We chose not to use U.S. Treasury rates as the discount rate because of the difficulty in projecting future U.S. Treasury rates. The Federal Reserve's monetary policy affects interest rates and Fed actions are not easily reflected in the construction of a future Treasury curve.

We also considered use of an earned rate for the average industry bond portfolio as the DR. In other words, the earned rate for the C1 model could be defined as the expected earned rate for a representative bond portfolio over the next 10 years (since the C1 time horizon is 10 years). Because defining an earned rate appropriate for each life insurer is nearly impossible, we considered the current market conditions for the typical assets purchased by life insurers. We would anticipate an expected earned rate to be greater than the risk-free rate, but did not attempt to quantify an average earned rate. We recognize that using a bond portfolio earned rate would require additional model complexity as "capital on capital" would need to be added to the model, including additional capital on those assets reflected in the discounted cash flows.

Sensitivity testing was performed to demonstrate the materiality of the DR assumption. The C1 factor for an A-rated bond was recalculated for a 1.5 percent after-tax DR (i.e., 3.25 percent minus 175 bp). The C1 factor increased approximately 8 percent (from 0.89 percent to 0.96 percent). Next, the C1 factor was recalculated using a 5 percent after-tax DR (i.e., 3.25 percent plus 175 bp). The C1 factor decreased approximately 8 percent (from 0.89 percent to 0.82 percent).

Applicability of factors to other asset classes

The C1WG has recommended the use of the corporate bond factors for all fixed income assets, as is the case today. Some have questioned the use of these factors when our default experience was only based on corporates (approximately 50 to 60 percent of industry holdings) and when the experience for some asset types is better. The following explanation of our development process and assumption choices will illustrate our thinking and support our recommendation.

The C1WG started with the plan to develop separate factors for all material asset classes. Initially, we modeled corporate bonds as this class is the largest asset class for life insurers, and experience data on defaults and recoveries in the corporate sector was readily available. Once we completed our modeling for corporate bonds, we evaluated what was needed in order to model other asset types. What experience studies are available? What are the differences in risks and

cash flows? What modeling adjustments would need to be made in order to develop appropriate C1 factors for these asset classes?

The C1 factor for bonds is directly linked to the rating of the security. The C1WG met with representatives of Moody's and S&P to better understand their ratings processes, as their ratings (along with other NRSROs) are used for the vast majority of industry bond holdings. The rating agencies described their ratings process, in particular, the global ratings process. The goal of the global ratings processes for Moody's and S&P is to assign an equivalent rating for all securities and asset types with similar degrees of risk. In other words, the risk of loss for an A-rated municipal is equivalent to the risk of loss for an A-rated corporate and the risk of loss for an A-rated private placement.

The global ratings process used by both Moody's and S&P implies that the rating agencies have made the appropriate risk adjustments in rating different types of fixed income securities. While corporate bonds form the base rating, this global rating process makes the appropriate risk adjustments in assigning ratings for municipals, privates, and other fixed income securities. In other words, appropriate risk adjustments are already reflected in the rating assigned by the rating agency. As such, there is no need for the C1WG to make any further risk adjustments in the bond model. Further, as long as the C1 calculation relies on the rating agency ratings, it is inappropriate to make any further adjustments or to develop a separate set of C1 factors.

One consideration is whether rating agencies are achieving their stated goals in using a global ratings process. Some anecdotal default studies suggest much lower default rates for municipals. However, in general, it is unclear whether there is statistically credible data to indicate that the ratings resulting from the global ratings process should be overridden. More importantly, as long as the RBC calculation is directly linked to rating agency ratings, one set of C1 factors for all fixed income securities is justified.

Portfolio adjustments

The factors recommended in the C1WG report are base factors. These base factors are direct model output and have not been rounded. We leave the decision on rounding the factors to the regulators.

Please note that the calculation of the C1 component in the LRBC formula is a two-step process. The first step is to determine the base factor and the second step adjusts the base factors for company specific investment portfolio characteristics. The purpose of this two-step process is to ensure that the statistical safety level for the C1 component in aggregate is met. As has been described in the past, the base C1 factors applied to an individual security are set at the 92^{nd} percentile over a 10-year time horizon. The statistical safety target for the C1 component, in aggregate for each company's portfolio, is set at approximately the 96^{th} percentile over a 10-year time horizon. The purpose of the portfolio adjustments is to scale the individual factors up or down, such that the 96^{th} percentile target is achieved for an individual insurance company.

