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# Seen from another angle

Liability modelling has traditionally been dominated by actuarial modelling tools. Now firms with credentials in capital markets modelling are trying to muscle in on the territory, particularly for modelling complex variable annuities portfolios. Clive Davidson reports

IT IS WELL KNOWN that hedging variable annuities (VAs) presents a challenge because of the complexities of the embedded options within the products. Losses on the products following the financial crisis made insurers take a second look at their hedging strategies. Since then, VA hedging has evolved further, particularly in the US where insurers are increasingly interested in not only the economic risk inherent in their VAs, but also the impact on capital and earnings at risk. Now, insurers are looking to analyse and possibly hedge under different financial reporting frameworks, including International Financial Reporting Standards (IFRS) and statutory capital.

However, if insurers are to take capital and earnings at risk into account in their VA hedging programmes – and even earlier, into their product design and commercial strategies – they need to calculate the relevant measures more frequently and more quickly than they have done traditionally. Given the complexity of the modelling and the size of many VA books, performing the calculations in the required time frame presents significant challenges in terms of processes and technology. Many insurers do not have, or do not want to have, the infrastructure and resources to carry out the various hedging, capital and earnings calculations, and hence outsource the task to consultants.

But for a variety of reasons, including cost considerations and wanting to keep strategic

decisions internal, a number of insurers are bringing their VA hedging programmes in-house. In doing so, they must ensure they have appropriate modelling and computational capabilities. Given the demanding requirements, most insurers look to third-party technology vendors for at least some of their analytics and systems. However, because VAs are essentially investment vehicles inside insurance wrappers, they straddle what have until recently been two largely separate technology markets served by different vendors – actuarial systems for liabilities created by insurance-oriented technology vendors and capital markets systems for assets created by banking system vendors.

With the growth of the market, several actuarial system vendors have made efforts to extend their systems to handle VA hedging. However, the complex and computationally demanding modelling requirements, scalable processing and high-volume data management requirements of VA hedging play to the strengths of capital markets technology vendors, which have already developed these capabilities for banks. Some of these vendors are now making significant inroads among insurers wanting to handle their VA hedging in-house.

Although facing a growing challenge by fixed annuities, the US VA market remains substantial, with sales for 2014 amounting to \$137.9 billion, according to investment research and management firm Morningstar.

VA hedging programmes are very different from what insurers are used to doing and require a number of new capabilities, says Deep Patel, principal and consulting actuary, financial risk management, at Milliman Financial Risk Management, based in Chicago. For a start, traditional actuarial functions, such as liability valuations or capital calculations, are typically undertaken monthly or quarterly, whereas VA hedging requires at least overnight, if not intraday, processes. “With overnight processing, you can’t start till markets close and there is a lot of input in terms of in-force data and the latest capital markets data, with little time to check accuracy. And you have to complete and verify the calculations before markets open in the morning. It’s a complex process and requires lot of people with different expertise,” he says.

The liability calculations are inherently demanding, says Alex Marion, vice-president, product management at Numerix, who is based in New York. “Because of their complexity, closed-form solutions do not exist for valuing living benefit guarantees in VAs. Monte Carlo methods are required, which can be computationally challenging given the size of some of these blocks,” he says.

Furthermore, hedge programmes have been evolving over the past decade and becoming more ambitious. “It used to be that insurers focused on economics only, but now they also want to look at how hedging affects their



statutory balance sheet and earnings, and they are trying to balance all of those things,” says Patel. To do so requires calculating statutory capital and earnings at risk more frequently than has been customary for insurers, with significant implications for systems’ performance.

To support its VA hedging outsourcing service, Milliman has had to develop capital markets modelling functionality in addition to its traditional actuarial modelling system, as well 24-hour global trading capabilities. It supports it all with a technology infrastructure of high-capacity data centres including business continuity and disaster recovery backup, and a multi-disciplinary team with actuarial, quantitative finance, capital markets and IT expertise, says Patel. The

challenge for individual insurers to develop all of this helps explain why Milliman has seen major growth in its VA hedging outsourcing in the past three years – the company now provides hedging services on \$100 billion in assets at major financial institutions. “The size of companies that are deciding to outsource to us has increased substantially, both in terms of their assets and sophistication,” says Patel.

