

Luvalle Life

Executive Summary

Team 18

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In order to more adequately monitor Luvalle's risk profile, we identified general risks for the four main products, and then conducted sensitivity analysis targeted toward determining specific risks for our SPIA product. Since we are in a low interest rate environment, we also evaluated the sensitivities of our investment portfolios. We ultimately recommend an alternate portfolio to back our SPIA liability and encourage Luvalle to push towards selling more investment-based products.

General Product Risks

Understanding product risks gives Luvalle the ability to adjust to the current low interest rate environment and confidently prepare for the future. All of Luvalle's products are subject to general risks such as high base mortality, unpredictable future events, and mass cancellations/surrenders. In particular, our Indexed Universal Life Insurance and Variable Annuity products are indirectly and directly tied to stock market performance; thus there comes a level of uncertainty that Luvalle must be prepared to take on, especially if we want to fulfill our Guaranteed Minimum Withdrawal policy. While the Term Life Insurance and SPIA products provide a less risky and more reliable stream of income, there is not as much room for growth.

Assumptions

While conducting SPIA testing, we assumed the expected best estimate given in the case was accurate and used this value as a guide to determine final data quality. We also assumed both alternate portfolios all have the same monetary value as the current portfolio, \$342.7 million. These assumptions may affect the accuracy of our numbers, but we expect our overall trends and sensitivity rankings to be unaffected if these assumptions do not hold.

SPIA Liability Sensitivities

To continue on our analysis of Luvalle's risk profile, we further analyzed how different sensitivities would impact liabilities from our SPIA block, and in turn determined prominent risks for this product.

To improve data quality, our most notable change was altering policies with a mode of 2, which the model revealed stood for bi-annual payments, to reflect annual payments to match our data dictionary. This change does not account for increasing mortality rates or the time value of money, but we assumed this would not have a significant impact on our final projections. We also deleted 15 policies with minor inconsistencies to reduce input uncertainty. To validate model output, we set predictions for how each sensitivity result would compare to the best estimate. Our model output accurately matches our predictions, which hints that the model is valid and our data quality is high (Figure 1).

As present value represents the amount of money Luvallé would need presently to pay off all SPIA policyholder benefits, the higher the PV benefit, the greater the liability. Benefits under each sensitivity decrease at a similar rate during the first decade, so present value at 2020 year's end alone is a good predictor of which sensitivity results in the greatest overall liability (Figure 2). Because benefits increase the most when interest rates drop, decreasing interest rates present the biggest liability. Also, 1% changes in interest rates cause more fluctuations in present value than 10% changes in mortality rates, so SPIA liability is ultimately more sensitive to interest rates than mortality rates, which supports our conclusion that decreasing interest rates are the biggest risk to Luvallé (Figure 3).

To further check the validity of our model, we compare our projection to already known trends in previous data, and use any differences in trends to pinpoint areas of improvement for our model.

0% Rate Shock for Asset Portfolios

We used the given 1% rate shock table to graph the relationship between bond prices and interest rates and conclude that bond prices are inversely related to interest rates (Figure 4). Therefore, a 0% interest rate shock leads to a much higher bond price of around \$400 million for each portfolio (Figure 5). However, there are possible inaccuracies in our calculations. First, 0% interest rates may not mean that the interest rate is exactly 0%. For example, the minimum benchmark interest rate was 0.5% in the projection model. Also, the change in bond prices given 1% change in interest rates does not match the duration, so the formula containing duration may not be entirely accurate.

Recommendations & Solutions

We analyzed the characteristics of 3 portfolios based on their sensitivities, yields, credit quality, term to maturity, and expectations for the future. We recommend using Alternate 1 for backing SPIA liabilities because it has the highest yields and is of medium sensitivity. Although its credit quality is lower, the default rate is still less than 5%, which is negligible. In comparison, Alternate 2 gives less yields, and the majority of this portfolio is 5-year bonds, which will result in a large opportunity cost if interest rates increase in the future. Similarly, the majority of the current portfolio is 20-year bonds, and we will experience a large amount of loss if the interest rates decrease in the future. We do not suggest taking these risks because interest rates fluctuate constantly.

While this project focused on Luvallé's SPIA product¹, our team also recommends performing sensitivity testing on our more volatile products as well, namely our IUL and VA packages, which come with an investment component. Although stock market fluctuations do introduce a degree of risk and uncertainty, the stock market tends to trend upward in the long run, meaning that our investment-based packages will likely see more growth and thus benefit Luvallé in the future.