Also, please note that the statistical safety level for the individual C1 factors and the C1 component, in aggregate, have not changed with this update of the C1 factors.

Current C1 Calculation
In the current C1 calculation, the first step is a calculation of the base requirement, where the base factors are multiplied by the specified carrying value for each security and summed. In the second step, adjustments are made for the concentration of the top 10 asset holdings and the number of issuers in the portfolio. The base factors for the top ten holdings are doubled. The size factor reflects the higher risk of a bond portfolio that contains relatively fewer bonds. The overall factor decreases as the number of issuers in a portfolio increases. Portfolios with more than 1,300 issuers receive a lower charge. The size factor is based on the weighted number of issuers. Depending on the weighted number of issuers, the base factors are scaled up or down. The weighted number of issuers is determined as follows:

Line	Source	# of Issuers	X Scalar	Weighted Issuers
First 50 Issuers	Company Records	----	2.5	----
Next 50 Issuers	Company Records	----	1.3	----
Next 300 Issuers	Company Records	----	1.0	----
Over 400	Company Records	----	0.9	----
Total # Issuers	Company Records	----		----

Size Factor = Total weighted issuers divided by total number of issuers

Review of Portfolio Adjustments
The portfolio adjustments must be reviewed and modified in light of the proposed base factors. The C1WG is reviewing both the nature of and the specific elements of adjustments to ensure the overall target of approximately the 96th percentile is met. These adjustments to the base C1 factors reflect key differences in the risk characteristics of an insurer's asset portfolio. The C1WG is evaluating whether the current size factor for the number of issuers and the concentration factor for the top 10 holdings, as defined, are appropriate in light of the model used to develop the base factors. The C1WG is also considering other ways to adjust the base factors that better reflect differences in risk characteristics among insurers' bond portfolio (e.g., issuer concentration).

We have received questions about the assumptions used in developing the representative portfolio and the weightings used in developing certain modeling assumptions. Every life insurer uses the same base C1 factors. Portfolio differences are eliminated, to some degree, with the portfolio adjustments applied in the second phase of the C1 calculation. While there are different approaches to weighting assumptions, or in developing the representative portfolio, the ultimate objective is to produce aggregate C1 capital at the 96th percentile for each company's portfolio. As such, any changes to the base factors force complementary changes to the portfolio adjustments.

Section 2. Specific Questions

1. **Sensitivity Testing**
   Q. *As a general comment, in a number of areas, a sensitivity analysis relative to assumptions would be useful. We have formed our own judgments, based in part on the attribution analysis, of those key items, but further analysis would be useful. In particular, where any*

simplifications or shortcuts were taken it is important to show that there was not a material impact.

A. The C1WG performed sensitivity testing on selected key assumptions. The testing confirmed the significance of each assumption. The testing confirmed the reasonability of the model logic and resulting C1 factors. The sensitivity testing was performed at two different levels. As the base factors were being developed, the C1WG evaluated various assumptions to understand the importance of the assumption and evaluated the relative impact on the results.

Once a set of factors was approaching "final" status, a separate group of C1WG members, not initially involved with the development of the model, performed an independent review of the model and assumptions. Their review included additional sensitivity testing, resulting in modifications to certain assumptions and model logic. The end result of this testing process was a set of assumptions and a model deemed reasonable to produce an appropriate set of C1 factors for bonds.

The level of rigor used in performing the sensitivity testing varied by the assumption. While the sensitivity testing was documented, we chose not to publish the results of sensitivity testing in our original documentation. We have included some of the results of sensitivity testing in Section 3.

2. Recovery

Q2a. *Originally, recovery was assumed to vary by rating; now it is constant across classes. This will obviously create higher losses for the higher quality classes and lower losses for the lower classes. This result is inconsistent with assumptions in the initial RBC, and is also inconsistent with the assumptions used in Principle-Based reserves. We would like to better understand whether these inconsistencies are justified.*

A2a. Generally, recovery rates do not show significant variation by issuer rating. Various studies published by Moody's and Edward Altman show that recovery rates are strongly correlated to instrument type (also known as lien position). While recovery rates vary by other characteristics (e.g., sector, position within the capital structure), the instrument type shows the greatest correlation with recovery rates.

