



February 2021

Variable Annuity Market Update

FEATURED ARTICLE	1
MILLIMAN GLOBAL DERIVATIVES SURVEY 2020	1
PRINCIPLES-BASED RESERVING – UPDATE ON THE ECONOMIC SCENARIO GENERATOR REPLACEMENT PROCESS	
MARKET UPDATES	4
U.S. VARIABLE ANNUITY MARKET UPDATE	4
PRODUCT TRENDS OF U.S. VARIABLE ANNUITY GUARANTEE BENEFITS	5
INTERNATIONAL VA MARKETS: TAIWAN	7
RISK MANAGEMENT	8
MILLIMAN HEDGE COST INDEX™ AND US MARKET COMMENTARY	9
DICK MANACED ELINDS ON MADIABLE ANNIHITY DI ATEODMS	10

Featured article

MILLIMAN GLOBAL DERIVATIVES SURVEY 2020

Milliman conducted its periodic survey of derivative usage by the global insurance industry in 2020. Since the last survey in 2017, a number of major developments may have influenced insurer risk management and asset liability management (ALM) strategies. In particular, the impact of the recent COVID-19 pandemic has caused turbulence in financial markets and created unprecedented challenges for the industry. The aim of the survey is to explore these impacts and the trends in risk management practice and derivative usage, among a wide range of insurance products, including variable annuities. This year's survey received responses from 54 insurance companies based in North America, Europe, and Asia, including many of the largest companies in the industry.

Some of the key overall findings from the survey are as follows:

- Risk profiles of respondents: Globally, interest rates, equity, and credit are the key market risks that insurance companies face, followed by currency risk and inflation risk. Regionally, we see that equity risk is viewed as less material in Asia, while inflation risk is considered more material in the UK, compared to the global averages.
- Broad hedging objectives: Economic profit and loss (P&L) volatility continues to be the most important objective for hedging programs. GAAP P&L volatility and regulatory capital are also key objectives for a significant proportion of firms. However, for many regulatory environments, management is likely to optimize across multiple measures, particularly in Europe where solvency regulation has become more market-consistent.
- Broad hedging strategies: At a group level there is a bias toward static (term matching) hedging techniques. Interestingly, there is a fairly even split between the dynamic hedging techniques of rolling short-term hedges to match longer-term liabilities and of tactical risk management or allocation decisions. Globally, 38% of respondents use a combination of both dynamic and static hedging strategies at a group level, and 44% a combination of both at a product level.
- Hedging instruments: For hedging equity risk, equity index futures and options are the popular instruments for delta risk, and most firms use options for vega risk. Interest rate swaps continue to be the favorite for hedging interest rate risk. Foreign exchange (FX) forwards on a collateralized basis remain the most popular currency hedge. Credit default swaps and inflation swaps are the popular instruments for hedging credit risk and inflation risk, respectively.

Some new trends identified in the 2020 survey across the insurance industry as a whole were:

- **Duration gap:** The survey indicates a definite shift from a negative duration gap to positive duration since the last survey in 2017, suggesting heightened concerns around interest rates continuing to fall.
- COVID-19 pandemic: Hedging programs largely performed as expected and achieved objectives during the market turbulence in the first quarter (Q1) of 2020. The vast majority of respondents report hedge program effectiveness in excess of 90% for hedged risks.
- Negative interest rates: While most insurers report modeling negative rates, there is a meaningful proportion for all currencies that still excludes negative interest rates, likely due to legacy modeling systems that are not yet able to cope with negative rates.
- Benchmark reform: In the context of the impending discontinuation of LIBOR, sovereign bond curves were the most cited choice as replacement risk-free rate (RFR) outside of the EU, where a single domestic bond curve does not exist. This could reflect legacy views and the current state of uncertainty about the new benchmark rates, and the situation could change over time as Secured Overnight Financing Rate (SOFR), euro short-term rate (€STR), and other replacement RFRs become more established. In practice companies are using the interbank offered rate swap (IBOR), the overnight indexed swap (OIS), and regulatory curves for risk-neutral valuation of liabilities with guarantees. They are using OIS curves predominantly for valuation of interest rate derivatives.
- Uncleared Margin Rules (UMR): Many survey respondents expect to be subject to the UMR in 2021, with a few expecting it as early as 2020. For segregation of margin under UMR, "Triparty" agreements are preferred over "Third Party" agreements, and AcadiaSoft, Numerix, and internal systems are the three main choices as technology solutions.

