Vanguard commentary

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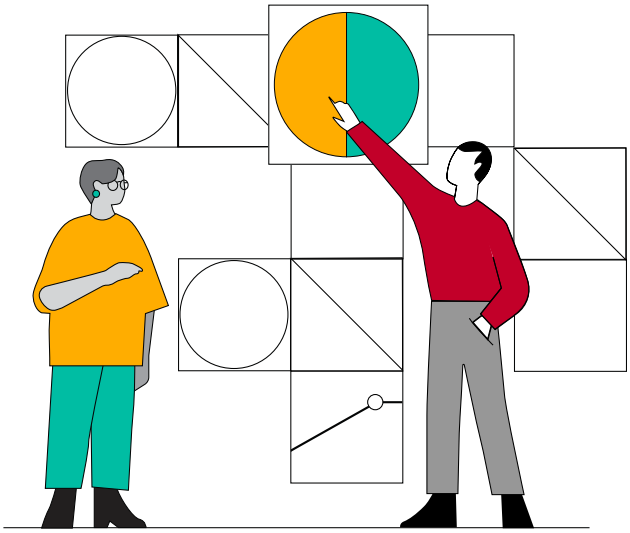
How Americans can benefit from age-appropriate allocations in target-date funds

One in a series of articles spotlighting data from *How America Saves 2023*.



The percentage of participants with professionally managed allocations has grown significantly over the years, from 9% in 2005 to 66% in 2022, driven mostly by the 59% of participants invested in a single target-date fund. The growing use of professionally managed allocations within defined contribution (DC) plans, including target-date funds, is reshaping equity allocations by age and reducing extreme allocations.

When building a portfolio to meet a specific objective, it is critical to select a combination of assets that offers the best chance for meeting that objective, subject to individual investor circumstances and constraints. For a portfolio with broadly diversified investments, its long-term total return and return variability will be largely determined by its strategic asset allocation *(Vanguard's Principles for Investing Success)*.

Authors

Jeffrey Clark, Product Owner, Strategic Retirement Consulting

Kimberly Stockton, Senior Manager, Investment Solutions

Jeffrey Seegers, Investment Analyst, Investment Solutions

Vivien Chen, Investment Analyst, Investment Solutions

In this piece, we examine how this increased alignment to age-appropriate allocations and reduced exposure to extreme equity allocations impact participant retirement outcomes.

Aligning age-based allocations with human capital theory improves retirement outcomes

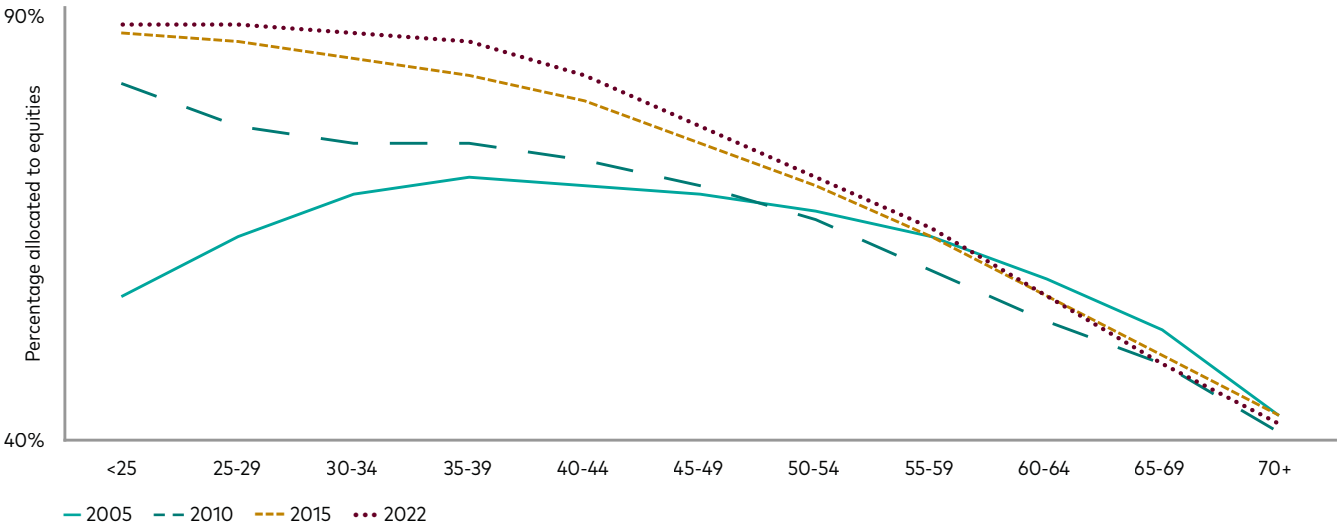
When it comes to retirement income sufficiency in DC retirement plans, portfolio construction along the life-cycle glide path is influenced by human capital theory, meaning risky and risk-mitigating asset mixes should evolve as the participant progresses through their working years and into retirement. Younger workers have high human capital or earning potential in the form of future income, which can be seen as a bond-like asset that enables them to better withstand portfolio risk. Thus, a larger allocation to equities may be appropriate to balance and diversify risk exposure to work-related earnings. As they get older and human capital decreases, equity allocation should decline to manage risk as the participant approaches and transitions into retirement. *(Vanguard's Approach to Target-Date Funds)*