The rating agency approach of notching the issuer rating to adjust for expected incremental loss (higher or lower), captures the expected recovery differential of a given credit due to varying instrument types (and all other perceived risks). Because the issuer rating is most closely related to a senior unsecured rating, the rating agency notching allows for the incremental expected loss difference relative to the expected recovery of senior unsecured issues. Given that rating agency practice already accounts for expected loss differences in the issue rating, further differentiation of risk is not needed and would double count the risk differential relative to senior unsecured expected loss.

Q2b. *The documentation notes that recovery assumptions were set based on rating immediately prior to default. There does not appear to have been any analysis as to*

whether the rating at some earlier point has an influence on the rate of recovery. There should be some tracking back to the rating at issue, or some prior point to either validate that a prior rating has no impact, or to verify if it does have impact.

A2b. We do not agree with the assertion that, "The documentation notes that recovery assumptions were set based on rating immediately prior to default." The assumed recovery rate does not vary by rating. We note in the documentation, Appendix B Chart B2 that recovery is relatively stable across issuer ratings and for periods of increasing time before default. Given the notching process described in (a) to produce an issue rating, we believe that same stability is applicable to issue rating.

Q2c. *There has been a material change in the recovery assumption by economic state that is explained only by referencing propriety data. Verbal comments during the Academy's presentation at the NAIC Summer National Meeting indicated that the variance of loss by economic state was wider than previously assumed. This is an area that needs more documentation and discussion.*

A2c. Our presentation was intended to indicate that the economic state has less impact on the proposed factors compared to the current factors as shown in Appendix E, Table E2, Column 3. The variation by economic state in the proposed factors is based on the S&P recovery data. The basis of the assumption used to produce the current factors is unknown.

Q2d. *The report indicates that out of over 4400 defaults, data on only 1260 defaults, (i.e. only senior unsecured bonds,) was used. This limited data set was then used to develop recovery by rating class and by economic state. We would like to see further documentation and analysis, including an assessment of the credibility of the data. As noted below for default rates, there appears to have been only a single year of 'continued contraction.' Were recovery assumptions based on that single year of data?*

A2d. No. The data contains over 4,400 measured recoveries, of which 1,260 are based on senior unsecured instruments. These are all unique recovery measurements, but technically may not be sourced from unique defaults as some defaults may have been measured in more than one instrument type. The highest proportion of measured recoveries come from senior unsecured instruments. The rationale for using only the senior unsecured data is explained in answers A2a above and A2e below. The variation of recoveries by economic state uses the same two state model as per issue ratings Aaa – A. Experience in the contraction years, 1991, 2001, 2008, and 2009, was used to derive the contraction recovery histogram. Conversely, all other years in the span of 1987 – 2012 formed the basis of the expansion recovery histogram. These four contraction years comprised around 40 percent of the recoveries.

Q2e. *No distinction was made by instrument type (i.e., lien position). The report indicates that senior secured bonds have better experience than senior unsecured bonds, which in turn have better experience than subordinated bonds. The rating agencies use a notching system to adjust ratings by issue for the seniority. This notching implies that the mix of assets by letter grade is not likely to be constant, with lower quality letter grades expected*

to have higher proportions of subordinated issues. This would potentially impact the recovery that should be expected by class. We would like to better understand the rationale for not using instrument type in the derivation of recovery rates.

A2e. Close followers of this project may recall that earlier work by the C1WG included preliminary proposals for factors based on a matrix of rating and instrument type. These proposals were based on the rationale of being able to produce the two parameters that align with the rating agency data that produces total expected loss, 1) issuer rating (the basis of default experience reports) and 2) instrument type (recovery rate). As explained in the documentation, after consultation with the rating agencies, this approach was deemed inappropriate because this approach could not improve the risk assessment already being made by the rating agency in deriving an issue rating. As explained above, because the issue rating captures incremental expected loss relative to senior unsecured instruments and that rating is used as the input for RBC, the same recovery assumption is used to develop the factor for each issue rating.

