

## Investment implications of proposed RBC changes.

Investment portfolios of insurance companies are heavily dominated by fixed income securities. Solvency implications of proposed changes to risk-based capital requirements on investment assets should be well understood and included in building an efficient investment strategy.

### Executive summary

The NAIC is currently updating its risk-based capital (RBC) factors for fixed income securities. It plans to increase the number of factors from six to 20 and revise the factor values. On average, the capital requirements for investment grade bonds will increase slightly while the capital requirements for many high yield bonds will decrease meaningfully. The NAIC's goal is to have the new factors in place for the life insurance industry's 2017 year-end reporting.

Our analysis indicates that the life insurance industry as a whole will experience a 5% decline in its RBC ratio as a result of the new factors. For the vast majority of life insurance companies this is not a problem since the industry is currently very well capitalized. However, the magnitude of the decline in each company's RBC ratio will vary depending on its level of capitalization and its specific mix of business and investment risks.

In this paper, we analyzed the capital efficiency of bond investments in all rating categories under the existing and proposed RBC factors. Currently, high yield bonds are not very capital efficient when their yields are adjusted to reflect

the cost of capital and default risk. We found that the new RBC factors would make top-rated high yield bonds (rated BB and B) relatively more capital efficient.

We do not anticipate that the RBC factor changes will drive wholesale rebalancing of insurers' fixed income portfolios. However, depending on each individual company's ability to tolerate moderate declines in its RBC ratio, the new factors could represent an opportunity to enhance portfolio yield through an incremental growth in high yield allocation.

### Background

Since 2011, the National Association of Insurance Commissioners (NAIC) has been working to revamp its Risk-Based Capital (RBC) requirements. In particular, it has made the review of RBC charges related to fixed income investments a priority. In coordination with the American Academy of Actuaries (the Academy) the NAIC's Investment RBC Working Group is considering increasing the number of risk-based bond factors from six to 20 and updating the factor values themselves.



The new factors, if adopted, would correspond more closely to the Nationally Recognized Statistical Ratings Organizations’ (NRSROs) alpha-numeric credit quality ratings. The proposed new factor values are based on recent credit loss data for U.S. public corporate bonds<sup>1</sup>. The goal is to better align capital charges on insurers’ bond holdings with the instruments’ actual credit risk. The NAIC is targeting having the new factors in place in time for 2017 year-end RBC reporting.

The new factors are based on publicly traded corporate bonds only, but we expect that they (or something similar) will be applied to municipal bonds, sovereign debt, asset-backed securities (excluding MBS), and private placements (insurer holdings of U.S. Treasuries and GNMA securities are exempt from risk asset charges). The NAIC’s working group is also evaluating the need to update bond factors for P&C and health insurers. Its stated objective is to apply the same factors consistently across all types of insurers, but this has not been finalized. It prioritized life companies because their investment risks carry much larger weight in determining their capital adequacy, relative to health and P&C companies. For further discussion about differences in RBC formulas for life, P&C, and health insurers, see [Appendix A](#).

In this publication we analyze the proposed RBC factors and their investment implications for U.S. life insurers. While we believe the economics of fixed income investing is the true

driver of long term performance, insurers (particularly life insurers) must be aware of the capital implications also.

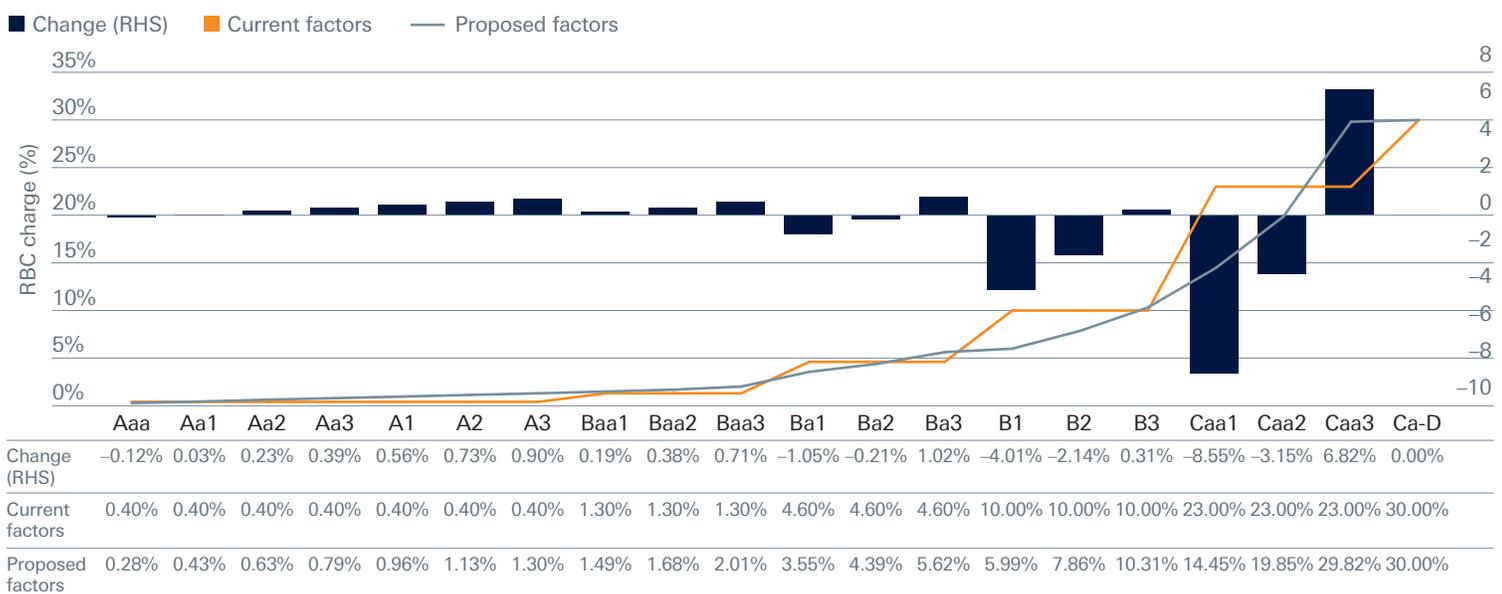
We analyzed the life insurance industry RBC data along with bond data for the largest companies to determine the total expected impact of the proposed changes. Overall, they seem likely to marginally increase the required capital for fixed income investments by slightly increasing the charge on investment grade bonds and materially decreasing the charge on many below investment grade bonds. However, we do not anticipate these changes will drive wholesale rebalancing of insurers’ fixed income portfolios, as most companies are well capitalized and not overly sensitive to marginal changes in the RBC ratio<sup>2</sup>. Rather, we expect an incremental organic growth in allocations to high yield bonds as they become more capital efficient under the proposed regulatory framework.

For further discussion of our analysis methods, please see the Methodologies section in [Appendix C](#).

### Comparing the RBC factors

So, how exactly would the RBC bond factors change? [Illustration 1](#) below summarizes the changes to the structure and gross values of the C-1 factors as proposed by the Academy.

Illustration 1: Proposed changes to RBC bond factors—Proposed changes to RBC charges, by rating category



Source: American Academy of Actuaries, “Model Construction and Development of RBC Factors for Fixed Income Securities for the NAIC’s Life Risk-Based Capital Formula”, August 3, 2015. There is no guarantee that the proposed changes to RBC charges will materialize.