While there is no universally accepted level of appropriate equity exposure or accepted rate at how quickly it should decline over time, many target-date funds have a downward-sloping equity glide path, declining from around 90% equity allocation to about 30%. According to Vanguard research, the growing use of target-date funds and managed account advice has significantly improved average age-based equity allocations to align closer to a typical target-date glide path. In earlier periods (dating back to 2005), we found age-based equity allocations were hump shaped, with younger participants having more conservative allocations, middle-aged participants with the highest exposure, and older participants having exposure at about the same level as younger participants.

FIGURE 1.

Vanguard DC plan participants see improvement in age-appropriate equity allocations

Trend in asset allocation by participant age; average equity allocation, participant weighted



The improvement in age-based allocations is expected to produce more age-appropriate risk and return outcomes for participants. We illustrate this with our proprietary Vanguard Life-Cycle Investing Model (VLCM) by comparing results of a hypothetical hump-shaped glide path based on the 2005 age-based allocations in Figure 1 with one based on a typical downward-sloping glide path, proxied here by the Vanguard Target Retirement Funds glide path.

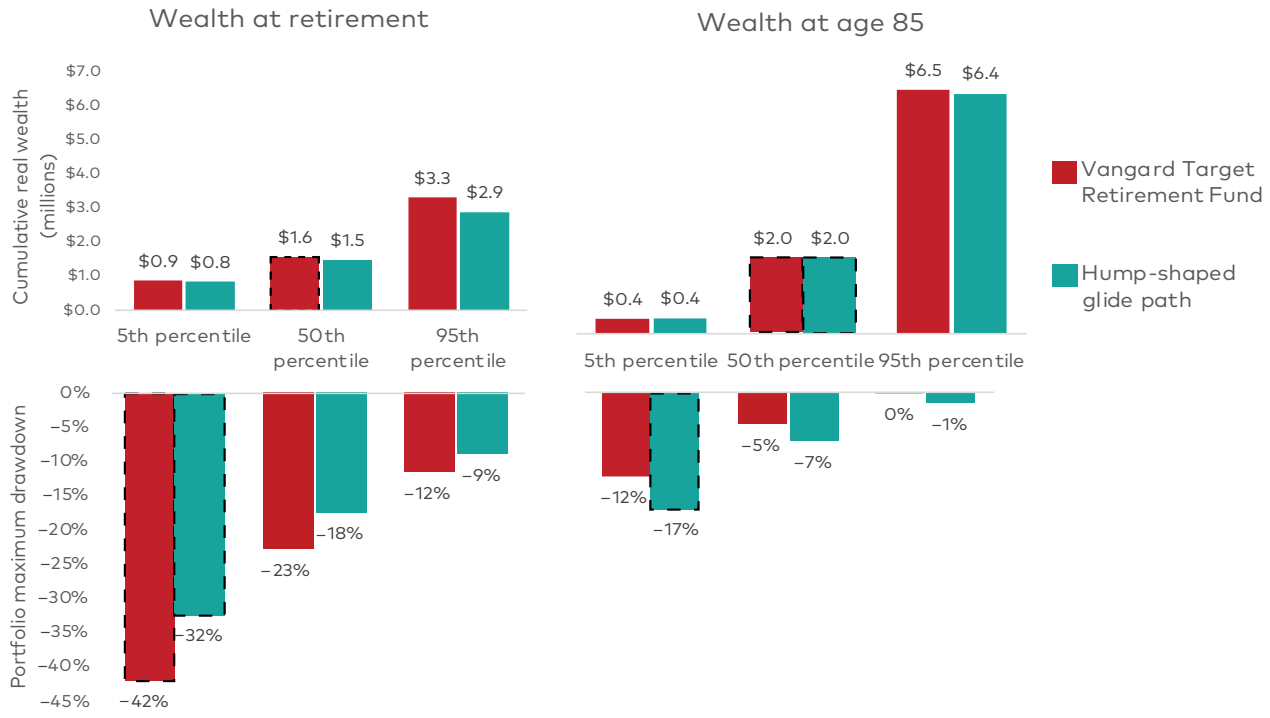
A younger participant underallocated to equity as in the hump-shaped glide path could experience lower expected returns and other longer-term risks, such as a retirement savings shortfall. As seen in Figure 2, the expected wealth at the start of retirement is higher with the age-appropriate Vanguard Target Retirement Fund glide path, with median wealth about $100,000 higher, putting the participant in a better position to meet their retirement spending goals. Expected portfolio maximum drawdown is also slightly higher in the pre-retirement period, but participants are generally better equipped to withstand risk during this period.

On the other hand, a participant nearing or in retirement may not be able to tolerate the portfolio fluctuations that come with assuming too much equity risk. The hump-shaped glide path is expected to generate much greater expected downside risk as measured by portfolio maximum drawdown—almost 50% more than the age-appropriate glide path—while producing similar wealth in retirement. If a participant has $1 million at retirement, the