3. Default rates – smoothing process

Q. *The documentation outlines a process used for smoothing the baseline default rates. When reviewing the rates, it is noticeable that the annual rates are anything but smooth, in some cases showing an oscillating pattern by duration. Of greater concern is whether they in total replicate the underlying experience. We would like to better understand the pattern of baseline default rates and whether the smoothed rates replicate the underlying experience.*

A. Yes, there is "oscillating pattern" of smoothed spot default rates for some rating classes; however, this oscillating pattern is also a characteristic of the raw spot default rates. As a statistical process, actual default experience is a single random pick of the "true" underlying default process. As a sample of the underlying experience, it is reasonable, and in line with actuarial practice, to "smooth" the underlying experience to create a set of default rates that are reasonable in relation to the underlying experience and consistent with theoretical expectations. For example, in the raw experience data, at all durations from 1 to 7, the A1 cumulative default rates are higher than the cumulative default rates for A2. At durations 6 and 7, the cumulative Ba1 default rates are higher than the corresponding Ba2 rates. Intuitively, these relationships do not make sense.

In addition, one would expect a significant difference between the 10-year cumulative default rate for Ba1 relative to Ba2. The Ba1 rate is 14.07 percent while the Ba2 rate is 14.75 percent. While the correct direction, the result is surprising when considered relative to the 10-year cumulative default rates of Baa3, 7.13 percent, and Ba3, 30.42 percent. This lack of distinction between the Ba1 and Ba2 rates is not conceptually intuitive and could lead to anomalies in the resulting C-1 factors.

Thus, similar to the construction of mortality tables, some type of smoothing of default rates is needed before being used in the C1 model. Initial smoothing approaches looked at both cumulative default rates and spot default rates within a rating class and smoothed the rates across time. Even after this smoothing, the resulting default rates and C1 factors showed

anomalies in the results especially in the relation between Ba1 and Ba2.

What should the relationship be between the cumulative default rates at a given duration between rating classes? Moody's provides the means to an answer based on "idealized" cumulative default rates from Appendix A of its report, "Loss Given Default for Speculative-Grade Non-Financial Companies in the U.S., Canada and EMEA."[2] The report provides by rating class "idealized" cumulative default rates for Year 4. Note that the idealized rate for Ba1 is significantly lower than the rate for Ba2: 4.62 percent and 7.48 percent, respectively. We then examined the ratios of the cumulative default rate for a rating class to that of the next higher rating class for our smoothed results.

The following table shows by rating class the Year 4 cumulative default rates for Moody's Idealized, Raw Data, and the Smoothed Data in the C1WG recommendation. The next set of columns shows the respective ratios of the cumulative default rate for a rating class to that of the next higher rating class.

	4 Year Cumulative Default Rates			Ratios: Rating / Next Higher Rating		
	Moody's Idealized	Raw Data	Smoothed (across Rating)	Moody Idealized	Raw Data	Smoothed (across Rating)
Aaa	0.00%	0.05%	0.05%			
Aa1	0.02%	0.09%	0.12%	1160%	184%	254%
Aa2	0.05%	0.34%	0.24%	223%	378%	198%
Aa3	0.11%	0.34%	0.39%	215%	99%	164%
A1	0.21%	0.81%	0.56%	187%	241%	143%
A2	0.38%	0.66%	0.73%	183%	81%	131%
A3	0.59%	0.70%	0.91%	156%	107%	124%
Baa1	0.91%	0.90%	1.11%	154%	128%	121%
Baa2	1.32%	1.46%	1.35%	145%	162%	122%
Baa3	2.62%	2.00%	1.68%	198%	138%	124%
Ba1	4.62%	5.48%	5.44%	176%	274%	324%
Ba2	7.48%	5.93%	7.25%	162%	108%	133%
Ba3	10.77%	13.11%	10.02%	144%	221%	138%
B1	15.24%	15.28%	14.20%	141%	117%	142%
B2	19.94%	19.83%	20.34%	131%	130%	143%
B3	26.44%	27.33%	28.77%	133%	138%	141%
Caa1	35.73%	35.19%	39.06%	135%	129%	136%
Caa2	48.27%	45.55%	49.07%	135%	129%	126%