But despite the challenges, a growing number of insurers in the US are choosing to keep their VA hedging in-house even while their volumes and hedging programme complexities grow, or are taking back their hedging where they had once outsourced it.

“In 2012, with the growing sophistication of our risk-management approach and capa-

bilities, we made the decision to bring the entire variable annuity hedging operation in-house. This was a natural and planned progression from the outsourced solution we selected in 2008 to fulfil our interim risk mitigation needs after the financial crisis unfolded and reinsurance became unavailable,” says Michael DeWeirdt, senior vice-president, Ohio National Financial Services, based in Cincinnati.

The company had no illusions about the challenge it faced. “We needed robust simulation of our variable annuity liabilities with the granularity of policy-level valuations covering over a decade of business. This information is used to produce tradeable grecks each day and to evaluate daily program performance. We were seeking a solution that

had superior calculation speed, provided access to multiple simulation methods, permitted fast prototyping, was scalable, production quality and had a large installed base,” says DeWeirdt.

Ohio National evaluated a number of providers, including offerings from actuarial, consulting, and software companies. The insurer considered packaged and more open software, and both installed and hosted systems. It also looked at systems built around high performance graphics processing unit hardware, as well as grid computing systems. In the end, Ohio National opted for derivatives and capital markets specialist Numerix, which had been extending its expertise into insurance liabilities.

“We felt Numerix provided the most sophisticated scenario generators and most comprehensive model alternatives among the vendors. Additionally, we found that Numerix had some of the most advanced thinking and experience in modelling, valuation and hedging of complex path-dependent options as a result of its roots in the banking and hedge fund worlds,” says DeWeirdt. Also important was the customisation, flexibility and integration that Numerix software allowed compared with more packaged or hosted options.

“Finally, having witnessed the rise and fall of various software platforms in the insurance sector, we carefully considered the sustainability of the platform in which we would be making a significant investment. As a result, it was important that the vendor be focused on and successful in software as a primary business rather than as an adjunct to consulting or other business lines,” he says.

Numerix has recently made a distinctive play for the insurance technology market by adding actuarial models of liability risks, such as longevity, to its capital markets modelling platform. “With variable annuities, having the ability to simulate a hedging strategy and optimise it by having the same modelling platform for assets and liabilities is powerful. It can improve product development because the product developers can

sync with the hedge team and make sure they incorporate the true cost of hedging, taking into account how it will impact reserves and capital,” says Marion of Numerix. As well as the integrated asset and liability modelling framework, the company



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Alex Marion, Numerix

can also draw on the performance and scalability (including access to cloud service providers), and large-scale data management capabilities it developed for the banking environment, to support the demands of hedging large books of VAs and other complex insurance products, he says.

Maryland-based Transamerica has also chosen to adopt Numerix technology – in this case, moving from in-house systems to a third-party vendor system. Numerix’s CrossAsset pricing and risk engine and Leading Hedge hedging platform are ena-

bling Transamerica to achieve a number of goals, including more automated processes and lower operational risk and creating an environment where it can analyse and hedge under different reporting frameworks, including economic, statutory capital and IFRS, says Hunt Blatz, vice-president and head of actuarial systems transformation within the Transamerica Enterprise Business Services division, based in Cedar Rapids, Iowa.

The Leading Hedge platform enables Transamerica to calculate current sensitivities of the options embedded in its VAs, as well as project the sensitivities forward in time, on its portfolio of more than 230,000 VA policies using nested stochastic functionality. “Transamerica uses risk-neutral scenarios nested in real-world scenarios, although we could also do risk-neutral on risk-neutral. We also project sensitivities out quarterly for five years, with these parameters being flexible,” says Blatz.

Transamerica had been doing something along these lines using a mix of Microsoft Access databases, Excel spreadsheets and an in-house coded module. “What was once an inflexible, manual and fragile calculation that took 40 hours to run, is now a flexible, transparent, robust, automated process that takes six to eight hours. The nested stochastic process uses the same fundamental cashflow logic as the daily hedging model,” says Blatz.