maximum drawdown would result in a portfolio loss of more than $170,000 with the hump-shaped glide path. This is $50,000 higher than the maximum drawdown from the Vanguard Target Retirement Fund glide path with the same assumed wealth at retirement. As we illustrate in the next section, a large decline in assets early in retirement is amplified over time by regular portfolio withdrawals needed to support retirement spending, making it difficult to recover.

FIGURE 2.

Cumulative real wealth in millions (top) and portfolio maximum drawdown (bottom)

for Vanguard Target Retirement Fund and humped-shaped glide path



Source: Vanguard.

Notes: Analysis is based on the Vanguard Life-Cycle Investing Model (VLCM) using the Vanguard Capital Markets Model® (VCMM) asset class simulations as of December 2022. Persona used in analysis is based on Vanguard Target Retirement Fund assumptions. Real wealth is 50th percentile of distribution of cumulative inflation-adjusted portfolio wealth in millions across 10,000 simulations that accounts for portfolio returns, pre-retirement contributions, and postretirement spending. Maximum drawdown is distribution of largest peak-to-trough cumulative portfolio return decline in the stated period across 10,000 simulations.

IMPORTANT: The projections and other information generated by the VCMM regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. Distribution of return outcomes from VCMM are derived from 10,000 simulations for each modeled asset class. Simulations as of December 31, 2022. Results from the model may vary with each use and over time. See the Appendix for more information.

Impact of extreme equity allocations and sequence of returns risk in retirement

As with age-based allocations, on average, we noted a reduction in extreme allocations among participants likely attributable to the rise in professionally managed allocations and advice within retirement plans. The percentage of participants with no allocation to equities has fallen from 13% in 2005 to 3% in 2022. At the other end, the percentage of participants with 100% equities has also fallen, from 21% to 4% over the same period. A participant with no equities early in their career would diminish their portfolio growth potential, while a participant with 100% equities would expose the portfolio to greater market risk than may be appropriate. The latter can be especially problematic for participants nearing or in retirement, as they do not have time to recover from large market downturns.