- Liquidity risk management: Given the increased demands on liquidity posed by the recent clearing and
 collateralization regulations, cash flow liquidity risk management has become increasingly important. We see 55%
 of respondents indicating that they have defined liquidity risk management plans in place.
- Cleared interest rate swap usage: There has been an increase in the usage of cleared interest rate swaps
 globally and these instruments are becoming more common as compared to bilateral swaps. However, in the UK,
 there is still some preference for noncleared interest rate swaps.
- Overnight indexed swap (OIS) rate discounting: Respondents to the 2020 survey indicated that many have now switched to using the OIS curve instead of IBOR for valuing interest rate derivatives, which is a change from the survey findings in 2017 when only 38% used OIS discounting for asset valuations and 14% were planning to switch, with 48% having no plans to change. In 2020, only 27% of respondents for USD and between 15% to 20% in other currencies are discounting using an IBOR curve.
- Views on future usage: Derivatives usage is expected to increase in coming years as a result of market volatility and its impact on valuations, plus lower interest rates and regulatory changes.

The survey also explores some of the more detailed aspects of derivative usage for insurance product lines that are heavy users of derivatives. For variable annuity (VA) writers, overall we see that hedging practices have been fairly stable since last time. In particular, some of the related findings from 2020 include:

- **Hedging monitoring frequency:** More VA writers are managing risk on an intraday basis, with 60% of the respondents opting to do so either during cash market hours or on a 24-hour basis, up from 44% in 2017.
- Hedged risk: More VA writers are hedging first-order equity and interest rate risk. However, for both equity gamma and vega, we are seeing more writers keeping these exposures unhedged in comparison to 2017. For those that hedge this risk, however, we are seeing an increase where their gamma and vega exposures are being hedged close to 100%. For second-order interest rate risk we are seeing a decrease in interest rate gamma hedging.
- Modeling approach: Most writers are still only using market-implied volatility up to five years. However, two-year to five-year market implied volatility assumptions are being used less than before, while there are slightly more firms using longer-term market implied volatilities for tenors over 10 years.

We plan to update the survey on a regular basis to ensure that results remain relevant. We also believe that valuable insights can be gained from analyzing change over a multiyear horizon, and so we encourage insurance companies to continue to participate in the initiative.

If your company would like to participate in the next update of the survey, please contact Ram Kelkar (ram.kelkar@milliman.com) based in Chicago, Neil Dissanayake (neil.dissanayake@milliman.com) based in London, or Victor Huang (victor.huang@milliman.com) based in Sydney. All survey participants will receive a detailed survey report containing all the survey results.

If you would like a copy of the summary report of the key findings from 2020, please contact the authors.

PRINCIPLES-BASED RESERVING: UPDATE ON THE ECONOMIC SCENARIO GENERATOR REPLACEMENT PROCESS

In October 2020, the National Association of Insurance Commissioners (NAIC) announced that Conning, a global investment management firm, will be providing economic scenario generator (ESG) services in support of statutory calculations for life and annuity reserves as promulgated under the Standard Valuation Manual (VM) and for capital under the Risk-Based Capital (RBC) instructions.

Conning is currently working with the NAIC's Life Actuarial (A) Task Force (LATF) and Life Risk-Based Capital (E) Working Group (LRBC), along with regulators, industry, and other interested parties to develop, parameterize and implement the new ESG. When completed and approved, the Conning ESG will replace the existing Academy Interest Rate Generator (AIRG) that is the currently prescribed ESG for VM-20 (life) and VM-21 (variable annuity) statutory calculations. Based on current timelines (which are subject to change), the Conning ESG will be effective for VM-20 and VM-21 as of January 1, 2022 and C3 Phase I and II as of December 31, 2022.

In December 2020, Conning exposed an initial set of recommendations and 10,000 economic scenarios (the Basic Data Set¹) for a public comment period ending January 31, 2021. This comment period was extended on January 21, 2021, to March 7, 2021. The stated intent was for the Basic Data Set to be used as a starting point for industry discussions only, and to help inform the development of the scenarios that will eventually be used for the ESG industry field testing to assess the potential impact on statutory reserves and capital for a range of insurance products. This industry field testing is currently scheduled to occur over the period June to September 2021, but these dates are contingent on LATF and LRBC working group discussions and any general industry feedback that is received by the revised deadline of March 7, 2021. Companies that wished to participate in the ESG industry field testing were requested to have contacted the NAIC by March 1, 2021.