¹ Note of caution for SPIA sensitivity testing: we only changed one variable at a time, which is not reflective of the real world. Secondly, the data and model should constantly be updated throughout the years to ensure accuracy.

Figures

Sensitivity Expectations vs Results (Trends in Comparison to Best Estimate)						
	Best Estimate	Base Mortality Shock	MI Shock	Rates Up	Rates Down	Rates 0%
Expectations (millions)	\$333	↑	↑	↓	↑	↑
Results (millions)	\$333	\$344	\$335	\$300	\$373	\$400

Figure 1. Sensitivity Expectations and Results

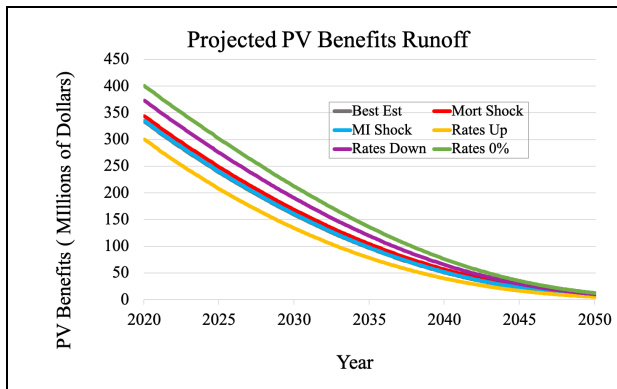


Figure 2. Projected Present Value Benefits Runoff

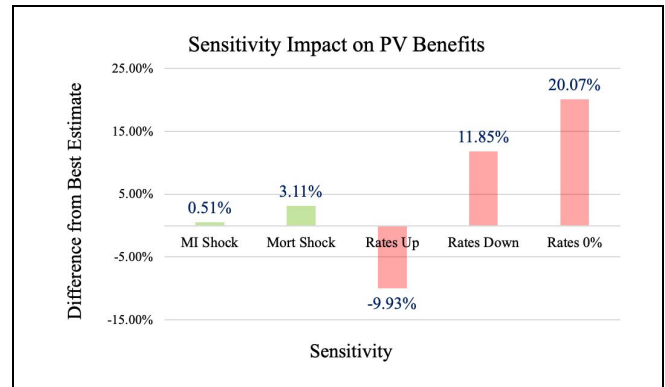


Figure 3. Sensitivity Impact on Present Value Benefits

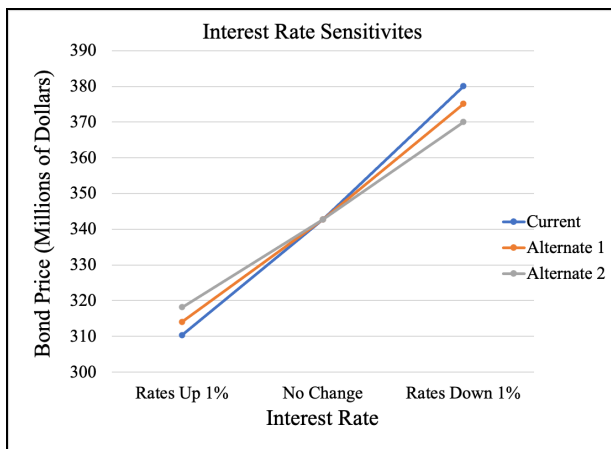


Figure 4: 1% Interest Rate Sensitivities

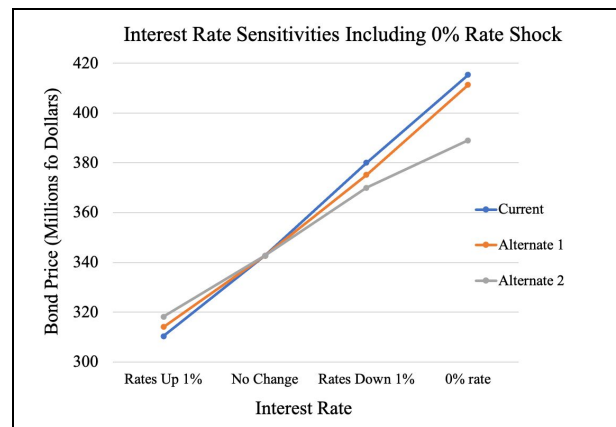


Figure 5: Interest Rate Sensitivities Including 0% Rate Shock