Using our proprietary Vanguard Capital Markets Model (VCMM), we examine forward-looking risk and return trade-offs of extreme equity allocations in the 30 years after retirement. We see in Figures 3a and 3b that higher equity allocations are expected to provide higher returns, but with wider dispersion and greater downside risk. The median expected 30-year annualized return for the 100% equity portfolio is 6.2% (3a). It is only 40 basis points higher than the more balanced portfolio invested 50-50 in equities and fixed income, but there is much greater uncertainty around that outcome (3b). Additionally, the 100% equity portfolio has an expected median maximum drawdown of –37% over the period, more than twice that of the more balanced portfolio (3c). Such a large portfolio decline could impact planned retirement spending.

Forward-looking portfolio metrics for Portfolios A, B, and C

FIGURE 3A.

Distribution range of 30-year annualized portfolio returns

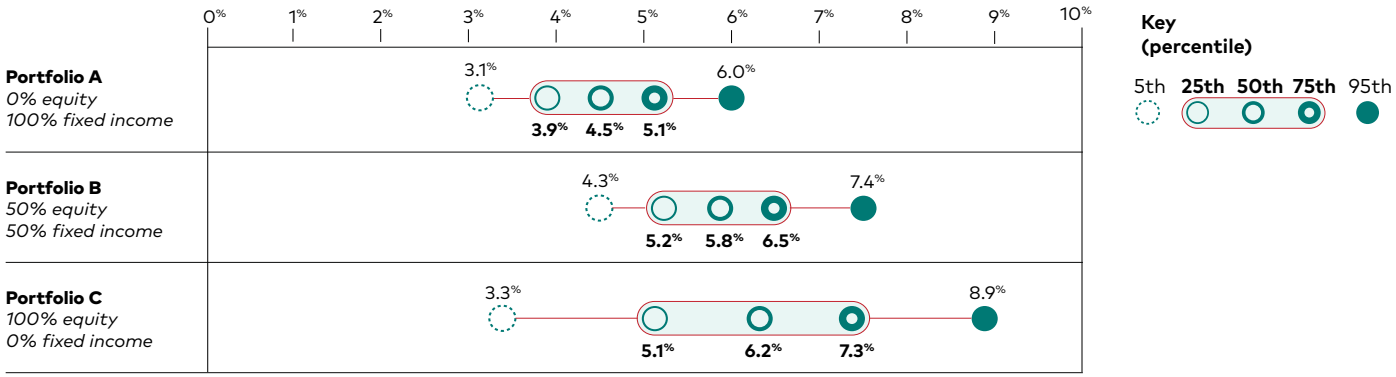


FIGURE 3B.