The current six NAIC designations and their corresponding RBC factors (the orange line on the graph) have significant jumps, or “cliffs”, between them. These exist because bonds with a wide range of credit risk are grouped together and assigned the same capital charge. For example, all investment grade bonds rated from Aaa down to A3, Moody’s top seven categories, are currently grouped in the NAIC 1 category, resulting in the same charge for bonds with varying degrees of credit risk. The NAIC 2 category covers bonds rated Baa1 to Baa3, and so on. By using a one-size-fits-all approach, the current regime penalizes higher quality bonds within each NAIC category and creates an incentive for insurers to invest in lower-quality, higher yielding bonds since they do not have to pay any additional regulatory price. The new and more granular RBC factor structure (the grey line) is designed to smooth out the regulatory cliffs and remove this incentive.

As shown in the chart, under the new structure most of the investment grade bonds (currently rated NAIC 1 and 2) will have slightly higher RBC factors. This means the majority of life insurance bond portfolios will be assessed incrementally higher gross capital charges, by an average of 40 bps. The below investment grade categories (NAIC 3 through 5) will experience more pronounced changes, however. The top tiers of each NAIC category will see their RBC factors reduced significantly, leading to an average decline of 122 bps in capital charges for below investment grade bonds overall. No changes are proposed to bonds in the NAIC 6 category (corresponding to ratings Ca through D), which will maintain the current maximum capital risk charge of 30%.

### How will it impact RBC ratios?

The capital charges shown above represent the gross factors used in the overall RBC calculation. To determine their impact on expected surplus, these factors need to be assessed based on their impact on an insurer’s total capital requirement net of the covariance effect. Specifically, we focused on the incremental surplus an insurer would need in order to maintain its current RBC ratio, using total industry data as a proxy.

We estimated the year-end 2015 life insurance industry RBC ratio at 533% by using the NAIC industry data and current RBC bond factors<sup>3</sup>. Applying the factors proposed by the Academy, we estimated an approximate net (after-covariance) reduction of 29 points to 504%, or about a 5% decline from the initial RBC ratio<sup>4</sup>. For the vast majority of life insurance companies this is not a big problem, since

the industry is currently very well capitalized, with more than 90% of life insurers having RBC ratios above 200% of the company action level. According to Moody’s, adoption of the new RBC factors would not immediately trigger a review of an insurer’s creditworthiness. In fact, the rating agency views the new RBC framework as a credit positive development, because it expects insurance companies to focus on risk-adjusted returns more than they do under the existing NAIC framework<sup>5</sup>.

Nonetheless, the modeled results of the RBC ratio declines vary for individual companies depending on several factors, including the composition of their investment portfolios and the weight of other business risks in the overall RBC calculation.

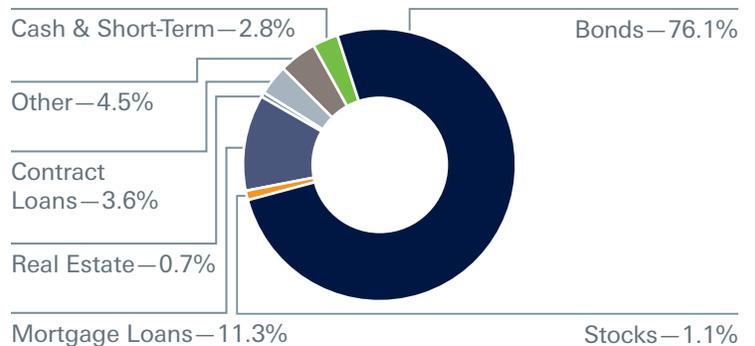
### What does this mean for investment strategy?

The proposed reduction in capital charges for several below investment grade categories would make high yield bonds a more attractive investment. For example, there would be a reduction from 10% to 5.99% for bonds rated B1 and from 23% to 14.45% for Caa1. In the ongoing low yield environment, the new regime will likely encourage insurance companies to re-assess and perhaps increase their allocation to below investment grade bonds, especially in the top-quality tiers. At a minimum, we expect that insurers will be more inclined to keep their existing high yield holdings.

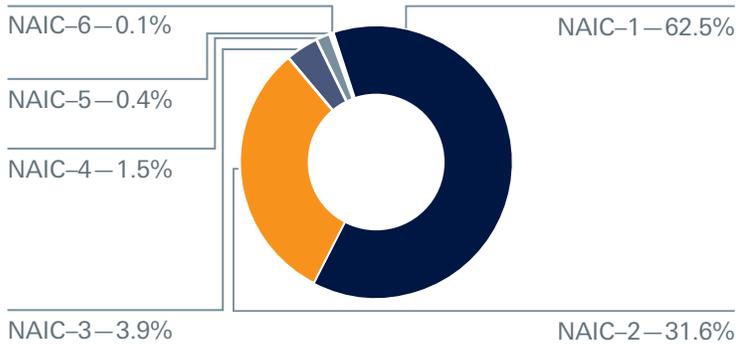
The companies should keep in mind that there will be higher charges on their investment grade portfolios, which constitute the majority of their fixed income holdings (94% of the industry’s bond holdings were rated NAIC 1 or 2 at the end of 2015). Because of the higher charges on these instruments, the total net effect of the new factors will be an

Illustration 2: Estimated life industry allocation

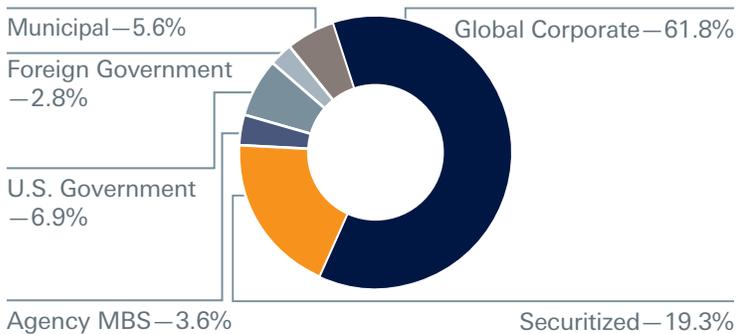
#### Life industry asset allocation 2015 year-end



### Life industry bond allocations by quality 2015 year-end



### Life industry bond portfolio sectors 2015 year-end



Source: SNL Financial, as of 12/31/2015.

immediate reduction of company RBC, as illustrated above. This might reduce some insurers' interest in increasing their high yield allocation. On the other hand, many well-capitalized insurers could easily digest the initial RBC reduction and consider expanding their high yield bond