We intend to provide an update on these developments in forthcoming quarterly Milliman Variable Annuity Market Updates.

If you have any questions on this update or if you require assistance in the industry field testing, please feel free to contact the authors.

Addendum:

As of February 24, 2021, Conning has published a new set of scenarios (Revised Baseline Scenarios) that have been exposed for public comment through March 22, 2021. The Revised Baseline Scenarios supersede the originally published Basic Data Set.

¹ More information can be found at: NAIC Economic Scenario Files

Market updates

U.S. VARIABLE ANNUITY MARKET UPDATE

- Q3 2020 year-to-date (YTD) sales were down 6.4% (\$4.8 billion) versus Q3 2019 YTD.
- Registered Indexed Annuity Sales were \$15.7 billion in Q3 2020 YTD.
- In Q3 2020, guaranteed living benefits (GLBs) were elected 73% of the time they were offered. Guaranteed Lifetime Withdrawal Benefits (GLWBs) were the most elected, at 63%, followed by Guaranteed Minimum Accumulation Benefits (GMABs), 6%, Guaranteed Minimum Income Benefits (GMIBs), 3%, and Guaranteed Minimum Withdrawal Benefits, 1%.



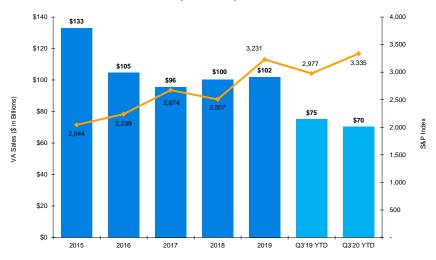


FIGURE 2: VARIABLE ANNUITY SALES BY COMPANY (\$ MILLIONS)

Q3'20 Rank	Company	2019	2018	2017	Q3'20 YTD	Q3'19 YTD	YoY
1	Jackson National Life	\$14,694	\$16,678	\$17,463	\$11,686	\$11,010	6%
2	Equitable Financial	11,698	10,651	10,254	7,611	8,539	-11%
3	Lincoln Financial Group	9,858	9,129	7,110	7,541	6,952	8%
4	TIAA	9,753	10,382	11,965	6,626	7,459	-11%
5	AIG Companies	8,524	6,789	6,413	4,335	4,441	-2%
6	Brighthouse Financial	6,155	4,559	1,370	4,239	4,207	1%
7	Prudential Annuities	5,768	7,846	5,836	3,936	6,670	-41%
8	Allianz Life of North America	4,694	2,376	2,448	3,034	2,870	6%
9	Nationwide	4,087	4,659	4,951	2,880	3,522	-18%
10	New York Life	4,001	2,904	3,135	2,847	2,425	17%
11	Pacific Life	3,634	3,251	3,054	2,716	2,303	18%
12	RiverSource Life Insurance	3,376	4,426	4,127	2,340	2,980	-21%
13	Transamerica	3,317	3,189	3,115	2,074	2,558	-19%
14	Thrivent Financial for Lutherans	2,291	2,389	2,544	1,644	1,717	-4%
15	Fidelity Investments Life	1,546	1,531	1,485	1,051	1,124	-7%
16	CMFG Life Insurance Company	1,045	834	771	836	733	14%
17	Northwestern Mutual Life	998	1,189	1,251	742	780	-5%
18	Principal Financial Group	569	477	526	296	454	-35%
19	Massachusetts Mutual Life	465	594	650	277	333	-17%
20	Horace Mann Life	364	NA	NA	244	NA	NA
	Other	5,063	6,345	7,132	3,344	4,022	-17%
	Total	101,900	100,200	95,600	70,300	75,100	-6.4%

PRODUCT TRENDS OF U.S. VARIABLE ANNUITY GUARANTEE BENEFITS

- October 2020:
 - AIG launched a new GLWB called Polaris Income Max. The structure is similar to other Polaris GLWBs.
 - The rollup rate is 5.25%.
 - For each single and joint life income option offered, there are two annual withdrawal rates, one in effect while the account value is above zero (the "maximum" rate), and a rate that would go into effect if the account value falls to zero (the "protected" rate).
 - The rider offers three income options. As an example, single life Income Option 2 offers the highest maximum rates, between 4% and 8% (dependent on age when GLWBs start), and the lowest protected rate of 3%.
 - The rider fee is 1.25% in the first year; thereafter it will be linked to changes in the CBOE-VIX index, subject to caps. (Same fee for single and joint life.)