Distribution range of 30-year annualized standard deviation

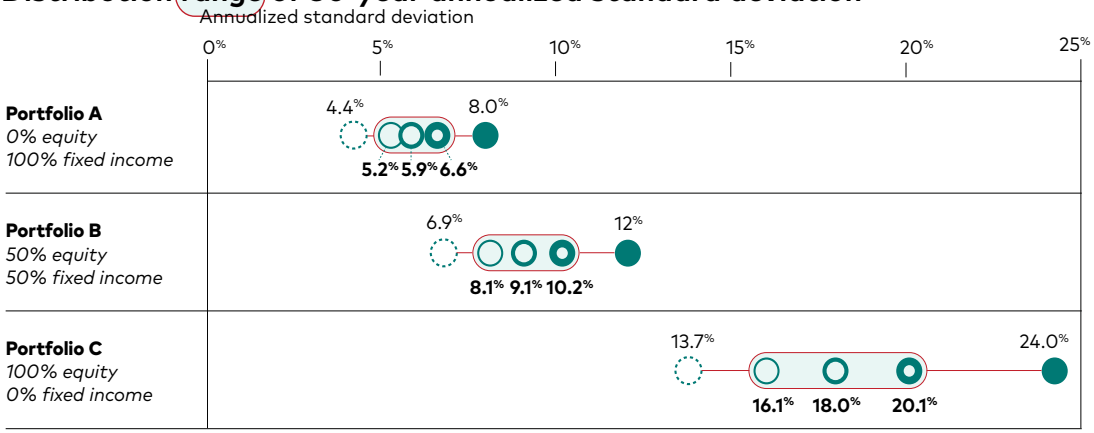
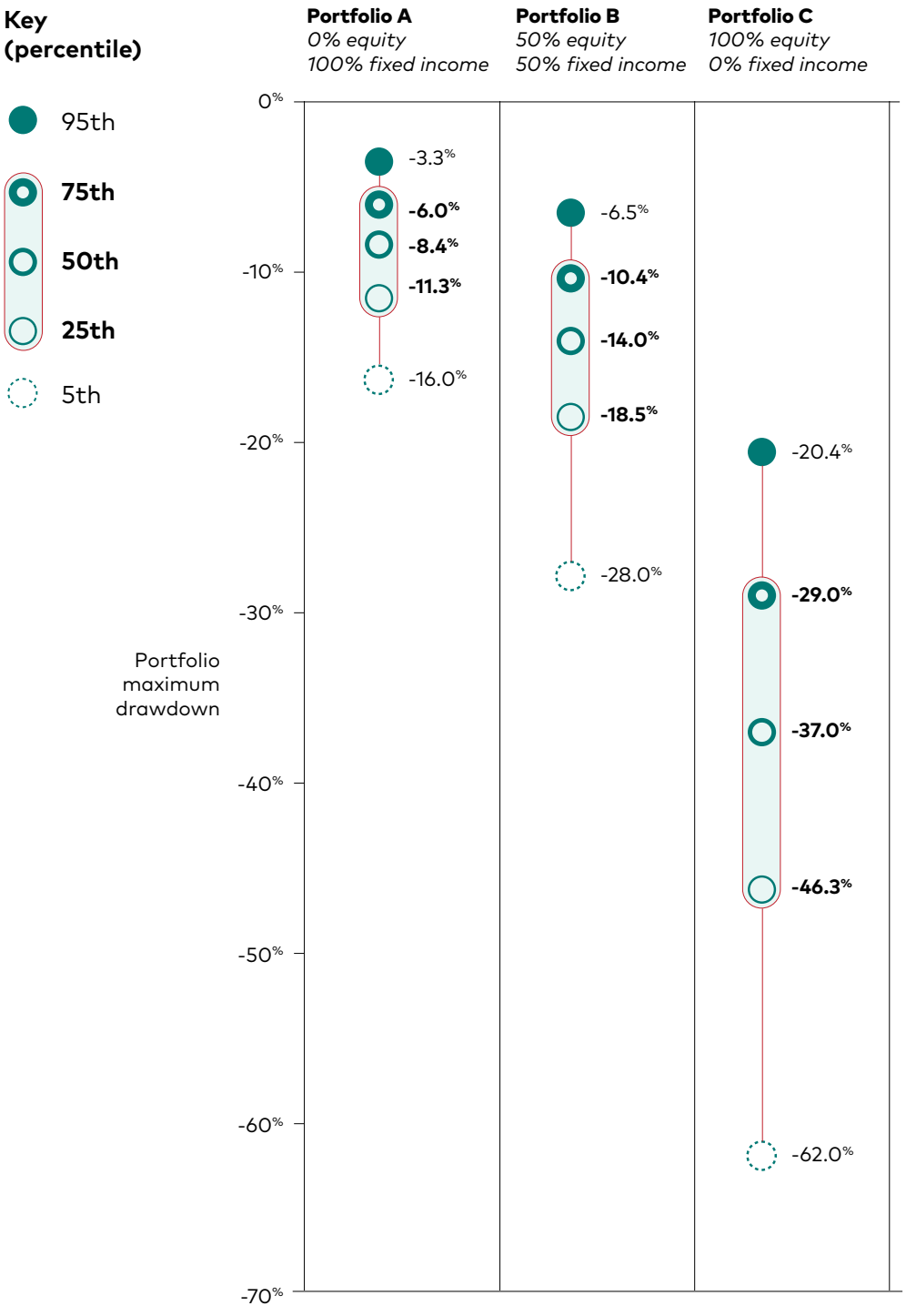


FIGURE 3C.

