

# Milliman FRM Insight

**ACTIONABLE PERSPECTIVES ON TOPICS THAT IMPACT WEALTH**

## Variable Annuity Guarantee Hedging maintains its effectiveness during COVID-19 market turmoil

### EXECUTIVE SUMMARY

The first half of 2020 saw an unprecedented level of market turmoil as the world began to deal with the far-reaching implications of the coronavirus pandemic. Such extended periods of elevated market volatility put a spotlight on insurers' ability to remain solvent and profitable. Hedging the guarantees embedded in variable annuities has become a core competency for VA carriers for whom an effective hedging program is critical from a standpoint of both solvency and earnings stability. The effectiveness of hedging programs is a closely watched metric for most VA carriers; this paper examines the hedge effectiveness of a wide range of VA carriers.

For this paper, we examined a group of VA carriers during the first six months of 2020, and we calculated that hedging programs were 97.5% effective in reducing earnings volatility during this period<sup>1</sup>. This period also saw unprecedented market movements, particularly during the two week period between Monday, March 9, 2020 and Friday, March 20, 2020, when four stock exchange circuit breaker events happened. We also observed that the hedging programs were 96.5% effective in recovering losses during this two-week period of significant market drawdowns<sup>2</sup>. Overall, our findings from this period are consistent with our previous research and indicate that well designed and prudently managed hedging programs continue to achieve a high level of hedging effectiveness. The following table summarizes our findings. The total figures are not within the range of the components because there is offsetting among the components.

#### HEDGE EFFECTIVENESS SUMMARY (12/31/2019 - 6/30/2020)

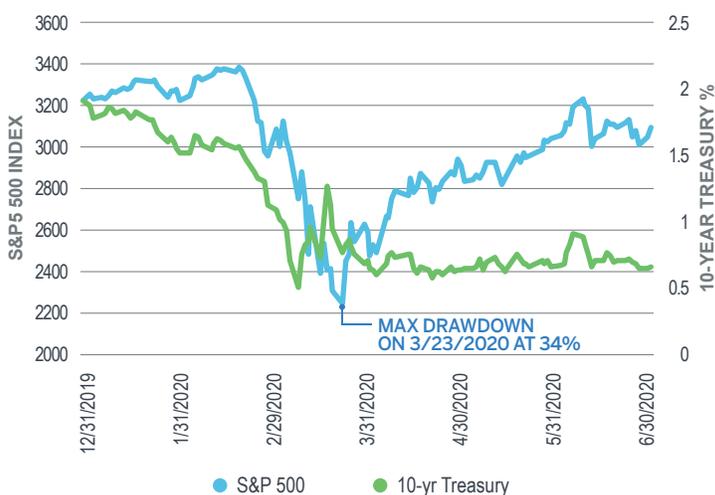
	<b>Reduction in P/L Vol</b>	<b>Recovery of Losses 3/9 - 3/20</b>
Equity	94.9%	98.1%
Rate	94.7%	101.9%
Currency	94.8%	122.6%
<b>Total</b>	<b>97.5%</b>	<b>96.5 %</b>

We also examined our experiences executing hedging strategies under extreme market conditions.

### MARKET CONDITIONS

Financial markets endured exceptionally high levels of volatility during the first six months of 2020 as a result of the COVID-19 pandemic. The following graph shows the movements of the S&P 500 index and 10-year U.S. Treasury yield during this period.

S&P500 INDEX AND 10-YEAR TREASURY



This period is characterized by the following observations, all of which are challenges for variable annuity hedging.

#### 1 Unprecedented triggering of circuit breakers

The so-called circuit breaker limits at the New York Stock Exchange (NYSE) were put in place after the Black Monday stock market drop in 1987 in order to reduce market volatility and massive panic sell-offs when the stock market drops a certain amount within a trading session, giving traders time to reconsider their transactions. Once the circuit breaker limits are reached, the NYSE trading is halted for a short period of time before trading can be resumed. Prior to 2020, the circuit breaker had been activated only once on October 27, 1997.