Ratios for the Moody's Idealized start very high 1,160 percent for Aa1/AAA, declining to 223 percent for Aa2/Aa1, and followed by a steady decline through Baa2. The Baa3/Baa2 ratio jumps to 198 percent, whereas we would have expected a jump at the investment-grade to below-investment-grade boundary. From there, the ratios show a decline to the 131

[2] "Loss Given Default for Speculative-Grade Non-Financial Companies in the U.S., Canada and EMEA," June 2009 (page 20).

percent to 144 percent range.

Ratios for the Raw Data vary, without apparent pattern, with a high of 378 percent and two ratios below 100 percent, including 81 percent for the A2/A1 ratio. Note the Ba2/Ba1 ratio of 108 percent.

Comparisons of the Idealized ratios to the Raw Data ratios give further support to a smoothing process.

Ratios for the Smoothed Rates start at 254 percent and decline to 121 to 124% for investment grade. The ratio of 324 percent for Ba1/Baa3 is a result of the dummy variable introduced in the smoothing to reflect a jump in the default rates as a bond becomes below-investment-grade. Below-investment-grade ratios are relatively close and range from 126 percent to 143 percent, not too far from the Moody's Idealized values.

The dummy variable for below-investment-grade was introduced into the smoothing process as a result of concerns with the weightings by rating and the resulting goodness of fit to the raw data. The introduction of the dummy variable and making the weightings equal by rating class provided a better fit to the raw data.

R-squared values from the smoothing process for the cumulative default rates for the 10 durations were all above 98.5 percent indicating a good fit.

The proposed smoothed default rates were compared to the raw data. Across the 10 durations, across the various rating categories, the average default rate, smoothed minus raw was calculated for various ratings groupings and is shown below for both the initial smoothing and the subsequent final version.

Initial: Spot Rate Smoothed—Raw

	All Ratings	IG	BIG	Aaa-A	Baa	Ba-B
Mean	0.001%	0.034%	-0.036%	0.026%	0.174%	0.051%

While the All Ratings average is close to zero, the various groupings of ratings looked questionable, especially the Baa group, Baa1, Baa2, and Baa3 combined. Consequently, the smoothing processes was re-examined. The result of the re-examination, discussed above, was the introduction of the dummy variable for below investment grade securities and weighting all ratings classes equally. The resulting smoothing, called "Alt 4," showed a much better fit to the underlying data.

Final: Spot Rate Alt 4 Smoothed—Raw

	All Ratings	IG	BIG	Aaa-A	Baa	Ba-B
Mean	-0.010%	0.006%	0.015%	0.011%	0.007%	0.006%

For each of the individual groupings, the Alt 4 method provided much a better fit to the raw data. With the agreement of the independent review team, the Alt 4 method became the basis of the C1WG's recommendation.

4. Default rates – change by environment

Q. *It is not clear from the documentation whether the scalars developed were done based on the smoothed or raw default data. If done independent of the smoothing, there should be reconciliation that the resulting combination as used in the model is representative of actual history.*

We also note that the scalars are more extreme than used in. For example, for A2, the 1992 modeling used a scalar of 130 % for the worst environment, while the current uses 272 %. Also, in the prior modeling, the scalars increased for lower quality investments, while the current proposal has them decreasing for lower quality. Similar to 1.d. above, there is a question about the credibility of the underlying data for each of the cells. Given the magnitude of these changes, the attribution analysis does not seem to reflect these changes in default rates as an explanation for the change. We believe additional documentation and explanation of the data underlying those scalars, including the volume and credibility of the data is important.

A. Economic scalars are developed from the raw default data, which are from Exhibit 41 of the Moody's default study. Exhibit 41 has the cumulative default rates by "duration" for each of the cohort year from 1983 to 2012. The combination of "cohort year" and "duration" determines the "calendar year," which will then be used to decide the economic state of that particular default experience (Appendix E, page 46 of the C1WG report).