November 2020:

- Equitable raised the initial rollup rate to 5% on the GMIB in its Retirement Cornerstone 19 contract.
- Equitable also added new segment options on its Structured Capital Strategies PLUS registered indexlinked annuity:
 - Enhanced Upside, which allows clients to capture up to 125% of the positive return of the S&P 500 benchmark index with -10% downside protection
 - Expanded Dual Direction protection options of -15% and -20% buffers, in addition to the original -10% buffer
 - The option to capture upside return or partial downside protection on a one-year basis for investments in the S&P 500, Russell 2000, MSCI EAFE, Nasdaq-100, and MSCI Emerging Markets indices.
- Nationwide increased the rollup rate on its Nationwide Lifetime Income Rider Plus Accelerated product to 5.50%.
- Nationwide launched the Pro 4 Income Rider, a new fee-based GLWB, available with the Nationwide Advisory Retirement Income Annuity. Features:
 - The withdrawal rate is set when the first GLWB is taken (it does not increase with age). At launch, the single life rate is 4% for ages 59-1/2 through 85. Joint is 25 basis points (bps) lower.
 - For the benefit base: Annual step-up to account value. (No roll-up rate.)
 - A one-time non-lifetime withdrawal, without stopping the step-up feature or locking in the lifetime withdrawal percentage, is available.
 - Annual rider fee: 45 bps for single life, 60 bps for joint.
 - Advisory fees of up to 1.50% of the average contract value can be pulled from the contract value, depending on broker dealer rules, without impacting the client's income benefit or death benefit. Also, advisory fees up to 1.50% can be pulled from a nonqualified annuity, depending on broker dealer rules, without creating a taxable event.

December 2020:

- Lincoln increased rider fees on the following GLWBs to 1.50% for single life and 1.60% for joint life. The company also changed lifetime withdrawal percentages:
 - Lifetime Income Advantage 2.0: The withdrawal percentage on the age 65+ band increased to 5% for single life and 4.50% for joint life.
 - Market Select Advantage: Withdrawal percentages were reduced. Single life ranges from 2.25% to 4.75%, with the age 65 rate at 4.75%. Joint life ranges from 2% to 4.15%, with the age 65 rate at 4.15%.
 - Max 6 Select Advantage: Single life percentages increased by 0.25% for three age bands, but decreased by the same amount for joint life. Single life rates range from 5.25% to 7% with the age 65 rate at 6.50%.
 Joint life rates range from 3% to 6%, with the age 65 rate at 5.50%.

- Charles Schwab launched the Schwab Genesis Advisory VA, issued by Protective. It offers an optional SecurePay Life GLWB similar to others offered by Protective for an additional fee of 1.10%.
 - The benefit base steps up to account value annually.
 - The annual withdrawal rates range from 3.75% to 5.75% for single life (50 bps lower for joint), with the age
 65 rate at 5%. Included in the rider is a nursing home benefit, which applies if the insured is confined to a nursing home and cannot perform two of six activities of daily living.

INTERNATIONAL VA MARKETS: TAIWAN

- First-year premium (FYP) sales of variable annuities as of Q3 2020 was around TWD 29.2 billion, 54.7% higher than Q3 2019.
- FYP sales of variable life as of Q3 2020 was around TWD 23.8 billion, 44.5% lower than Q3 2019.
- Year-to-date sales of variable products have been 28.4% lower versus 2019.
- According to the disclosure from the Life Insurance Association R.O.C., the decline in sales has been due to the following:
 - The COVID-19 pandemic reduced the opportunities to sell the insurance products.
 - The Insurance Bureau implemented a new regulation for investment-linked policies that are linked to target maturity bond funds. The regulation requires that the credit ratings for the underlying bonds must be BBB+ or above and the total value of BBB+ bonds cannot exceed 40% of the fund's net value. The returns of the funds decreased and hence the sales of variable products significantly dropped in 2020.
 - The sales of USD variable products decreased because of the 1.50% cut in the U.S. federal funds rate.