However, the COVID-19 pandemic caused massive market gyrations in the two-week period between March 9 and March 20, triggering the circuit breakers on March 9, March 12, March 16 and March 18.

The challenge of circuit breakers to hedging programs is that rebalancing may be more difficult amidst the market disruption.

## 2 Rapid large market movements

On the days the circuit breakers were triggered, the stock market dropped significantly. For example, the market dropped by about 12% on March 16, and 9.5% on March 12. In addition to large single day market drops, we also saw large single day market rallies. For example, the S&P 500 index rallied 9.3% on March 13 and 9.4% on March 24.

In dynamic hedging programs with significant gamma, rapid large market movements have the potential to result in losses if rebalancing is not carried out on a near real time basis.

## 3 Historically high market volatility

The realized volatility of the S&P 500 index over the first half of 2020 was 45.9%, more than double its historical average of about 18%. The first two months of 2020 exhibited near normal volatility of about 19.1%, but the COVID-19 pandemic caused volatility to shoot up tremendously at the beginning of March, such that the four-month period between March 2020 and June 2020 saw a realized volatility of about 54.2%!

High realized volatility can be a significant challenge for VA writers both in terms of managing existing hedge programs and developing new products because of the increased volatility cost.

## 4 Rapid reduction in interest rates.

The 10-year treasury rate started 2020 at about 1.90%. However, the interest rate environment experienced a dramatic reduction as the fed attempted to limit the COVID-19 pandemic impact starting in March. By the end of June, the 10-year treasury rate had fallen by more than 120 basis point to about 0.65%.

The ongoing low interest rate environment presents a daunting challenge to VA carriers, as interest rates are a significant driver in VA profitability. Fortunately, the movement of interest rates was less volatile than the movements in the stock market in that there were no days of near-panic trading.

## DEFINITIONS OF HEDGE EFFECTIVENESS

Hedge programs aim to achieve two primary goals for VA carriers:

1. Stabilization of a VA carrier's earnings: During periods of market volatility, a hedging program can help stabilize a VA carrier's profitability, which enhances investor confidence. Hedging reduces earnings volatility because the hedge asset value is usually designed to offset movements in liability value.

The effectiveness of earnings stabilization is measured by the reduction of earnings volatility on a fair value basis. In our studies, the earnings volatility reduction is calculated as:

$$1 - \frac{\text{standard deviation of weekly earnings with hedge}}{\text{standard deviation of weekly earnings without hedge}}$$

As a hypothetical illustrative example, suppose weekly earnings volatility is \$100 without hedging and \$5 with hedging, then earnings stabilization hedge effectiveness is  $1 - 5/100 = 95\%$ .

2. Recovery of losses resulting from adverse market movements: during a market downturn, a VA carrier's liabilities will increase, and increases in hedge asset value should help offset the losses. The effectiveness of the loss recovery is measured by the ratio of the increase in value of the hedge asset to the increase in value of the liability. The measurement is taken from the week during the study period in which the value of the liability experienced a large increase. In our studies, the effectiveness of loss recovery is calculated as:

$$1 - \frac{\text{earnings with hedge}}{\text{earnings without hedge}}$$

Similarly, as a hypothetical illustrative example, suppose earnings during a specific period is -\$200 without hedging and -\$6 with hedging, then loss recovery hedge effectiveness is  $1 - (-6)/(-200) = 97\%$ .

We chose these two definitions because each helps to address the other's limitations. A limitation of the earnings volatility reduction definition is its indifference to the size of the hedged program, provided it is stable. A limitation for the loss recovery definition is its inability to illustrate a hedging program's effectiveness in a volatile but non-directional market, such as so-called V-shaped markets. We believe the combination of these two metrics provides a good measure of a hedge program's overall effectiveness.