Distribution range of portfolio maximum drawdown



Source: Vanguard.

Notes: Projections are from Vanguard Capital Markets Model (VCMM) asset class simulations for U.S. equities and U.S. bonds as of June 2023. The asset-return distributions included in these results are drawn from 10,000 VCMM simulations based on market data and other information available as of June 30, 2023. Maximum drawdown is distribution of largest peak-to-trough cumulative portfolio return decline in the stated period across 10,000 simulations. Please see the Appendix for more information with respect to VCMM.

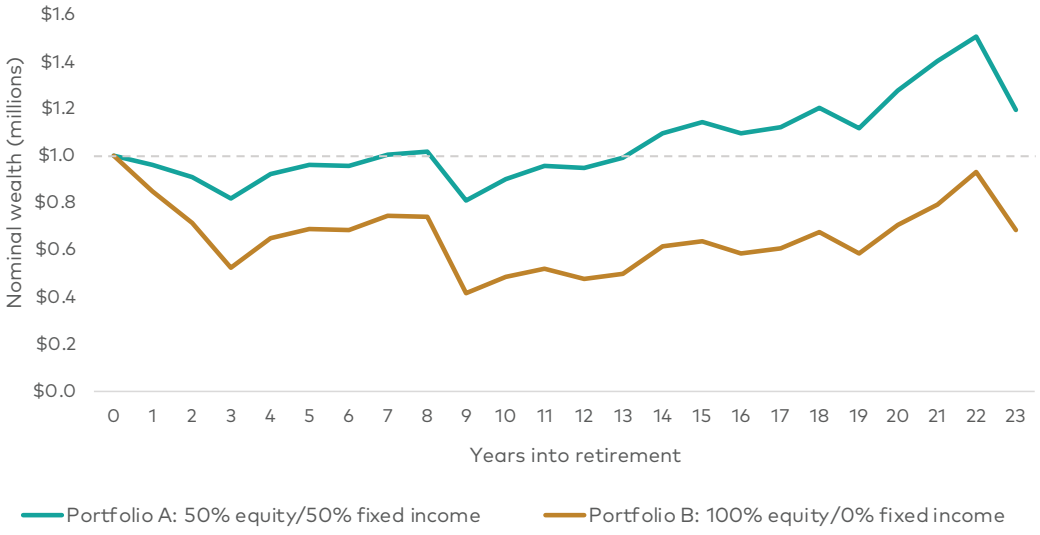
	Asset allocation at start of retirement	Median annualized return	Median annualized standard deviation	Portfolio maximum drawdown
Portfolio A	0% equity/100% fixed income	4.5%	5.9%	–8.4%
Portfolio B	50% equity/50% fixed income	5.8%	9.1%	–14.0%
Portfolio C	100% equity/0% fixed income	6.2%	18.0%	–37.0%

Furthermore, overly aggressive equity allocations like the 100% equity portfolio above can amplify the phenomenon known as *sequence of returns* risk early in retirement when portfolio withdrawals begin. If markets decline at the beginning of a participant's decumulation phase, it can be difficult for them to fully recover their losses when market conditions improve. This could lead to a savings shortfall later in retirement.

We can illustrate this by looking at history: What if a participant retired just before the large market and economic downturns of the early 2000s? Using actual historical returns from 2000 through 2022, Figure 4 shows the resilience of a balanced, 50-50 equity and fixed income portfolio (Portfolio A) compared with an all-equity portfolio (Portfolio B) when experiencing a market downturn timed at the start of retirement spending and portfolio withdrawals. Both portfolios have a balance of $1 million at the start of retirement and spend an inflation-adjusted $40,000 (4% of initial portfolio value) every year in retirement. The annual portfolio withdrawals compounded losses from poor investment returns, and portfolios with more equities suffered more, leaving fewer assets to generate growth during future market recoveries. Despite robust equity returns in later years, Portfolio B, with its 100% equity exposure, was still unable to recover from the large drop in value early in retirement, putting the longevity of the portfolio at risk. Its ending value is roughly half that of the more balanced Portfolio A.

