

Milliman VALUES

2016 GLWB Utilization study

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In 2014, Milliman kicked off a series of policyholder behavior experience studies on variable annuities using predictive analytics, starting with an industry lapse study. The goal of our Milliman VALUES™ series is to evaluate and improve common assumptions using advanced analytics, and to provide implementable suggestions. The 2014 Milliman VALUES Lapse study assessed the drivers of lapse behavior, using 117 million observations from 12 distinct companies with exposure between 2007 and 2013. Total assets under management in the dataset at the end of 2012 was roughly \$500 billion. The report detailed many complex relationships between policyholder characteristics and lapse behavior for variable annuities with GMAB, GLWB, GMWB, and GMIB riders as well as those with no living benefit riders.

We recently completed a second study, looking at GLWB utilization. Our 2016 Milliman VALUES GLWB Utilization study included two million policyholders from seven large VA writers, representing roughly \$220 billion of account value (based on initial purchase amounts) and covering a range of GLWB product designs and demographic attributes. Our experience spanned from 2007 through 2015. Along with lapse, a company's utilization assumption is a key driver of VA business value, so this study represents a logical next step in understanding policyholder behavior. We studied both when the policyholders chose to begin taking lifetime withdrawals, as well as how efficiently they continued to take them thereafter. In the process, we were able to confirm and, more importantly, quantify many intuitive assumptions about these behaviors and what drives them, and discovered new insights as well.

Predictive modeling as a tool for understanding policyholder behavior

The value of a predictive model stems from its capability to provide a framework for statistically quantifying the effect, or signal, of each driver while all others are held constant. As a result, actuaries can use predictive modeling as a tool for isolating real effects and identifying meaningful drivers.

A predictive model can be constructed with common variables such as age, tax-qualified status, and single/joint status to allow easy implementation. The models constructed for our study use drivers that are readily available in a typical in-force data file, making them suitable for implementation in

existing actuarial projection platforms. Including additional explanatory variables or interactions to the assumption formula is a natural step of predictive modeling because many variables can be captured in a single model without double-counting the individual variables' effects. This framework allows iterative improvements to predictions and better differentiation of policyholder behavior at a seriatim level.

Predictive modeling of policyholder behavior offers a statistically defensible framework for demonstrating assumption effectiveness to internal and external stakeholders. Rating agencies and regulators are placing higher scrutiny on how companies set assumptions around policyholder behavior. A predictive model built on statistical principles provides sound validation metrics for measuring the effects of explanatory variables and the accuracy of the predictions. In our report we demonstrate these aspects of predictive modeling by quantifying relative variable importance and presenting metrics for model validation. A broader application of predictive modeling is predicting variations in behavior within a block of business under a range of stochastic scenarios to generate a distribution of behavior outcomes. These types of analyses can be useful for demonstrating capital adequacy and strategic capital allocation.

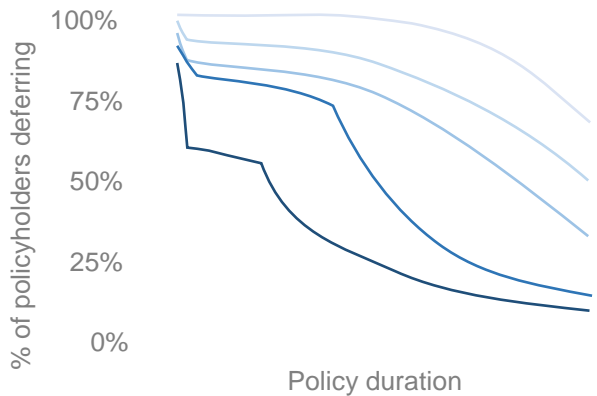
We include below some of the findings from our report. The report contains a comprehensive analysis of all the drivers we studied related to GLWB utilization, and for each driver the report provides more details, including charts, tables, etc. It also provides the final models for both timing of first GLWB utilization and efficiency of utilization, which are each easy to implement in an actuarial projection. For more information on purchasing the full report, please refer to the end of the article.

Timing of first lifetime withdrawal

Of the policyholders we studied, nearly 70% have not yet utilized their GLWB rider. However, with the size of the data we obtained, we still had more than 500,000 policies that utilized their GLWB rider. Of those we observed utilizing their GLWBs, approximately one in four began immediately after issue.

Policyholders who are older at issue tend to utilize their policies sooner. Issue age is commonly used in a typical GLWB utilization assumption, but there is often guesswork in how exactly issue age affects utilization. In our work, we see that the magnitude of this issue age effect is the largest of any single driver in the model. Policyholders in our oldest issue

age buckets are nearly six times as likely as younger policyholders to begin utilization in any given quarter, holding all other model variables constant. And these older policyholders are nearly thirty times as likely as their younger counterparts to begin utilization in the first rider quarter. The report provides details about how GLWB utilization varies in the different issue age groups. The chart below is a stylized example that illustrates the utilization deferral probability by duration, segmented over the issue age groups.



