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Brett Durbin
Western Washington University

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WASHINGTON UNIVERSITY

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Honors Program

Bellingham, Washington 98225-9089
(360)650-3034 Fax (360) 650-7305

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Risk-Based Capital (RBC)

Under the law, insurance companies are subject to capital requirements, which are enforced by the state insurance commissioner. The reason that insurance companies are subject to capital requirements is to ensure their solvency in the case of adverse financial conditions, such as an unexpected increase in liability payments or credit events in their investments that decrease their interest revenues.

In order to establish capital requirements, the National Association of Insurance Companies (NAIC) created the Risk-Based Capital model. This model accounts for four main risk factors that face insurance companies. They are listed as follows: C-1 Asset Risk, C-2 Insurance Risk, C-3 Interest Rate Risk, and C-4 Business Risk. These factors are used in an equation to determine the amount of capital that a company must have on hand to cover claims.

The C-1 Asset Factor measures the risk of a security defaulting on its payments or realizing a loss on the investment. This factor varies by asset category but ranges from 0.15% to 30%, which means that an insurance company that invests in an asset with a C-1 factor of 5% must keep an amount equal to 5% of the investment on hand in capital. The C-1 factor is also subject to a concentration factor where the exposure to a single entity is highest. The asset concentration factor is computed by doubling the C-1 factor for the ten largest assets up to the 30% maximum RBC requirement.

The C-2 factor assesses the insurance risk of claims being above expected levels. This factor is computed based on statistical information gathered on the type of insurance under consideration and the probability of fluctuations from the expected claims. The C-3 interest rate risk factor calculates the risk that policyholders of products such as annuities

or other interest rate sensitive policies will withdraw their money. This risk varies depending on the terms of the policy and fluctuations of interest rates. The C-4 business risk factor is a general factor that looks at the overall business risk that the company has regardless of the other factors. Examples include litigation, guaranteed payments, and other factors that have to do with the company but not its investment assets or liabilities.

To compute the risk-based capital required by each company, the C-1, C-2, and C-3 factors are corrected for covariance adjustment where the C-1, C-2 and C-3 factors are calculated as follows $[(C\text{-}1+C\text{-}3)^2+(C\text{-}2)^2)]^{(1/2)}$ and then the C-4 factor is added in and the entire formula is multiplied by 0.5. Therefore, the entire risk based capital for a company is equal to $\{[(C\text{-}1+C\text{-}3)^2+(C\text{-}2)^2)]^{(1/2)}+C\text{-}4\}*.5$. The risk-based capital formula determines the minimum capital that is needed to ensure solvency in the event of adverse financial conditions, and from this minimum different levels are determined, at which the insurance commissioner can take various types of actions to improve the companies financial position.

The following is from the NAIC web page regarding life insurance company RBC. It shows the different action levels based on the reported RBC for a life insurance company in their annual filing.

200% or more of minimum risk-based capital
"No Action" level company; nothing needs to be done by regulators (the majority of regulated insurers fall into this category).

200 to 250%
Triggers a trend test, the trend test calculates the greater of the decrease in the margin between the current year and prior year and the average of the past three years. The assumption is that the decrease could occur again in the coming year. Any company that trends below 1.9 times their Authorized Control Level Risk-Based Capital would trigger the company action level.

150% to 200%
Institutes a Company Action Level under which the insurer must prepare a report to the regulator outlining the corrective actions the company intends to take. At this level, an insurer must submit to the insurance

regulator, a comprehensive financial plan that identifies the conditions that contribute to the company's financial condition. This plan must contain proposals to correct the company's financial problems and provide projections of the company's financial condition, both with and without the proposed corrections. The plan also must list the key assumptions underlying the projections and identify the quality of, and the problems associated with, the insurer's business. If a company fails to file this comprehensive financial plan, this failure to respond triggers the next lower action level.

100 to 150%
Triggers a Regulatory Action Level initiative. At this level, an insurance company is also required to file an action plan, and the state insurance commissioner is required to perform any examinations or analyses to the insurer's business and operations that he or she deems necessary. The state insurance commissioner also issues appropriate corrective orders to address the company's financial problems.

70 to 100%
Triggers an Authorized Control Level. This is the first point that the law authorizes the regulator to take control of the insurer. This authorization is in addition to the remedies available at the higher action levels. It is important to note that the law grants the insurance commissioner this power automatically. This action level occurs at a point where the insurer may still be technically solvent according to traditional standards – that is, the company's assets may still be greater than it liabilities.