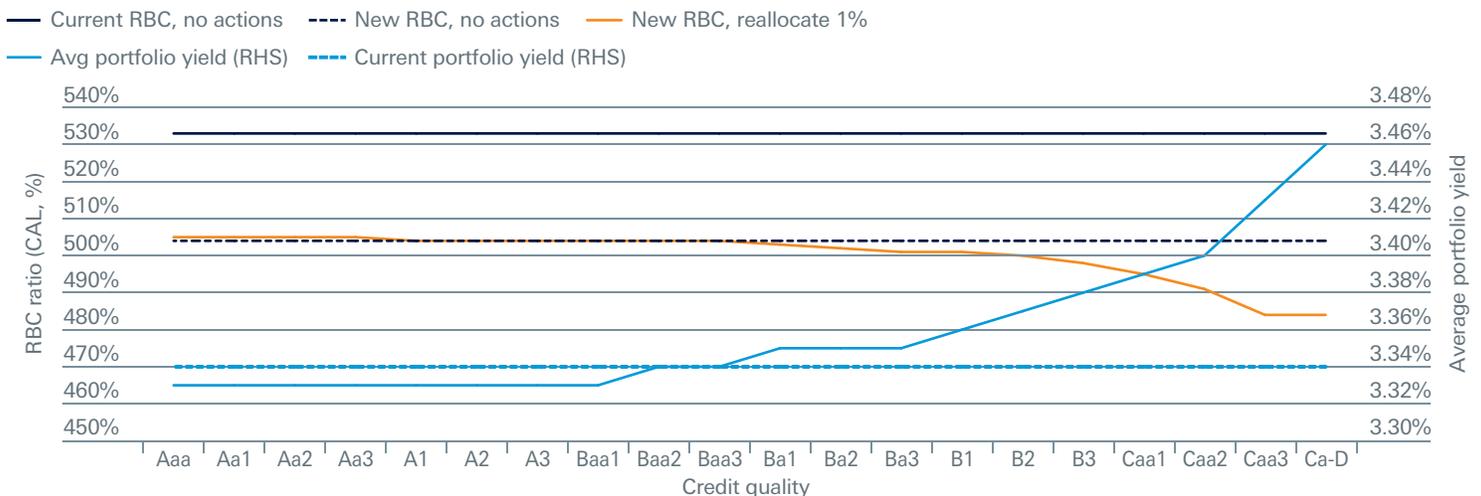
holdings to take advantage of the more favorable regulatory treatment. For those investors, here is what the tradeoff between RBC and incremental income might look like.

### A reallocation exercise

We have modeled a hypothetical reallocation of a pro-rata 1% slice of a typical life insurance corporate bond portfolio sequentially into bonds of each quality rating from Aaa to Ca. We then measured the effects of this exercise on the portfolio yield and RBC ratio using the proposed C-1 factors. **Illustration 3** depicts the results. Initially, as 1% of portfolio is reallocated into high investment grade bonds, the RBC ratio marginally improves by 1 point from 504% to 505% and the portfolio investment yield marginally declines by 1 bps from 3.34% to 3.33%. Beginning with Baa3 and below, the portfolio yield begins to improve faster and more meaningfully. Reallocating the same amount to B2 bonds, the portfolio yield would improve by 4 bps while the RBC would decline by 4 percentage points<sup>6</sup>.

Certainly, this reallocation exercise only takes into account the risk-based capital charges associated with bonds and ignores other factors such as price volatility, defaults, and illiquidity as well as any potential diversification benefits. Typically, as insurers invest in lower quality credit exposures, these additional considerations dominate the decision process. The holistic approach is especially prudent since the NAIC is re-evaluating the RBC factors for real estate and common stock as well, and this may have more significant implications, particularly for P&C insurers. For example, the current life proposal includes lower RBC

Illustration 3: The yield versus RBC trade-off—Changes in RBC ratio and portfolio yield from reallocating 1% of portfolio



Source: NAIC, SNL Financial, Barclays. Industry data as of 12/31/2015. Yields as of 12/31/2016. See **Appendix C** for description of methodology. There is no guarantee that the proposed changes to RBC charges will materialize.

factors for real estate, making the asset class as attractive from the capital efficiency perspective as some high-yield bonds. (For more details see [Appendix B.](#))

A more important question is whether portfolio reallocation into high yield makes sense even if the insurer is not willing to tolerate further RBC deterioration and would instead choose to maintain the RBC ratio by posting additional capital. We explore this option in more detail in the next section.

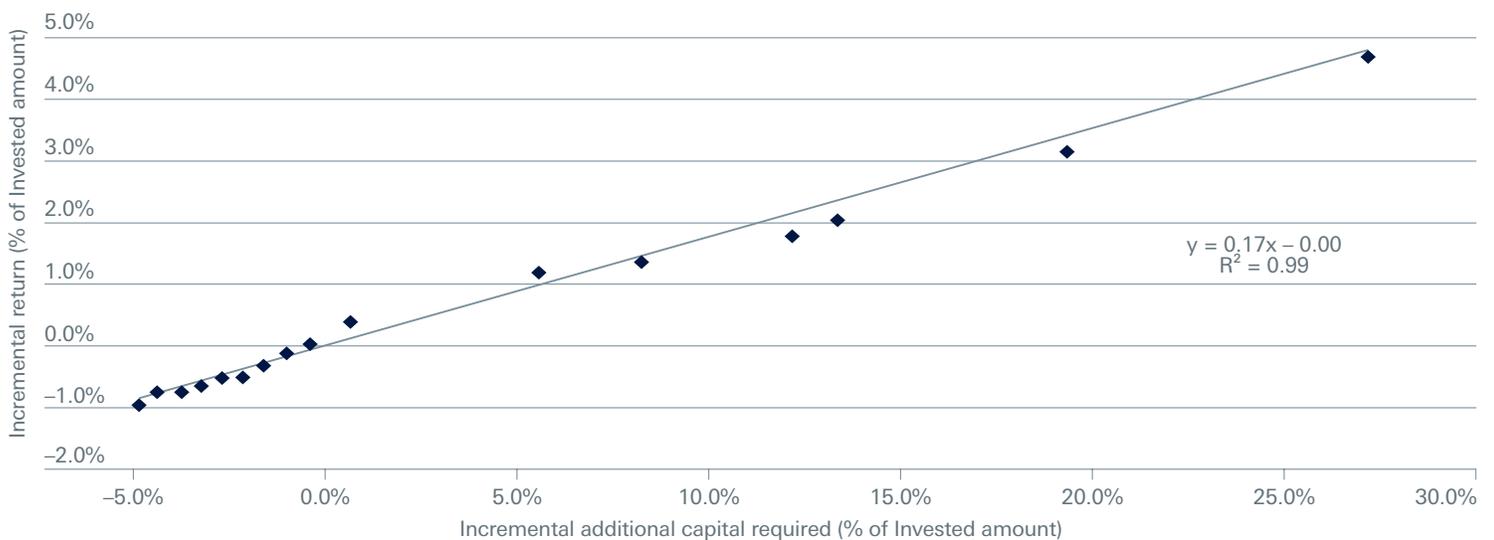
### Keeping the RBC ratio constant

If the company wants to shift to lower quality bonds but keep the same RBC ratio, it must keep larger amounts of capital/surplus to compensate for the higher RBC charge. We carried out the same exercise of reallocating a 1% slice

of a portfolio along the credit quality range using both the existing and proposed charges. Under the existing factors there is a nonlinear and clustered relationship between incremental investment income and the additional capital needed to maintain the same RBC ratio. This is expected, since current RBC factors are the same for all bonds within each NAIC category.

However, under the proposed factors we observe a steady, almost linear 1:5 relationship between incremental investment income and the additional capital needed to maintain the same RBC ratio. In other words, for every \$1 of incremental income achieved as a result of this re-allocation, an insurance company would have to post almost \$5 of additional capital. See [Illustration 4.](#)

Illustration 4: Incremental return on additional required capital (at constant RBC ratio, proposed factors)



Source: Deutsche Asset Management. There is no guarantee that the proposed changes to RBC charges will materialize.