Previous withdrawal behavior is a strong leading indicator of earlier GLWB utilization. Withdrawal behavior that occurs before GLWB utilization begins (referred to as “non-lifetime withdrawals”) was the second-most influential variable behind issue age. Previous withdrawal is not typically seen in a GLWB utilization assumption today, but our findings reveal that policyholders that have taken such non-lifetime withdrawals are, depending on the amount taken, between two and five times as likely to begin utilizing the benefit as a policyholder who has never made any such withdrawal to date.

Policyholders with a rollup feature wait longer to utilize the GLWB. Our work shows that the existence of a rollup feature is influential. Regardless of the length of the rollup period, by simply having a rollup feature, a policyholder is about half as likely to commence GLWB utilization as someone without such a feature.

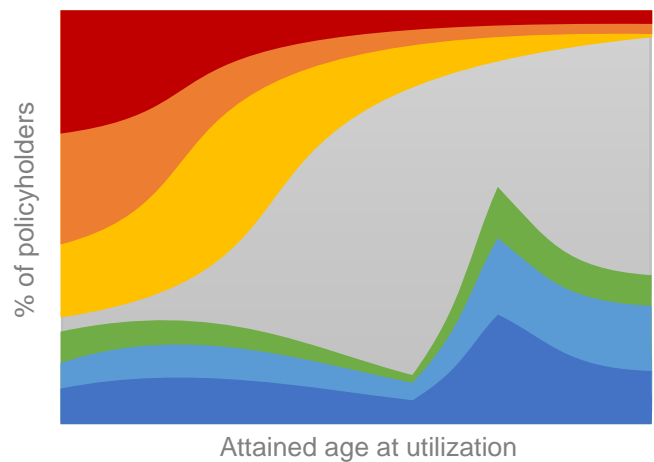
The implication of people behaving differently with and without a rollup is tremendously important. As large cohorts of policies exit their rollup period, the industry as a whole may see a larger percent of policyholders beginning utilization each year starting in 2016–2017. For 50,000 policies in a single calendar year—at an average size of \$100,000 and with a ten-year, 5% rollup (assuming all defer withdrawals and none lapse)—the benefit base will grow to roughly \$8.1B at the end of year ten. If these policyholders then begin to utilize at twice an assumed baseline

rate of 5% per year as they pass their rollup, this will result in new annual payout amounts of \$40M rather than \$20M, assuming an average payout rate of 5%. Each year an additional cohort hitting the end of the rollup period will result in another group commencing utilization at higher rates. Based on inforce data as of 12/31/2013, the seven participating companies could see a total of 50,000 to 100,000 policies, (\$6B to \$16B in benefit base) hitting the end of their rollup each year between 2017 and 2023. It is therefore important that the industry monitor emerging experience closely over the next 12 months to stay on top of how this critical element affects GLWB policyholder behavior.

Some other drivers we studied that are important in predicting commencement of GLWB utilization include tax status, joint life status, first rider quarter effect, and anniversary quarter effect, etc.

Efficiency of utilization

Empirically, companies know that not everyone takes precisely the Maximum Allowed Withdrawal Amount (MAWA). But in the absence of evidence regarding how policyholders actually utilize the amount, and to be conservative, many companies assume people always take their MAWA after they elect the GLWB. A policyholder who takes less than their MAWA is essentially leaving money on the table, whereas one who takes more will begin to deplete their benefit base. We performed a rigorous study on how policyholders have utilized their MAWA in our data, and we designed a model in which people are classified into different buckets depending on their efficiency of utilization. The chart below depicts a stylized example of the distribution of these utilization buckets across different ages.



We generated some valuable insights into the efficiency behavior, and we provide below a highlight from two of them.

Less than half of all policyholders currently taking GLWB withdrawals utilize their GLWB benefit with 100% efficiency.

A majority of policyholders either take excess withdrawals that reduce future MAWA or take less than the MAWA, thus not fully using the benefit. Slightly more policyholders underutilize than overutilize their benefit. This observation is made across the entire dataset, and we note that it varies from company to company. Therefore, companies will want to monitor emerging experience closely to determine to what extent this inefficiency may mitigate the increasing payout amounts expected in the coming years.

Utilization inefficiency is a driver of lapse. We found that policyholders who took the largest and smallest withdrawals relative to their MAWA were more likely to lapse in the following year. This effect was especially pronounced for those who took the largest excess withdrawals.

Our goal

This study, together with the industry lapse study in 2014, starts a new era in the industry experience analysis. Predictive modeling enables us to sort through the complicated effects and interactions among various behavioral drivers and determine the best assumption in a rigorous mathematical framework. Our goal is to continue to adopt predictive modeling in our ongoing industry study to help our clients with the following:

- To closely monitor the emerging industry experience as well as the change in the industry experience pattern
- To use industry data to supplement assumption setting, particularly where a company's own experience is scarce
- To benchmark company experience against the industry
- To allow companies with no GLWB products to get a view on behavior as they contemplate market entry
- To develop insights on customer behavior to support inforce management and product development strategies

To achieve this goal, we promise our clients that we will conduct our study with the highest standards and provide our results in an intuitive and user-friendly manner. In addition to the report, our clients will gain access to an interactive, web-based platform that allows them to visualize both the data and the modeling results in an effective way.



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For more information on the purchase of the full 2016 GLWB utilization report, and to participate in our future industry experience studies, please contact:

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