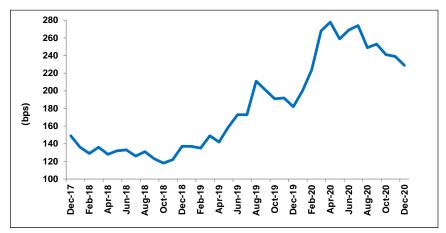
Risk management

MILLIMAN HEDGE COST INDEX™ AND U.S. MARKET COMMENTARY

December 2020 update

- The S&P 500 and Nasdaq recorded all-time highs to end the year—gaining 11.69% and 12.88%, respectively—as investors swooned over COVID-19 vaccines, stimulus, and the presidential election. Markets largely disregarded negative economic data in the hopes that U.S. lawmakers would manage to pass a COVID-19 relief bill before various federal protections expired at the end of the year. The United States began its rollout of COVID-19 vaccines on December 14 after it was announced in November that two vaccines had been developed that were upwards of 90% effective. Lawmakers passed a \$2.3 trillion spending package that included \$900 billion in COVID-19 relief and direct payments of \$600 to individuals with qualifying income. While it is expected that a large percentage of Americans will save these funds, current projections for the timeline to reach herd immunity suggest that more government aid may be needed to support the economy through the summer.
- Q4 2020 also brought about a rotation out of the large-cap stocks that led the recovery in Q2 and Q3. As Joe Biden was declared the victor of the 2020 presidential election the small-cap stocks that were once laggards began to outperform, with the Russell 2000 gaining 31% for the guarter.
- Labor market fundamentals showed continued stress and signs of a stalling recovery despite the decline in the U3 unemployment rate from 7.8% by to 6.7% for the quarter. The number of Americans filing for unemployment remained elevated above 700,000 and the number of jobs added declined each month from 711,000 at the start of the quarter to -140,000 by year's end as surging COVID-19 cases caused states to impose new restrictions. After a modest decline in October, retail sales data for November and December showed declines of 1.4% and 0.7%, respectively.
- Despite weakening labor market and consumer spending data, orders for durable goods increased 0.9% for the month of November and the Q3 estimated gross domestic product (GDP) grew by 0.3% to 33.4%. This suggests that business investment may have helped to keep the economy on a moderate growth path in Q4, as the pandemic has shifted demand away from services like travel and hospitality and toward goods.
- The Federal Reserve committed to continue using its tools to mitigate the effects of the economic downturn, kept rates on hold, and continued the Main Street lending program. The central bank explicitly tied its bond-buying program to its goals of full employment and stable inflation and committed to buying approximately \$120 billion in government bonds and mortgage-backed securities each month to help fuel the economic recovery.
- Market-based gauges of inflation expectations as measured by 10-year break-even rates increased 35 basis points on the quarter after President Biden's election victory increased the likelihood of a more progressive agenda and the impending economic recovery associated with the rollout of COVID-19 vaccines led participants to reprice term premium.
- The benchmark U.S. Treasury yield increased by 23 basis points for the quarter to 0.91%—its highest level since March. The move higher in yields reflects expectations of economic stimulus under a Biden administration. Longend Treasury yields continued to rise faster than short-end yields; the 2s10s spread steepened by 24 basis points to end the year at its high.
- The U.S. Dollar Index continued its slide, declining by 4.21% as the Fed continued its liquidity injections and easymoney policies.
- Implied volatility remains elevated from pre-pandemic levels as surging coronavirus cases remain as a tail
 risk overhang.
- S&P 500 10-day realized volatility decreased from 22.47% to 7.48%, making a high of 32.40% on November 5 and a low of 7.04% on December 30.
- Spot VIX declined from 26.37 to 22.75, making a high of 40.28 on October 28 and a low of 20.57 on November 30.

FIGURE 3: EXPECTED HEDGE COST* (229 BPS)



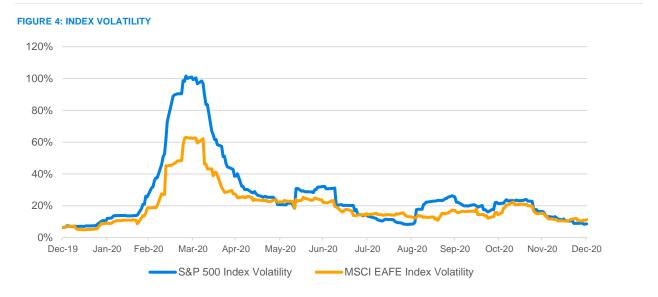
^{*} Milliman recently completed a review of the design of its Hedge Cost Index and implemented some changes to align product features and assumptions with those prevalent in the VA marketplace. Details regarding this update can be found in the Index Methodology document at: http://www.milliman.com/mhcimethodology/.