The additional required capital has a cost (e.g. weighted average cost of capital, or WACC), which must be taken into consideration as an investment hurdle to overcome. In the current low-yield environment, with the existing RBC framework, risk charges for below investment grade bonds are too punitive to justify meaningful allocations for most insurance companies. However, we expect that the proposed factors will make some high yield bonds more capital efficient, so they will start to make economic sense for life insurers. We explain this further in the next section.

### Cost of capital as a “haircut” to market yields

One way to look at the bond RBC factor charges is to treat them as a “haircut” to nominal yields observed in the bond market. They should be viewed not as an immediate deduction of the factor charge from the coupon yield, but as a financing cost associated with the additional capital needed to maintain a constant RBC ratio.

To illustrate this concept, let's turn aside for a minute from our re-allocation example and consider an insurer that wants to invest an additional \$1,000,000 into a B1-rated corporate bond yielding 5%. The risk-based capital requirement of the company will increase by \$73,500 simply due to the current RBC factor of 7.35% for NAIC-4 bonds<sup>7</sup>. In addition, the company's RBC ratio will decline by approximately 35 bps as a result of this new investment due to the marginally lower average quality of the portfolio. If the company would rather avoid this incremental

decline and choose to maintain a constant RBC ratio, then the amount of the additional required capital would be \$326,193. This new capital would have an internal financing cost, such as the company's WACC.

In [Table 1](#) below, we illustrate how the net yield of a high yield bond investment is much lower than the market yield, due to financing cost of the additional required risk-based capital.

Table 1: Net yield after cost of additional capital (hypothetical example)

	Current RBC factors	Proposed RBC factors
Corporate B1-rated bond, Par Amount	\$1,000,000	\$1,000,000
Market Yield (YTW)	5.00%	5.00%
RBC factor, pre-tax	10.00%	5.99%
RBC factor, after-tax	7.35%	4.40%
Required capital before covariance	\$73,500	\$44,027
Required capital after covariance	\$61,189	\$37,774
Additional capital to maintain initial RBC*	\$326,193	\$190,663
WACC	10.00%	10.00%
Net Yield**	1.74%	3.09%

Source: Deutsche Asset Management.

\*Initial RBC Ratio of 533% under Current RBC factors and 505% under proposed factors.

\*\*Net Yield = Market Yield – (Additional Capital to maintain same RBC \* WACC) / (Par Amount). This example is shown for illustrative purposes and does not represent the actual return of any investment.

The above example indicates that the new RBC factors would mean smaller "haircuts" to market yields for some below investment grade rating categories, making them more capital efficient and increasing their net yields. However, this exercise only looks at the nominal market yields and does not account for potential defaults of the lower-grade bond issuers. In the high yield bond market, avoiding credit losses through active portfolio risk management is of paramount importance because of high cumulative probability of defaults over time. As illustrated in [Table 2](#) nearby, speculative issuers default at non-trivial rates, which is why it is important to adjust nominal market yields for expected credit losses. See [Appendix C](#) for an explanation of the methodology. This approach assumes a buy-and-hold investor.

In the following section we analyze the effect of considering default risk, as well as capital cost, for all rating categories.

## Expected defaults as another "haircut" to market yields

It is important to understand the true net benefits of reallocating into high yield bonds after adjusting for the additional capital costs and potential credit defaults. Which credit ratings represent the best opportunities and how would the new factors change the current investment picture? To find the answer, we again reallocated a 1% slice of the corporate bond portfolio across all quality ratings. However, this time we determine the net bond yields by incorporating the financing costs for the additional capital required to maintain same RBC (the first haircut) and by applying expected default-related capital losses (the second haircut). The results of our analysis are summarized in [Illustration 5](#)<sup>8</sup>.

Table 2: Market yields versus default-adjusted yields

Rating	YTW 5-Yr Bond	5-Yr Cumulative Default Rate	Recovery Rate	Default-Adjusted YTW 5-Yr Bond
Aaa	2.38%	0.07%	69.58%	2.37%
Aa1	2.59%	0.10%	43.18%	2.58%
Aa2	2.59%	0.36%	43.18%	2.55%
Aa3	2.68%	0.39%	43.18%	2.64%
A1	2.81%	0.89%	44.17%	2.71%
A2	2.83%	0.81%	44.17%	2.73%
A3	3.01%	0.92%	44.17%	2.91%
Baa1	3.21%	1.23%	44.41%	3.07%
Baa2	3.36%	1.62%	44.41%	3.17%
Baa3	3.73%	2.28%	44.41%	3.46%
Ba1	4.52%	5.51%	42.37%	3.83%
Ba2	4.70%	6.26%	42.37%	3.91%
Ba3	5.12%	13.69%	42.37%	3.33%
B1	5.38%	17.50%	37.93%	2.88%
B2	6.49%	21.79%	37.93%	3.23%
B3	8.03%	28.15%	37.93%	3.57%
Caa1	9.23%	27.93%	38.98%	4.79%
Caa2	10.00%	39.42%	38.98%	3.06%
Caa3	13.33%	51.22%	38.98%	2.62%
Ca-C	15.82%	50.84%	38.98%	4.16%

Sources: Barclays, Moody's, Deutsche Asset Management YTW as of 12/31/2016. Past performance is not indicative of future results.

The orange line representing default-adjusted yields in charts A and B is relatively flat fluctuating around the 3% ballpark after adjusting for expected defaults. Net yields, as depicted by the gray bars, are market-observed yields adjusted for both defaults and the cost of capital needed to maintain a constant RBC ratio. Interestingly, under the current capital charges the net yields turn negative starting with B1 and lower ratings (see Illustration 5-A). This may explain why life insurance companies historically focused on investing only the in highest tiers of the high yield universe. The current RBC factors are too punitive, making certain areas of the sub-investment grade universe un-economical.

The good news is that with the adoption of new RBC factors, net yields on most high yield bonds would increase, improving their capital efficiency and economic viability for life insurers.

#### Improved capital efficiency of high yield bonds

Current RBC factors are too punitive, making certain areas of high yield bonds un-economical for insurers. With adoption of the new RBC factors net yields on high yield bonds would increase, improving their capital efficiency and economic viability

Illustration 5-A: Net yield after defaults and capital costs, at current RBC factors

