Delaware Life®

# The Hedge Edge

# Background

Over the past two decades, fixed indexed annuities (FIAs) have become very popular tools used by financial advisors in client accounts. These products deliver safety to clients in the form of a floor of 0% and upside tied to a variety of indices and crediting strategies. The most popular index is the S&P 500, but others including multi-asset and volatility-controlled indices have become popular in recent years. A couple of the most common FIA crediting strategies are caps and participation rates. With both strategies, the return is floored at 0% for the crediting term (typically 1 year). With a cap option, the return is limited to the cap (a 10% cap would mean that if the index return exceeds 10% the credit would be limited to 10%). A participation rate is essentially a multiplier applied to the return. So, a 50% participation rate would mean the credit would be equal to 50% of the index return if it is more than 0%.

In the following sections we describe how insurers manage risks related to these products and how Delaware Life uses a unique approach in the industry to reduce costs to then help offer attractive rates and products to its policyholders.

## How are FIAs traditionally hedged?

When insurers offer fixed indexed annuities, they take on market risk to factors like equity returns and interest rates. Insurers mitigate these risks through hedging.

Typically, FIAs are hedged using options purchased from bank trading desks. On the surface, hedging these annuities is a straightforward exercise in today's markets. Many dealers (banks) will quote prices on options that identically match those required to fund the index credits offered to the policyholder. In the 10% cap example above, the insurer could buy a call spread package to match the payoff profile. This would consist of buying an at-the-money call option and selling a 10% out-of-the-money call option to create a call spread. For the participation rate example, the insurer would just buy an at-the-money call option with notional equal to 50% of the account value to match the potential index credit.

## What is the traditional measurement of cost to hedge?

The traditional and most obvious cost to any type of hedge trade is the bid-ask spread. The bid-ask spread is the difference in price between the market implied fair value of an option and the price that a dealer will buy or sell the option at. This essentially refers to the amount that the insurer "pays" the bank to be willing to make this trade that the bank wouldn't necessarily trade otherwise. In a market such as the S&P 500, that is highly liquid, the bid-ask spread is actually quite low because dealers can easily trade in and out of the options. Because of this, almost all insurers see a low bid-ask spread and decide it makes the most sense to fully and perfectly hedge their liability exposures as they write them. The idea is that by paying a modest cost upfront, they now have a perfect hedge in place—freeing them to focus on writing new business.

The bid-ask spread is the difference in price between the market implied fair value of an option and the price that a dealer will buy or sell the option at.

In markets or option strategies that are much less liquid, the bid-ask spreads are often substantially wider and their cost can be material to a strategy. This can include less liquid indices, such as multi-asset, volatility-controlled, intraday rebalancing, and all sorts of proprietary indices that are very common in FIAs. This can also include less liquid option types, such as binary, cliquet, Asian, timer, rainbow, and several more exotic varieties.

In these situations, with much higher bid-ask costs, it turns out that almost all insurers still decide to buy options from dealers to fully match their liabilities and are all willing to pay the high premium to do so. The reasons for this vary with some insurers being unwilling or unable to hedge in any other way while some view the high cost as being fairly in line with the value of the option and a part of the overall business model.

Choosing to systematically buy options in a "one size fits all" way has high explicit as well as implicit costs and that these costs are ultimately borne by the client.

Delaware Life is different. Whether it be in highly liquid or illiquid markets, we believe that choosing to systematically buy options in a "one size fits all" way has high explicit as well as implicit costs and that these costs are ultimately borne by the client.

## What is dynamic hedging?

At its highest level, dynamic hedging is a strategy that seeks to continuously rebalance hedge positions as market conditions change to maintain a neutral exposure. This strategy often uses dynamic option replication a technique in which a portfolio, primarily consisting of the underlying that an option is based, is constructed to replicate the payoff of an option without actually buying that option. This is not a simple exercise and requires a high degree of expertise in modeling, portfolio construction, and position rebalancing but it opens the door to a whole new world on the cost of hedging.

One of the key concepts in dynamic replication is breaking down the exposure of an option into pieces and hedging those separately.

Black-Scholes is the standard model for option valuation and uses the inputs of underlying price, strike price, risk-free interest rate, time to maturity, and implied volatility to determine an option's price (see Appendix 1). That model is then able to generate measures of sensitivity for the option price relative to those inputs, commonly referred to as "the greeks". The most used measurements of sensitivity are delta, gamma, vega, theta, and rho. Some of these sensitivities can easily be hedged with other instruments, such as the underlying for delta or interest rate products for rho, while more complex sensitivities require continuous rebalancing to replicate the option exposure.

Even after the step of modeling these exposures is completed, there remains significant further analysis and management needed to properly understand a portfolio of these exposures, as each has a varying strike price, time to maturity, and implied volatility.

### The Greeks

**Delta** = measure of sensitivity of option price to changes in underlying asset price

**Gamma** = measure of sensitivity of option's delta to changes in underlying asset price

**Vega** = measure of sensitivity of option price to changes in volatility of underlying asset

**Theta** = measure of sensitivity of option price to option's time to maturity

**Rho** = measure of sensitivity of option price to changes in interest rates

Many other measures of 2nd and 3rd order sensitivities such as vomma, vanna, charm, veta, etc.

## Why does Delaware Life use dynamic hedging?

Delaware Life chooses to dynamically hedge because we believe the benefits outweigh the costs. While dynamic hedging is complex and demands significant resources and active risk management, it delivers lower realized hedging costs, greater flexibility, synergies across the business, and room for innovation — advantages that a static hedging approach can't match.

