Corebridge Financial Executive Summary

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Background/Purpose

As a team of pricing actuaries part of the Sgt. Pepper Financial Group, we were tasked with creating a lapse rate formula in order to help price a new Fixed Annuity Product. Our process involved four parts, outlined below: identifying four factors that contributed to the lapse rate, creating a lapse rate formula based on those factors, predicting the lapse rate throughout the duration of the FA product, and identifying potential other factors that could contribute to the lapse rate.

Data Analysis

In order to propose the four factors that impact the lapse rate, we analyzed the correlation each factor had in determining the past lapse rate data. Before we even analyzed the data, we removed year 9 from our data set, as it was clearly an outlier, having lapse rates above 30% while every other year hovered around 15%. Using the scatter plot and linear regression features of Excel, we visualized the correlation of each factor with a graph and calculated the correlation coefficient (See Table I). This allowed us to separate the factors into three broad groups: factors that had a clear correlation with the lapse rate (MVA, Surrender Charge, Crediting Rate), factors that had some correlation with the lapse rate (Policy Year, Mortality Rate, General Account Yield, Statutory Reserves), and factors that had almost no correlation (5y and 10y Treasury Rates). From this, we were able to choose the top 3 factors for the lapse rate formula: MVA, Surrender Charge, and Crediting Rate, which all had clear negative correlations with the lapse rate. We also cross checked to ensure that these factors would all be information customers would have access to when making a decision on whether or not to lapse in order to prevent any potential for confounding variables.

In order to choose the fourth factor, we went back to the fact that we deleted the 9th year data in order to calculate the correlation. We noticed that the 9th year was the first year that the surrender charge was 0%, leading to many people choosing to lapse. Although the lapse rate only had a slight positive correlation with the policy year, we wanted some way to capture this “ninth year effect”, so we still chose it as our fourth factor.

Lapse Formula Construction

As a linear model, our lapse rate formula considers the four specified factors as variables which contribute additively and proportionately to the lapse rate. Each coefficient thus represents the change in lapse rate expected from a one-percent change in each factor, expressed as a percentage. The policy year coefficient is an exception, representing the change in lapse rate associated with the passage of one year’s time. The fifth predictor is derived from the Policy Year variable. It equals 1 during the policy’s 9th year and approximately 0 otherwise. A Gaussian function was used to create this predictor to avoid using piecewise functions. There is also an intercept at 19.23%, which represents the hypothetical lapse rate when every variable is zero. In reality, this condition never occurs because the crediting rate must not fall below the guaranteed minimum.

After choosing all the variables, we input them into Excel’s LINEST() function, which creates a multiple regression model based on a vector of input variables. Our formula is thus the linear function that best fits the 90 provided data points. Regression results also provide the standard error of each predictor; we use these to calculate the *t*-statistics of each variable to evaluate their statistical significance. P-values

are included for comparison. At a 1% significance level, all variables are significant in predicting lapse, with the highest p-value being about 0.2%. Our formula can explain about 80.2% of the variation within the data, outperforming all 125 other 4-variable linear models after adjusting for the ninth year effect.

Future Projection

In applying the lapse rate formula derived from a previously launched product, we map our projected rate of the new product onto the historical data of the previously launched product. The focus on historical data from policies issued in 1993 serves two key purposes. First, it provides insights into the lapsation rate during the initial three policy years, which is particularly relevant due to differing surrender charges for the two products during those years. Second, narrowing the comparison to 1993 helps maintain clarity by avoiding an overwhelming number of factors. An inference we make is that the two graphs follow similar trends; however, the lapsation rate is generally higher for the new product, with the exception of the first three years.

A lower free withdrawal rate discourages lapsation, and the higher surrender charges in the new product during the initial years act as a disincentive for policyholders to withdraw or lapse early on. Additionally, although there is a higher guaranteed minimum crediting rate, the potential benefits may be compromised by a negative market value adjustment (MVA), which could be interpreted as indicating a high interest rate. This high interest rate scenario results in a loss for insurance firms relying on bond sales for financing annuity payouts. The incurred loss is then passed on to policyholders through a negative MVA, leading to a reduction in the total withdrawal value. Moreover, a high interest rate may encourage policyholders to consider other financial instruments with higher yields, potentially contributing to a higher lapsation rate.

Potential Considerations

When considering the inclusion of a guaranteed living benefit in the policy, it is crucial to examine additional factors that could influence lapsation, including economic conditions and personal factors.

In the context of an economic downturn characterized by heightened financial instability and uncertainty, factors such as higher unemployment rates may favor the holding of more liquid assets, potentially leading to increased lapsation. Conversely, in instances of elevated inflation, the decline in the purchasing power of money, coupled with the depreciation of the annuity's value, could contribute to an increase in lapsation. Other factors influencing lapsation may be personalized and tied to the individual policyholder. These factors include the policyholder's health, satisfaction with the insurance product or company, and their unique financial circumstances.

Appendix

Table I: Correlation Coefficient between Factors and Lapse Rate

Factor	r value
Policy Year	0.15899181
MVA	0.37952267
Mortality	0.15451973
Crediting Rate	0.44641988
5y Treasury	0.01646818
General Account Yield	0.09180008
Statutory Reserves	0.12290059
10y Treasury	0.00153985
Surrender Charge	0.56699056