Within Moody's default study, Exhibit 41 is the only source where we can further distinguish the default experience by economic state through the respective "calendar year." Before we started using the cohort/durational default rates to develop economic scalars, we compared the scalars from the raw default rates used to develop/smooth the baseline default rates. The results are shown on pages 60-61 of the C1WG report. We believe Exhibit 41 and Exhibit 34 have similar underlying default experiences as they show consistently similar durational default rates (p.61).

Again, the purpose of economic scalars is to introduce the variability of the default rate by different economic states. The volatility of the baseline rate will impact tail distribution and hence the capital charges. The 1992 RBC approach also used economic scalars; however, we were not able to identify any historically observed data/documentation to support how these economic scalars assumptions were developed.

Regarding the credibility of these economic scalars, we acknowledge the fact that we only used default experience data from 1983 to 2012 and there are only limited observations for certain economic states, particularly under the four-state economic model. To address this credibility issue, we did two things:

1. We used two-state model for the higher rated securities (Aaa, Aa, A) and four-state model for the lower rated securities.
2. In addition, we use "leveled" economic scalars to "smooth" or "average" the economic scalar impact.

We believe these two changes represent a modified approach that recognizes the limited data while introducing variability to the default rate that does not overly penalize the high default rates observed in a handful of instances.

5. Relationship of experience database with industry holdings

Q. *The modelers appear to have done significant analysis of the make-up of the industry portfolio by size, quality, and other factors. One analysis that seems missing is any look at the mix of holdings by industry, and particularly a comparison of the default and recovery databases with industry holdings. In particular, during the recent recession, a significant amount of the defaults and losses came from financial firms, yet the insurance industry has traditionally been underweighted in this sector. We would like to better understand how comfort was established that the experience used is relevant to the asset portfolios of the insurance industry.*

A. Because issue ratings reflect the ordinal ranking of risk by rating agencies of all rated corporate bonds, which are not distinguished by sector, we do not believe it is necessary to consider variations of sector holdings of the industry relative to the underlying experience of the default and recovery assumptions. We are aware that the financial sector had higher than expected loss experience in the Great Recession of the late 2000s, but we do not think the assumptions should be adjusted because the industry had lower exposure than rating agency rated debt.

Rather, we view the higher than expected defaults in the financial sector as a random shortcoming in the rating process that could occur again with any other sector. In that light, all prior experience is appropriate to form the historical experience assumption. Further, because the issue ratings adjust for expected variations by risk, there is no need to further reflect sector differences in life insurance industry holdings in the experience data.

Section 3: Sensitivity Testing

We performed sensitivity tests on the following assumptions:

1. Discount rate: +50bp after tax (3.25 percent increased to 3.75 percent)
2. Rerun C1 factors with RP defined at the 70th percentile

We considered performing sensitivity testing related to using a representative portfolio based on the largest class, but we opted not to run those tests. The impact of different portfolio sizes is captured in the portfolio adjustments and not in the base factors. The C1WG recommended base C1 factors from running the model using 10,000 economic scenarios. Due to the computational time required, we performed sensitivity testing over 2,000 economic scenarios. To facilitate a

comparison with the recommended factors, we reran the base factors over 2,000 economic scenarios. The following table shows the results of the sensitivity tests.

		C1 Factors				
		10,000 Trials	2,000 Trials			10,000 Trials
Proposed RBC category		C1 Factors Recommended in August 2015*	Recalculated Base C1 Factors	C1 Factors at 3.75% DR	C1 Factors at Moody's 2012 Raw Rates	C1 factors using the 70th %ile Risk Premium
P1	Aaa	0.20%	0.20%	0.19%	0.19%	0.21%
P2	Aa1	0.31%	0.34%	0.32%	0.16%	0.30%
P3	Aa2	0.45%	0.44%	0.42%	0.57%	0.42%
P4	Aa3	0.57%	0.58%	0.56%	0.52%	0.50%
P5	A1	0.69%	0.70%	0.69%	0.81%	0.59%
P6	A2	0.81%	0.82%	0.79%	0.89%	0.68%
P7	A3	0.93%	0.96%	0.94%	0.91%	0.77%
P8	Baa1	1.07%	1.04%	1.01%	0.87%	0.88%
P9	Baa2	1.21%	1.23%	1.20%	1.20%	1.00%
P10	Baa3	1.45%	1.40%	1.36%	1.59%	1.16%
P11	Ba1	2.56%	2.49%	2.39%	2.52%	2.11%
P12	Ba2	3.16%	3.08%	3.02%	2.48%	2.61%
P13	Ba3	4.05%	3.89%	3.83%	4.74%	3.42%
P14	B1	4.32%	4.29%	4.21%	4.74%	3.51%
P15	B2	5.66%	5.73%	5.59%	5.56%	4.67%
P16	B3	7.42%	7.76%	7.59%	8.01%	6.28%
P17	Caa1	10.41%	10.95%	10.82%	9.84%	9.04%
P18	Caa2	14.29%	14.33%	14.13%	13.61%	12.79%
P19	Caa3	21.47%	21.30%	21.16%	21.66%	20.73%