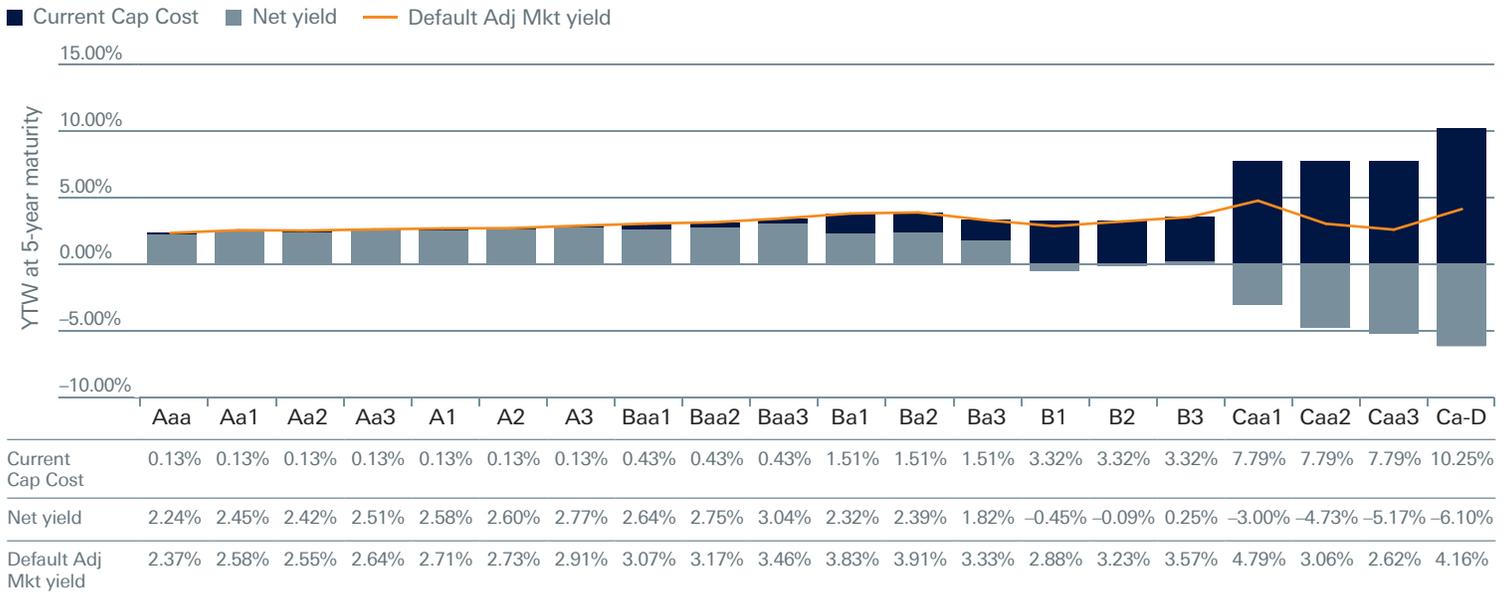


Illustration 5-B: Net yield after defaults and capital costs, at proposed RBC factors

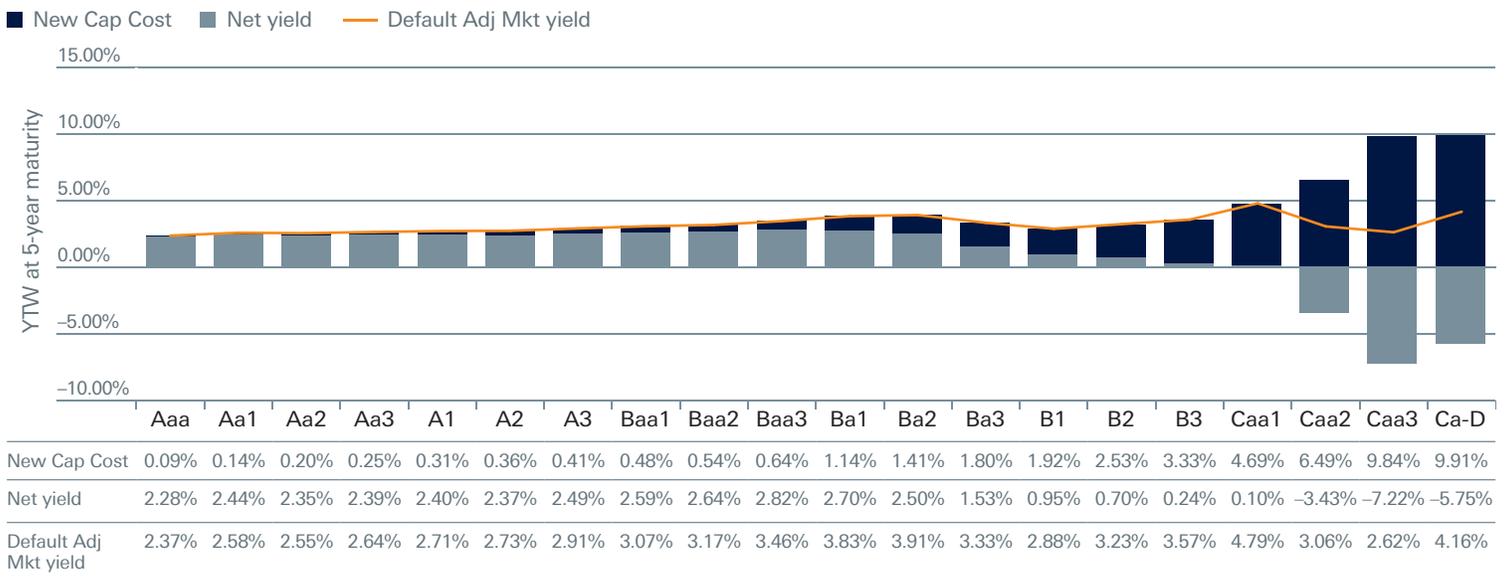
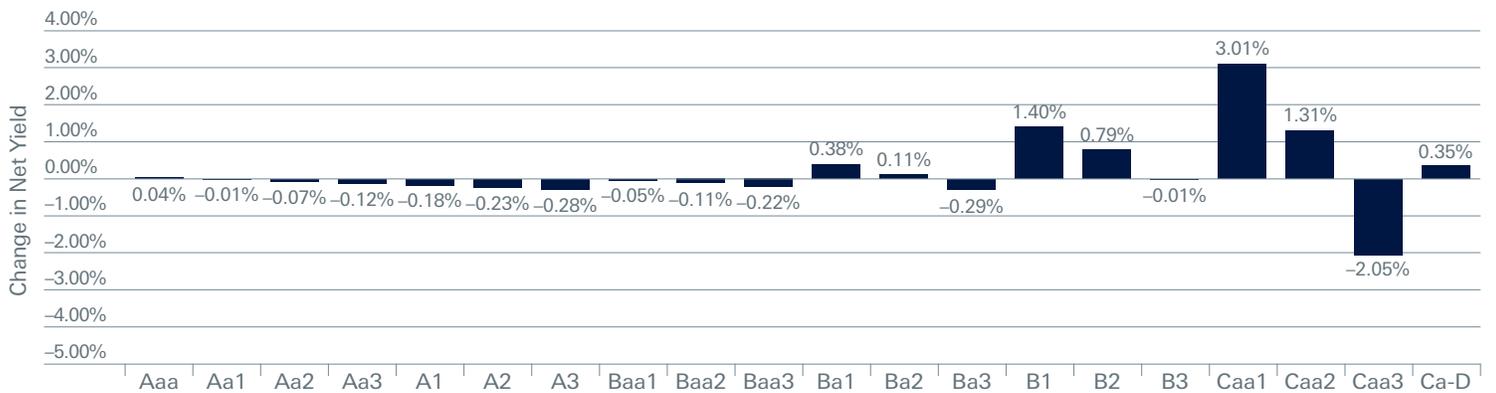


Illustration 5-C: Change in net yield due to new RBC factors



Source: Deutsche Asset Management. Yields as of 12/31/2016. There is no guarantee that the proposed changes to RBC charges will materialize.

## An improved opportunity in the high yield space

Table 3: Universe of U.S. corporate bond issuers

Rating Category	Number of Issuers
Aaa	80
Aa	482
A	2,256
Baa	3,101
<b>Total U.S. Corporate Investment Grade Index</b>	<b>5,919</b>
Ba	834
B	821
Caa	390
Ca	29
C	5
NR	7
<b>Total U.S. High Yield Index</b>	<b>2,086</b>

Source: Barclays Live, as of 12/31/2016.