As a broad based financial services technology vendor, Pennsylvania-based SunGard offers a portfolio of financial services software products that includes the iWorks Prophet actuarial system and capital markets-oriented systems such as its Adaptiv and APT valuation and risk stems and Front Arena cross-asset trading system. Some insurers are taking advantage of this to create in-house VA hedging platforms, says Sean Hayward, head of US actuarial development for SunGard’s insurance business, who is based in Winnipeg, Canada. iWorks Prophet provides the essential cashflow engine for capturing liability characteristics under a

variety of economic scenarios, while the capital markets-focused systems will support a firm's hedging strategy. "Managing a derivatives portfolio, potential intra-daily trading and executing trades are all outside the standard area of expertise for life insurers, who are typically focused on managing longer term interest rate and longevity risks," says Hayward.

Meanwhile, Toronto-based GGY Axis has recently helped an insurer take its VA hedging programme in-house, using the company's packaged Axis system for the key calculations and reporting. "Insurance companies need a modelling solution capable of capturing both assets and liabilities effectively, and reflecting the insurer's view of the risk, which may focus more on statutory capital or Generally Accepted Accounting Principles (GAAP) earnings when hedging, and thus need to calculate risk metrics consistently, and be able to simulate the impact [of hedges] on financial statements," says Trevor Howes, vice-president and actuary for GGY Axis, who is based in Toronto.

Transamerica is integrating two hedging programmes with its centralised platform. "We have a daily hedge programme that aims to reduce the economic market risk of the embedded options in the VA products. Layered on top of this daily hedge is a capital hedge that is managed through a combination of tools. We are working toward putting these earnings and capital calculations into Leading Hedge so that we have one cash-flow logic, one standard set of methodologies for market models, and one source of input data such as market, policy, product and fund. Once we have accomplished this, we will have a consistent hedge modelling view across each of these financial reporting dimensions."

But while many insurers are working towards a single integrated hedging platform, modelling consistency is not the primary challenge with VA hedging, says Milliman's Patel. "From a US perspective at least, there is not one single hedge programme that will help an insurer manage its

economic risk and its earnings and capital, regardless of how consistent the models and assumptions are. The underlying formulas for doing the various calculations are very



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Hunt Blatz, Transamerica

different, and the way they look at risk is different," he says. Two examples of these differences are: guaranteed living benefits are valued on a market-consistent basis under US GAAP, but on a real-world equity and interest rate scenario basis under a US capital framework; and death and income benefits are valued on a real-world scenario basis with smoothing under US GAAP, but on a risk-neutral basis under an economic framework.

Consistency is an added benefit of an integrated platform (which Milliman does

have), Patel says. However, the bigger challenges relate to model development and maintenance, devising efficient processes that require minimal human intervention, and building the data and IT infrastructure to perform the required calculations to support daily dynamic hedging on the one hand, and provide management with the depth, accuracy and frequency of information for strategic hedging decision-making on the other.

Model validation is an area of particular concern, given the complexity of VAs and the chequered history of the business. Vendors and outsourcers claim this is an area where they can offer an important benefit as senior management and regulators demand more rigorous scrutiny of models. And it is one area where insurers that decide to go it alone in building their hedging platforms are seeking help.

"Due to more companies taking their VA hedging in-house, we have seen an increase in companies looking for support in validating their models, both in terms of validating scenario generators and cashflow models," says Ken Lombardo, senior consultant, Americas life practice, Towers Watson, based in Connecticut. "We also have seen companies taking a closer look at assumptions and modelling methodologies. Sometimes they find that assumptions made previously have gotten stale in light of more recent experience. Also, simplifications that may have been made when models were previously developed may need to be enhanced to more accurately reflect product and risk characteristics."

The decision on whether to run hedging programmes in-house or to outsource – whether for VAs, or the rapidly growing market for fixed-index annuities, or for other products – is often down to company culture and board and senior management policy rather than cost or other pragmatic considerations. Whatever approach insurers opt for, they now have a wider range of modelling and technology options to choose from. ■