As mentioned previously, one element of hedge cost is the explicit cost of the bid-ask spread that the hedger is essentially paying the market maker to make the trade. For liquid options on liquid underlyings (like S&P 500 options with 1 year or less to maturity) this cost can be low but for many more complex options and underlyings this cost can be very high. Several years ago Delaware Life began hedging all its S&P 500 exotic option structures (complex options on vanilla underlying) dynamically on the thesis that the bid-ask spread on these types of options was high enough that it was materially beneficial to not purchase those options and rather hedge the exposures using their underlying and short-term vanilla liquid options if needed. We next began to dynamically hedge options on more complex underlyings such as multi-asset, volatility-controlled, intraday rebalancing, and other proprietary indices (vanilla options on complex underlyings). In both these instances Delaware Life was able to realize material cost savings while still managing the risk of liability exposures to extremely tight targets.

In addition to explicit costs there can also be implicit costs to systematically buying calls and call spreads. The Volatility Risk Premium is a well-established principle in options pricing where the implied volatility used in option pricing is often higher than the ultimate volatility that the underlying realizes over that option's time period. This is driven by the supply and demand of volatility trading where investors' demand to hedge creates that premium. Given that insurers are net buyers of options for their FIA hedges, they systematically pay a premium embedded in implied volatility. Like the Volatility Risk Premium, there can also be a "Skew" Risk Premium. Skew is a measure of volatility across different strike prices as volatility is not uniform around price but instead is often higher at lower prices (market selloffs) and lower at higher prices (grinding higher markets). The issue here also comes down to supply and demand of volatility trading and is very applicable to the common FIA cap strategy. Basically, every insurer has a version of a cap offering and in turn wants to hedge it by buying an at-the-money call and selling an out-of-the-money call. Not only this, but an overwhelming number of product offerings (defined outcome, call writing, put buying for protection) feature a version of this same trade. This demand drives the relative volatility pricing between the at-the-money and out-of-the-money call options and routinely makes call spreads more expensive than they should be based on true volatility risk. Once again, insurers systematically buying call spreads are on the wrong side of the equation and paying an implicit premium. When Delaware Life dynamically hedges these exposures, we are able to ultimately realize volatility and skew at a lower cost.

Dynamic hedging also offers the benefit of increased flexibility, which is a superior approach when dealing with policyholder behavior. If an insurer owns call options that they bought when a policy was first sold, they might want to unwind small portions of those positions as surrenders and policy withdrawals occur. With a dynamic program, the positions are being trued up each day and will naturally be reflective of the current outstanding policies without needing to try to unwind portions of the portfolio or enter into offsetting trades. Added flexibility is also seen with the ability to incorporate any amount of options traded into the portfolio. As market dynamics and pricing evolve, dynamic hedging provides the opportunity to have a full suite of hedging tools and to choose whichever is most attractive at any given time.

Part of the increased flexibility also opens the door to using dynamic hedging to find synergy opportunities and further cost savings. Dynamic hedging often introduces more hedge instruments into the overall portfolio. Depending on an insurer's lines of business and types of strategies there is the potential to find places where some of these positions may offset one another or be correlated and complementary. Such synergies can result in less margin/collateral usage and more investable cash for the overall bond portfolio and can also be overall risk reducing for the insurer when looking across multiple business lines.

A less expected benefit of dynamic hedging comes in the form of innovation. Given the success Delaware Life has had with this approach, we wanted to find ways to incorporate it into product development to create innovative, custom indices in ways that others might not be able to accomplish. One example of this is the Janus Adaptive Market Leaders Index which we have utilized on two of our indexed annuity products. We partnered with Janus Henderson to design this index to offer a complex multi-asset exposure in a format that we could dynamically hedge and thus confidently lower prices and offer additional features like no volatility control (very unique for a custom index in the FIA market) to customers.

## How does all of this ultimately impact the client?

In summary, simply hedging by systematically purchasing options can lead to higher hedge costs, limited product design, and less flexibility to manage an evolving liability profile. Dynamic hedging is a very involved exercise that requires a great deal of resources and expertise but with it come even greater benefits. Delaware Life seeks to be a leader in the annuity space by offering products that best fit the needs of its policyholders and doing so at extremely competitive market rates. We view the use of dynamic hedging as creating material value that separates us from other insurers. In turn we can share these efficiencies and cost savings with policyholders in the form of competitive cap and participation rates and innovative indices. Delaware Life's view is that this allows our offerings to contain some of the best value that can be found in the annuity marketplace.

# Appendix 1

The standard for computing European options is Black-Scholes:

$C = N(d_1)S - N(d_2)Ke^{-rt}$

where $d_1 = \frac{\ln \frac{S}{K} + \left(r + \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}}$ and $d_2 = d_1 - \sigma\sqrt{t}$

C = call option price

N = cumulative distribution function of the normal distribution

S = current price of an asset/current index level

K = strike price

r = risk-free interest rate

t = time to maturity

$\sigma$ = volatility of the asset

## delawarelife.com

Delaware Life Insurance Company (Zionsville, IN) is authorized to transact business in all states (except New York), the District of Columbia, Puerto Rico, and the U.S. Virgin Islands.

Guarantees are backed by the financial strength and claims-paying ability of the issuer.

This communication is for informational purposes only. It is not intended to provide, and should not be interpreted as, individualized investment, legal, or tax advice. To obtain such advice, please consult with your investment, legal, or tax professional.

Fixed index annuities are not securities and do not participate directly in the stock market or any index and are not investments. It is not possible to invest directly in an index. Past performance is not indicative of future results.

**NOT FDIC/NCUA INSURED | MAY LOSE VALUE | NO BANK/CREDIT UNION GUARANTEE | NOT A DEPOSIT | NOT INSURED BY ANY FEDERAL GOVERNMENT AGENCY**