As [Illustration 5-C](#) shows, net yields could increase by 38 bps for Ba1 rated bonds, 140 bps for B1 bonds and 79 bps for B2 bonds, bringing them from negative to positive territory. This should broaden the corporate bond investment universe beyond investment grade and improve the diversification of credit risks. The [Table 3](#) nearby displays the number of unique issuers in the Barclays U.S. Corporate Investment Grade Index and the Barclays U.S. High Yield Index, broken down by the rating categories. An insurance company could expand its investment universe among corporate bond issuer names by nearly 30% by including bonds from Ba and B rating categories<sup>9</sup>. An additional diversification benefit is possible because lower rated bonds have a higher correlation to equities than Treasuries, which improves overall multi-asset class portfolio efficiency.

We feel it is important to reiterate that while high yield bonds represent a good opportunity, they exist in a much riskier investment universe with a high probability of experiencing credit losses and relatively low trading liquidity. There are meaningful external considerations such as regulatory and ratings agency perception as well as overall downside risk and internal enterprise risk management impacts that need to factor into any such allocation decision.

## Summary

We have estimated the potential impact the proposed changes to the NAIC's RBC framework could have on the capitalization and investment portfolios of U.S. life insurers and agree that the proposed changes are positive. They would remove some of the adverse incentives that exist within the current six-tier NAIC framework and potentially better align asset capital charges on insurers' bond holdings with their underlying credit risk.

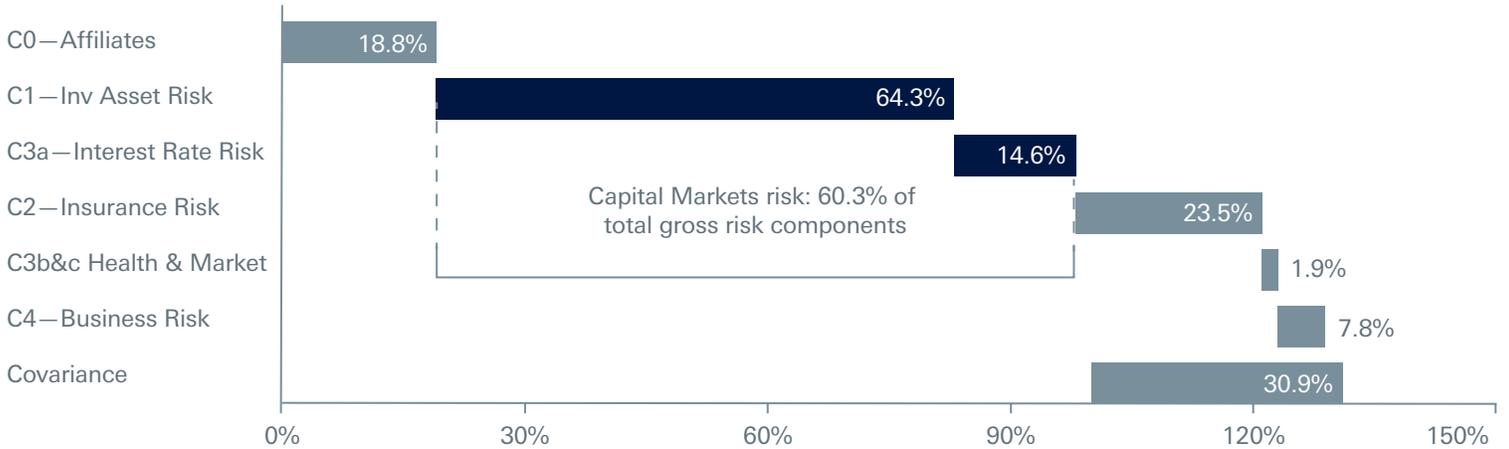
Additionally, based on our analysis of the capital efficiency of bond investments in all rating categories under the existing and proposed RBC factors, we found that the new factors would make upper tiers of high-yield bonds relatively more capital efficient.

We do not anticipate these changes will drive wholesale rebalancing of insurers' fixed-income portfolios. However, depending on each company's ability to tolerate moderate declines in its RBC ratio, the new factors represent a potential opportunity to enhance yield through incremental growth of its high yield allocation. Potential increase in demand for high yield bonds from the insurers may cause changes in valuations in that segment of the market, creating both an opportunity and a challenge.

## Appendix A

While RBC can be a critical measure for any insurer, on a percentage basis capital markets-related risks (asset charges and interest rate charges) are more pronounced for life companies relative to PC. For life companies, these charges make up 60.3% of total RBC charges on a percentage basis of gross charges (before covariance).

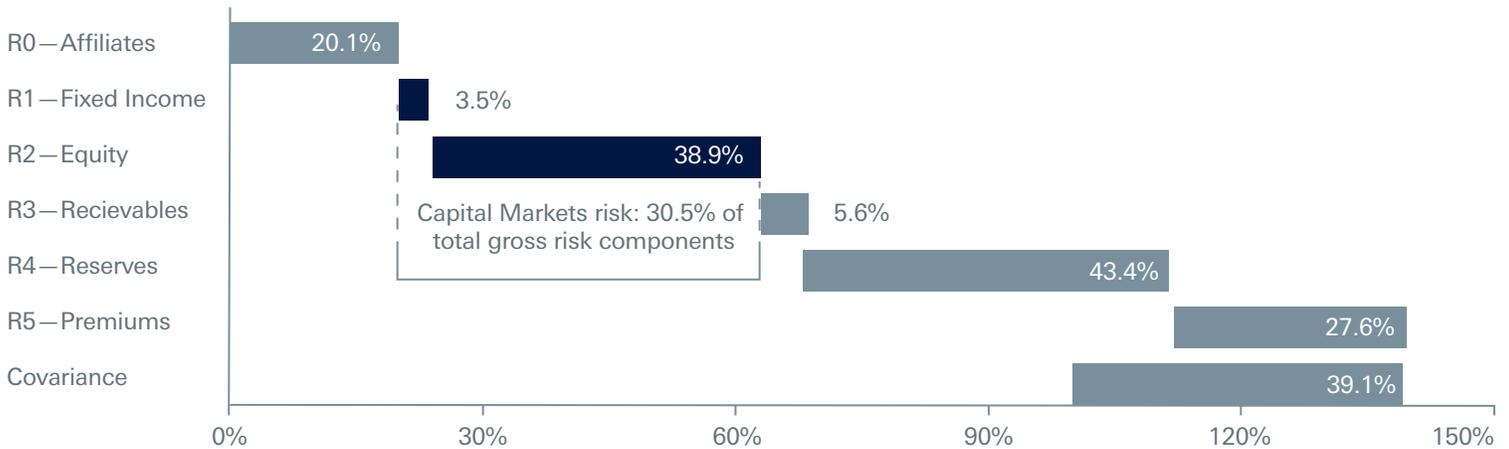
### Life



Source: Deutsche Asset Management.

In contrast, capital markets risk makes up only 30.5% of gross P&C charges. This in part affects asset strategies across insurer types, with PC companies having a substantially larger percentage allocation to equities.

### P&C



Source: Deutsche Asset Management.

We expect any changes to the equity charge will be significantly more meaningful to PC insurers compared to life insurers.