## BACKGROUND OF OUR STUDY

This study analyzes performance data for a wide range of clients, including those for whom Milliman FRM executes outsourced hedging programs. This study also evaluates other companies who use Milliman software tools and techniques to hedge their capital market risk exposures. While the overall study is based on actual historical data, extensive measures have been taken to anonymize the results to protect client confidentiality. There are a total of 9 companies in our study, covering more than \$18 billion of account value. The study period is the six-month period from January 2020 through June 2020.

## TRADING UNDER EXTREME MARKET CONDITIONS

The extreme levels of volatility seen through this period resulted in significantly larger trade volumes for VA dynamic hedging programs. These hedging programs navigated four circuit breaker days for the S&P 500 Futures, and navigated through a period where the rolling 1 month realized volatility exceeded 90%. In addition to this, there were also significant increases in initial margin requirements for exchange traded or centrally cleared products.

In spite of these challenging market conditions, Milliman FRM continued to execute all hedging programs as per client mandates and maintained focus on achieving best execution by keeping track of market conditions, and maintaining close contact with all top tier banks/brokers and FCMs with whom we work and carry out trading. In particular, on numerous occasions, Milliman FRM traders were able to tighten hedges just before circuit breakers were breached minimizing the exposure to gap events. The connectivity with the brokers/dealers throughout this period helped with finding liquidity and therefore better pricing when trading over-the-counter instruments during this period.

Unique to this crisis, more than half the volatility in the S&P 500 occurred outside of the US trading day, highlighting the importance of having access to 24/5 global trading capability. Where allowed, Milliman FRM utilized its global trading coverage to minimize the exposure to gap events, and allow for rebalancing of hedge positions in between many of the circuit breakers. In fact, for VA hedge programs where overnight trading was allowed, 52% of the S&P 500 futures were traded outside of the US trading day.

## LOOKING AHEAD

Our study shows that many VA carriers withstood the tests posed during the market turmoil in the first half of 2020, due in no small part to the effectiveness of hedging programs. It is clear that in the absence of such effective hedging, many VA writers would likely experience heightened pressure on their solvency. During the recent market turmoil, markets benefited from the active steps taken by the Federal Reserve to prevent a repeat of the credit panic that happened during the 2008 global financial crisis. Even with the success of the hedging programs, however, elevated market volatility and a prolonged period of ultralow interest rates remain significant challenges to VA writers.

During the height of the COVID-19 pandemic market turbulence, the realized volatility for the two-month period of March and April 2020 was an incredible 72.1%! Although the realized volatility reversed in the following two months of May and June, it was still at 26.1%, which is significantly higher than historical average. Without the ability to manage such market volatility, the increased volatility cost in the embedded VA guarantees would simply make all current VA products unfeasible. Fortunately, risk managed funds with the ability to target a preselected volatility level have become widely accepted in the market and have helped to alleviate much of the impact of very high realized volatilities. Legacy VA blocks without the ability to switch to risk managed funds continue to face difficulties in terms of increased volatility cost.

While the topic of low interest rates has been discussed for several years, the Fed's actions to prevent a credit crisis during the recent market turmoil led to fresh new lows in interest rates. Furthermore, there are even discussions of negative U.S. interest rates, similar to what is already happening in Europe and Japan. If this rate environment persists, most current VA products will be untenable. As such, new innovations will have to happen if the VA industry is to survive.

## CONCLUSIONS

We are once again pleased to see the high level of effectiveness exhibited by VA hedging programs during this most recent period of market turbulence. Nevertheless, significant challenges lay ahead for the VA industry. With hedging programs being a solid foundation, we are optimistic that the talents within the industry will find innovative ways to continue to provide value for the retirement income security of people around the globe.

## FOOTNOTES

1. The effectiveness of earnings stabilization is measured by the reduction of earnings volatility on a fair value basis.
2. The effectiveness of the loss recovery is measured by the ratio of the increase in value of the hedge asset to the increase in value of the liability.

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