* Recommended factors are based on a discount rate of 3.25% AT, 10,000 economic scenarios, and risk premiums set at the mean.

The C1WG provided further details on the composition of the industry holdings, including:

1) Public corporate bonds by letter rating and seniority
2) Privates by letter rating (or NAIC category with + / -)
3) Municipal bonds by letter rating
4) All other bonds by letter rating, including a description of "all other"

The data is provided in the following tables. Where an NRSRO rating is not available, an NAIC Category rating is listed.

Public Corporate Bonds by Rating and Seniority (millions)

NAIC Category/ NRSRO Rating	Term Loans	Senior Secured	Senior Unsecured	Senior Subordinated	Junior Subordinated	Not Reported	NAIC Category/ Rating Total
1		9,342.7	50,481.7	5,167.0	1,131.0	12,248.1	78,370.4
2	22.3	4,185.3	39,243.3	1,962.0	1,594.2	10,318.6	57,325.7
3	605.7	3,729.0	7,488.8	1,460.6	709.7	3,256.4	17,250.1
4	734.5	1,910.2	3,738.0	716.8	27.0	1,451.0	8,577.5
5	49.3	163.8	1,204.8	211.6	0.3	677.2	2,307.0
6	1.0	218.4	320.7	21.1	81.9	25.9	668.9
Aaa		2,533.2	11,856.2	163.5			14,552.8
Aa		9,065.5	70,704.1	1,428.0	11.2	24.9	81,233.8
A		53,369.9	340,987.1	22,246.6	1,599.2	2.1	418,204.9
Baa		15,235.9	396,512.4	20,033.2	7,118.4	127.2	439,027.1
Ba		3,543.9	33,898.2	4,273.3	3,236.2		44,951.6
B		2,156.0	8,374.8	657.5	84.0		11,272.3
Caa		203.4	2,041.1	189.4			2,433.9
Ca		17.3	25.2	5.0	4.4		51.9
C			24.0	20.7			44.7
Seniority Total	1,412.7	105,674.5	966,900.1	58,556.4	15,597.7	28,131.3	1,176,272.7

Other Bond Types by Rating (millions)

NAIC Category/ NRSRO Rating	Municipal	Private	Other*
1	12,531.5	84,455.2	40,343.6
2	1,720.7	166,648.0	1,133.0
3	308.1	18,761.3	204.2
4	150.6	6,302.6	340.8
5	16.2	3,590.1	0.0
6	10.2	579.8	29.4
Aaa	19,077.4		16,254.3
Aa	58,032.1		9,805.5
A	19,330.5	512.3	1,413.1
Baa	1,955.8	296.5	5,957.4
Ba	53.2		1,010.6
B	64.3		244.7
Caa	13.5		7.7
Ca	0.7		0.7
C			1.0
D			0.2
Total	113,264.8	281,145.8	76,746.0

* Other by macro sector includes U.S. government agency, sovereign, supranational, mortgage and equity.

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We appreciate the opportunity to provide a response to the comments received on the C1WG report, "Model Construction and Development of RBC Factors for Fixed Income Securities for the NAIC's Life Risk Based Capital Formula." If you have any questions or would like to discuss further, please contact Nancy Bennett (bennett@actuary.org), Senior Life Fellow, or Amanda Darlington, Life Policy Analyst (darlington@actuary.org).

Sincerely,

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