## Appendix B

Summary of potential RBC changes for real estate and common stocks.

In the guiding document “A Way Forward” as of March 18, 2016 the NAIC has outlined principles for updating RBC factors for real estate and common stocks, in addition to bonds.

### Real estate

- In August 2015, the American Council of Life Insurers (ACLI) proposed revisions to NAIC’s current methodology and risk charges for the real estate holdings of life insurers<sup>10</sup>. The proposed changes would apply only to the life insurance industry.
- To lower the base RBC factor applicable to **Schedule A** real estate from current **15% to 8.5%**.
- To lower the RBC factor for real estate held in joint ventures, LLC’s or similar structures recorded on **Schedule BA** from current **23% to 12.75%**. This is consistent with current practice of assigning a factor that is 50% higher than the Schedule A factor because of the additional risks inherent in owning real estate through a partnership.
- Change the RBC factor for real estate encumbrances from current **3% to 1.75%** so that it is consistent with the commercial mortgage RBC framework adopted in 2013.
- Implement an adjustment within RBC to account for the excess of market value over the statutory carrying value which is recorded at depreciated cost. Over time, the unrealized gain can become substantial and serve as a cushion against loss of statutory value. The base RBC factor would be reduced to partially adjust for this reduction in risk. The reduction would be two-thirds of the difference between market value and book value<sup>11</sup>.
- Industry groups such as American Academy of Actuaries, Mortgage Bankers Association as well as major life insurance companies have expressed support for the ACLI’s proposal on real estate RBC revisions.
- NAIC will continue to work on revising real estate RBC factors provided that the priority of efforts will be given to implementation of the changes for bonds and stocks.

### Common stocks

- The current factor for P&C and Health insurers is **15%**.
- The current tax-adjusted factor for life insurers is **19.5%**.
- The Working Group proposes to equalize the capital charges by keeping life factor unchanged, while increasing the P&C and health factors to **19.5%**.

We expect that proposed changes would make real estate investments more capital efficient and more attractive to life insurers. The new RBC factor for Schedule A real estate would be comparable to a single-B corporate bond, especially taking into account the market value adjustment component. At the same time, the proposed increase in common stock factors for P&C and health insurers would make equity and real estate investments carry essentially equal capital charges<sup>12</sup>. This would make real estate relatively more appealing and may attract insurers to reallocate a portion of their equity exposure to a more income-oriented, less volatile real estate asset class.

## Appendix C: Methodologies

### Estimating life industry RBC ratio

We used the following formula to calculate the Required Capital used in calculating the Company Action Level RBC ratio:

$$C0 + C4a + \text{Square Root} [(C1o + C3a)^2 + (C1cs + C3c)^2 + (C2)^2 + (C3b)^2 + (C4b)^2]$$

Source: American Academy of Actuaries

- C0 — Insurance affiliate investment and (non-derivative) off-balance sheet risk
- C1cs — Invested common stock asset risk
- C1o — Invested asset risk, plus reinsurance credit risk except for assets in C1cs
- C2 — Insurance risk
- C3a — Interest rate risk
- C3b — Health provider credit risk
- C3c — Market risk
- C4a — Business risk-guaranty fund assessment and separate account risks
- C4b — Business risk-health administrative expense risk

Values for all C-factors were obtained from the NAIC’s annual report on RBC factors for the Life industry for the year end 2015 which is most recently available data: [http://naic.org/documents/research\\_stats\\_rbc\\_results\\_life.pdf](http://naic.org/documents/research_stats_rbc_results_life.pdf)

Using the formula and the data above, we calculated Required Capital for the industry as \$92.9 billion relative to a total adjusted capital of \$495.4 billion for an RBC ratio of 533%. Note that the Required Capital disclosed by the NAIC in their report is \$102.6 billion, which corresponds to an RBC ratio of 483%. The difference in calculated and reported Required Capital reflects consolidation and other adjustments that were not disclosed. For the purposes of our analysis we used the calculated values of required capital and RBC ratio.

The key industry investment data from the NAIC's RBC report is total US Life industry invested assets of \$3.787 trillion at year end 2015.

### Estimating life industry average bond allocation by ratings

To estimate the life Industry allocation of bond portfolio by NRSRO credit quality ratings, we collected portfolio holdings from 2015YE annual statutory filings (Schedule D) from a diverse sample of 15 large life insurance companies with investment assets ranging from \$1 billion to \$100 billion. The alphanumeric quality ratings were obtained from fixed income analytic software BondEdge. We used the simple average of these sample portfolios as a proxy for the industry-wide allocation. See [Table 4](#) below.

Table 4: Estimated allocation of corporate bond portfolios by quality rating, as of 2015 year-end (%)

	American National	Allstate	Assurant	American Family	CNO	Genworth	Global Atlantic	Guardian	Lincoln Benefit	ManuLife	Nationwide	National Western	Voya	Western Southern	Zurich	Average
Aaa	0.0	1.8	0.7	0.9	0.0	2.2	0.7	1.0	1.6	6.5	0.8	0.4	1.4	1.0	2.6	1.4
Aa1	0.1	0.5	0.1	0.2	0.0	0.4	0.6	0.7	0.2	0.6	0.0	0.0	0.7	0.2	0.4	0.3
Aa2	1.6	1.9	1.7	1.7	0.7	2.8	1.1	2.8	0.7	7.1	2.7	2.7	3.0	2.6	4.3	2.5
Aa3	3.2	3.6	2.6	3.0	0.6	3.7	1.6	3.2	2.1	9.1	3.4	3.0	4.4	5.7	6.7	3.7
A1	7.9	8.8	5.6	8.1	3.1	9.2	6.8	8.5	6.4	13.7	9.8	6.4	10.7	9.7	15.0	8.6
A2	12.6	9.8	7.3	9.5	6.6	14.4	10.4	13.3	8.1	16.7	9.1	12.6	13.5	12.3	18.7	11.7
A3	15.4	12.1	9.1	15.9	15.3	15.0	17.3	22.1	16.4	11.8	16.4	17.8	15.5	15.4	19.1	15.6
Baa1	21.7	14.0	18.5	22.5	23.2	16.6	19.1	17.3	16.8	10.6	20.6	21.0	18.0	18.4	16.6	18.3
Baa2	22.9	16.4	23.2	17.0	27.8	15.6	21.3	16.2	21.1	8.9	16.9	23.1	15.4	12.8	9.8	17.9
Baa3	9.2	13.4	17.9	12.7	14.3	11.6	17.1	9.2	16.9	8.2	11.2	8.6	9.8	9.7	4.9	11.6
Ba1	1.6	3.9	2.1	2.4	2.4	3.5	1.6	2.2	3.5	2.5	2.9	2.1	2.8	3.3	1.0	2.5
Ba2	1.5	3.9	9.4	0.7	1.8	2.7	1.1	1.3	2.4	1.6	2.2	1.7	1.6	2.4	0.7	2.3
Ba3	0.6	4.2	0.6	1.8	1.2	1.0	0.1	0.6	1.6	1.1	0.7	0.3	1.3	1.6	0.0	1.1
B1	1.3	2.8	0.6	1.5	0.6	0.4	0.2	0.4	1.5	0.7	1.6	0.2	0.9	1.9	0.2	1.0
B2	0.2	1.0	0.5	0.7	0.5	0.2	0.2	0.3	0.0	0.2	1.0	0.2	0.5	0.8	0.1	0.4
B3	0.0	0.9	0.1	0.9	0.3	0.2	0.0	0.3	0.3	0.1	0.5	0.0	0.1	0.9	0.0	0.3
Caa1-D	0.4	0.7	0.1	0.5	0.4	0.2	0.1	0.3	0.5	0.1	0.2	0.1	0.3	1.4	0.0	0.4
N/A	0.0	0.4	0.1	0.0	1.4	0.3	0.7	0.2	0.1	0.5	0.0	0.0	0.2	0.1	0.0	0.3

Source: SNL Financial, BondEdge (as of 12/31/2015).