Less than 70%
Triggers a Mandatory Control Level that requires the regulator to take steps to place the insurer under control. This situation can occur while the insurer still has a positive level of capital and surplus, although a number of the companies that trigger this action level are technically insolvent (liabilities exceed assets).

Risk-based Capital Model

The RBC model I have developed does not calculate the C-2, C-3, or C4 factors. These factors are assumed to be provided by the company's financial statement. The main purpose of this model is to maximize the return on equity of the portfolio by optimizing the asset allocation of the portfolio based on the different classes of investments yields and C-1 requirements within the model constraints.

The Asset Analysis sheet is where most of the computations occur. On this sheet, the asset classes that insurance companies can invest in are listed along with their C-1 factors and yields. The C-1 factor is based on the C-1 factors calculated by the NAIC, Moody's, S&P, and Wiess. I have used the most conservative estimates of the C-1 factors from each of the asset classes supplied by the different agencies. The average yield is listed for each class of investment, and then the adjusted C-1 factor is listed to adjust the

C-1 for a concentration factor based on the percentage of the portfolio that is invested in that particular asset class. Next to the yield are the model investment limits. These are the statutory limits set forth by the state, or the NAIC, for different types of investments. For this model, the Washington Revised Code was used to set the investment limits with assumptions being made for the foreign securities based on the Canadian security limitations.

The next column deals with the option-adjusted spread (OAS). This accounts for the option value of certain types of investments such as mortgages or callable bonds. The OAS column is subtracted from the Yield column to produce the Expected Yield. The next column contains the liability information. This is fed from the Company Input sheet, where the companies, crediting rate, the weighted average rate of their liabilities, is entered along with their C-2 Insurance factors, C-3 Interest Rate factors, and C-4 Business factors. The Total RBC column is where the RBC for the company is calculated for that asset class. Then the spread between the expected yield and the liabilities is calculated and from these two columns the return on risk-based capital is calculated.

For this model the total RBC was modified. The minimum RBC was multiplied by 250% to place the company at the point where regulators would initiate no contact at all, due to the undesirable nature of interventions on the part of the regulators. The level of RBC required by the manager might be varied to ensure a greater or lesser cushion above the statutory minimum RBC based on the manager's preference. The spread of risk factors is also factored into the Total RBC equation as an adjuster to the C-1 factor.

This adjustment occurs based on size and diversification of the portfolio among the different asset classes.

From the different asset classes, information on their yield and RBC requirements is linked in to the table that calculated the weighted average RBC for the portfolio along with Return on RBC and the Portfolio yield. The Asset Allocations are defined as decision variables for the Crystal Ball OptQuest optimization program. These are the variables Crystal Ball OptQuest alters to determine the optimum yield to maximize the Return on RBC calculated on the Output worksheet. Return on RBC is the net spread of the portfolio (Portfolio Yield – Liability rate) divided by the required RBC. The heart of the model is the Crystal Ball OptQuest program, which runs random numbers through the decision variables based on the constraints established in the model to determine the asset allocations that will optimized Return on RBC. For the optimization, 2,500 trails were run to determine what the optimum mix should be.

Limitations & Improvements

This model that has been constructed is a very useful tool in finding the areas that offer high returns on risk based capital and allocating investments to take advantage of them. However, this model leaves out many crucial considerations in the truly optimum allocation of the portfolio, among these are the duration and shifts in yields as interest rates change and the how various investments react to it and other market forces. Another current limitation is that currently the model does not account for the asset concentration factor in the C-1 RBC requirement. This is because the top ten holdings and the number of bonds held are not known, and therefore the asset concentration factor cannot be computed. I have found that the best way to account for this adjustment, is to

allocate the adjustment proportionally to the different asset classes based on the percent of the portfolio allocated to the different asset classes and the percent of the portfolio that ten of the largest bonds in the portfolio will account for.

Improvements to this model would include a method for estimating changes in yield for the different types of investments for a specific time horizon, and an adjustment to the C-1 Asset Factor to account for the asset concentration adjustments that are required of the ten largest assets.

Conclusion

The return on RBC model could prove to be a very useful tool in illustrating areas that have better overall returns for a specific insurance company, thus allowing an insurance company to maximize its revenues. While the model is useful, it should only be viewed as a tool to point out these areas and not taken as revealing the best allocation of monies for the company because it does have a very limited set of inputs about the company, and the asset categories are large and ambiguous. Thus, considerable variation can occur between the model's yields and its measures of risk, and the actual yields and risks of investing in specific securities within the category. Keeping these items in mind along with the incorporation of the improvements mentioned, the Return on RBC model is a viable and useful tool in the management of investments for insurance companies.

Sources of Information

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