RISK-MANAGED FUNDS ON VARIABLE ANNUITY PLATFORMS

Q4 2020

Equity investors looked away from the tech sector and returned to mid-cap and small-cap securities and to one of the most out-of-flavor factors over the past decade, value stocks, all of which outperformed large-cap and growth equity indices in Q4. Investors were positioning their portfolios in anticipation of a successful rollout of the COVID-19 vaccine and a recovery in corporate earnings. During Q4 the S&P 500 returned 12.15%, the MSCI EAFE Index 16.05%, and the MSCI Emerging Markets Index 19.70%. Over 2020, the S&P 500 returned 18.40%, the MSCI EAFE Index 7.82%, and the MSCI Emerging Markets Index 18.31%.

The graph in Figure 4 illustrates the average 20-day realized volatility for S&P 500 and MSCI EAFE as two representative indices. During Q4 2020, the average 20-day realized volatility for the S&P 500 and MSCI EAFE was 17.34% and 15.21%, respectively. Over 2020, the average 20-day realized volatility for the S&P 500 and MSCI EAFE was 26.87% and 19.93%, respectively.

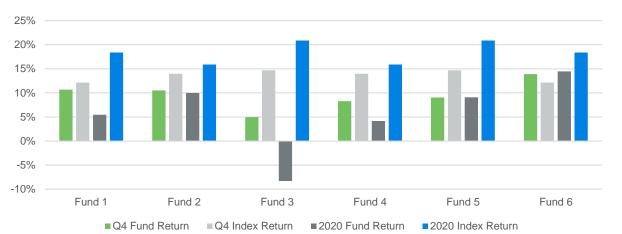


Source: Bloomberg

We selected six different indicative risk-managed fund strategies available within VA products, managed by six different investment managers. Quarterly return and realized volatility profiles of these funds are shown below. The following notes were observed in Q4.

- 1. Fund 6, target volatility fund, had the best absolute return over the quarter, driven by its singular allocation to U.S. large-cap equities, which nearly matched the return of the S&P 500 index.
- 2. Fund 3, a dynamic asset allocation fund with a tail risk hedging program, was the lowest-performing fund over the quarter, driven by its under-allocation to equities and overweighting to fixed income.
- Fund 1, a target volatility and put overlay strategy, was the best performing fund on a risk-adjusted basis over 2020.

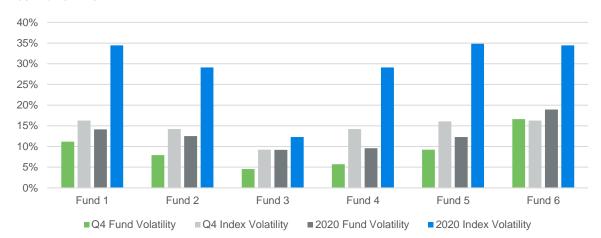
FIGURE 5: FUND PERFORMANCE



Source: Bloomberg.

Benchmarks: Fund 1: S&P 500 TR, Fund 2: MSCI World NR, Fund 3: Russell 3000 TR, Fund 4: MSCI World NR, Fund 5: Russell 3000 TR and Fund 6: S&P 500 TR.

FIGURE 6: FUND VOLATILITY



Source: Bloomberg

Benchmarks: Fund 1: S&P 500 TR, Fund 2: MSCI World NR, Fund 3: Russell 3000 TR, Fund 4: MSCI World NR, Fund 5: S&P 500 TR and Fund 6: S&P 500 TR. Fund 4: MSCI World NR, Fund 5: S&P 500 TR and Fund 6: S&P 500 TR. Fund 6: S&P

Milliman Milliman

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Data has been obtained from the following reports by LIMRA Secure Retirement Institute: U.S. Individual Annuity Sales (2017 Annual, 2018 Annual 2019 Annual and 2020 YTD) and Variable Annuity Guaranteed Living Benefit (GLB) Election Tracking Survey (2020, 3rd Quarter).

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DERIVATIVES SURVEY LONDON

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