### Estimating decline in RBC ratio as a result of new RBC factors

The proposed RBC charges only affect the C1o factor in the Life RBC formula (Invested asset risk-other). We estimate the dollar value of investment assets to be impacted by new RBC factors as the bond portion of life industry's total invested assets except for cash, U.S. government securities and structured securities, which are not expected to be affected by the change. The total industry invested assets were \$3.787 trillion as of year-end 2015. Using industry data from the SNL Financial database we estimate that roughly 76% of the invested assets were bonds, of which about 77% would be impacted by the RBC factor revisions. This gives us an adjusted invested asset base of approximately \$2.220 trillion.

As a next step, we segment this asset pool according to the average industry bond allocation among alphanumeric quality ratings (see above) and apply the new after-tax RBC

factors to each segment. For example, the Baa1 segment is 18.3% of our adjusted asset base, or \$406.6 billion. Using the current after-tax RBC factor of 0.956% for NAIC-2 bonds, this segment is currently assessed an industry-wide risk capital charge of \$3.9 billion. Under the proposed RBC factor of 1.095% the corresponding amount would be \$4.5 billion.

Repeating these calculations for all quality segments, we estimate that aggregate amounts of risk capital charge would increase from \$22.9 billion to \$29.3 billion as a result of RBC factor changes. This corresponds to a 28% increase on a gross basis. However, the net impact on the industry risk based capital would be much smaller because of the covariance effect in the Life RBC formula. We add the increase in risk charge amount (approximately \$6.4 billion) to the C1o component and recalculate the RBC formula for the Life Industry. See details in the [Table 5](#) below.

Table 5: Comparison of year end 2015 and proposed RBC factors

Ci	Rick category	Existing RBC C1o factors	Proposed RBC C1o factors	Change
C0	Asset risk—affiliates	19,307,626	19,307,626	
C1cs	Asset risk—common stocks	25,801,854	25,801,854	
<b>C1o</b>	<b>Asset risk—other invested assets</b>	<b>40,179,612</b>	<b>46,561,621</b>	<b>6,382,009</b>
C1	Asset risk—total	65,981,466	72,363,475	
C2	Insurance risk	24,094,787	24,094,787	
C3a	Interest rate risk	14,970,305	14,970,305	
C3b	Health provider credit risk	2,309	2,309	
C3c	Market risk	1,906,067	1,906,067	
C4a	Business risk	7,357,040	7,357,040	
C4b	Business risk	677,624	677,624	
C4	Business risk—total	8,034,664	8,034,664	
Total RBC before covariance (sum of Ci's)		134,297,224	140,679,233	
Covariance effect		-41,373,520	-42,356,178	
Total RBC after covariance (formula*)		92,923,704	98,323,055	
Total adjusted capital		495,365,059	495,365,059	
<b>Total industry RBC ratio (calculated)</b>		<b>533%</b>	<b>504%</b>	<b>-29%</b>
*Life RBC formula: $C0 + C4a + \text{Sqrt}[(C1o + C3a)^2 + (C1cs + C3c)^2 + (C2)^2 + (C3b)^2 + (C4b)^2]$				

Source: NAIC, American Academy of Actuaries.

2015 year end industry risk charge amounts, as of 6/21/2016. Source: NAIC.

Proposed RBC factors as of 8/3/2015. Source: American Academy of Actuaries. There is no guarantee that the proposed changes to RBC charges will materialize.

### Trade-off between RBC ratio and portfolio yield: a reallocation exercise

As a proxy portfolio for this exercise, we used the industry's investment assets of \$2.2 trillion invested along our sample-average credit quality allocation (See [Table 4](#)). We then reallocated a pro-rata 1% slice of this portfolio (\$22 billion) sequentially to each alphanumeric rating category from Aaa to Ca, and re-calculated the net RBC ratio at each step. We used the existing assets in the portfolio as opposed to new cash contribution in order to measure effects of investment actions separately from any changes in portfolio size. This exercise was done using the 20 after-tax RBC C1o factors proposed by the Academy.

To calculate the portfolio yield we utilized the yield-to-worst information from Barclays Corporate Bond Indexes as of December 31, 2016. Using the index constituents' data we modeled yield curves for each alphanumeric rating category and selected yield values at a 5-year maturity point on each curve, as listed in the [Table 2](#) on page 7. The portfolio yield in the reallocation example was calculated as a weighted average yield using the varying credit quality allocation mix applicable at each reallocation step.

### Estimating default-adjusted yields

We adjusted the 5-year YTWs for potential issuer defaults by calculating an IRR of 5 years of cash flows. Each year's cash flow is adjusted for potential lost principal and income using annual realized 1983–2015 default and recovery rates from Moody's.<sup>13</sup> Comparison of market yields and calculated default-adjusted yields is displayed in [Table 2](#) on page 7 in the text.

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<sup>1</sup> In developing the new factors, the Academy relied on 1983-2012 historical default data for corporate bonds from the "Moody's 2012 Special Comment: Corporate Default and Recovery Rates, 1920-2012".

<sup>2</sup> Note that throughout the paper, where we refer to "RBC ratio", we use the industry convention of referring to the Company Action Level (CAL) RBC ratio, which is Total Capital divided by the 2x quantity of Required Capital.

<sup>3</sup> [http://naic.org/documents/research\\_stats\\_rbc\\_results\\_life.pdf](http://naic.org/documents/research_stats_rbc_results_life.pdf)

<sup>4</sup> See detailed explanation of this calculation in [Appendix C](#).

<sup>5</sup> Moody's Credit Outlook, September 15, 2016, "US Insurer Risk-Based Capital Asset Charges Are Credit Positive".

<sup>6</sup> To estimate the portfolio yield in this example, we applied the nominal YTW observed on five-year bonds in the Barclays Corporate Bond Indexes as of December 31, 2016. Later in the paper we analyze net yields after adjusting for the cost of capital and historical credit losses.

<sup>7</sup> After-tax, before covariance effect. Source: NAIC.

<sup>8</sup> See our methodology for determining default-adjusted yields in [Appendix C](#).

<sup>9</sup> Note that issuers may issue bonds in different rating categories depending on the issuing entity.

<sup>10</sup> NAIC Memorandum as of August 7, 2015 "Life Insurer C-1 Asset Risk-Based Capital Requirements—Real Estate".

<sup>11</sup> The specific formula including adjustment would be:  $RBC\% = \text{Max} [NAIC2\%, 8.5\% * (1 - 2/3 * (MV - BVg) / BVg)]$ .

<sup>12</sup> Current real estate RBC charge of 20% vs. proposed common stock charge of 19.5% .

<sup>13</sup> 2016-02-29 Moody's Annual Default Study.

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