FIGURE 4.

Post-retirement growth of $1 million from 2000 to 2022 for Portfolio A and Portfolio B



Sources: Vanguard calculations using yearly returns from January 2000 through December 2022. Portfolio returns are calculated on a time-weighted basis. Equities represented by Dow Jones U.S. Total Stock Market Index (formerly known as the Dow Jones Wilshire 5000 Index) through April 22, 2005; MSCI US Broad Market Index through June 2, 2013; and CRSP US Total Market Index thereafter. Fixed income represented by Bloomberg U.S. Aggregate Bond Index through December 31, 2009; Bloomberg U.S. Aggregate Float Adjusted Index thereafter. The performance of an index is not an exact representation of any particular investment, as you cannot invest directly in an index.

Notes: The chart shows the change in portfolio wealth following a large market downturn coinciding with retirement starting in January 2000. Beginning portfolio value is $1 million and annual portfolio withdrawals are 4% of the initial value adjusted for inflation as represented by the Consumer Price Index for All Urban Consumers (CPI-U). The largest annual wealth decline is the largest negative year over year change in cumulative portfolio wealth, inclusive of annual retirement spending withdrawal and portfolio returns.

	Asset allocation at start of retirement	Annualized total return	Annualized standard deviation	Largest annual wealth decline	Ending wealth
Portfolio A	50% equity/50% fixed income	5.7%	9.8%	–20.8%	$1.2M
Portfolio B	100% equity/0% fixed income	6.5%	18.7%	–43.6%	$0.7M

Conclusion

We have observed positive trends over the years with improvements in plan design and participant portfolio construction. The expanding use of professionally managed allocations, including target-date funds, has contributed to age-based allocations more closely aligned with human capital theory. Our historical and forward-looking analyses illustrate how these developments will lead to better retirement outcomes for participants.

Citations

How America Saves 2023. Vanguard, June 2023.

Vanguard's Approach to Target-Date Funds. Vanguard, November 2022.

Vanguard Target Retirement Funds and Trusts Quarterly Review. Vanguard, September 2023.

Vanguard's Principles for Investing Success. Vanguard, 2023.

Appendix
Life-cycle assumptions use for Vanguard Target Retirement Funds

Input	Assumption	Notes
Starting age	25	
Horizon age	111	
Retirement age	65	
Social Security withdrawal age	65	
Risk aversion	Moderately conservative	
Saving rate (as % of salary)	8.8%–12.0%	Saving rate increases over time because of the expectation of savings escalation for retirement plan enrollees as the investor approaches their retirement date
Starting real salary	$52,000	For investor in the workforce at age 25
Ending real salary	$75,000	For investor starting at age 25 and retiring at age 65. We add productivity growth and inflation to this over time
Wage scale	Social Security Administration	
Average Wage Index		
Total replacement ratio	79%	For ending salary of $75,000 and saving rate of 15%. Single earner – replacement ratio = 79%*
Social Security replacement ratio	37%	Based on real monthly Social Security benefit estimates for ending salary of about $75,000 and saving rate of 15%.
Single earner – SS RR = 37%		
DB replacement ratio	None (0%)	
TDF replacement ratio	42%	Total replacement ratio—Social Security replacement ratio—DB replacement ratio
Spending rule	Fixed real dollar with sustainability adjustment	Withdrawal amounts bounded on higher end by replacement ratio and on lower end by determining sustainable withdrawal amount given years of spending the portfolio is expected to support

Asset returns: Vanguard Capital Markets Model

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The VCMM projections are based on a statistical analysis of historical data. Future returns may behave differently from the historical patterns captured in the VCMM. More important, the VCMM may be underestimating extreme negative scenarios unobserved in the historical period on which the model estimation is based.

The Vanguard Capital Markets Model® is a proprietary financial simulation tool developed and maintained by Vanguard's primary investment research and advice teams. The model forecasts distributions of future returns for a wide array of broad asset classes. Those asset classes include U.S. and international equity markets, several maturities of the U.S. Treasury and corporate fixed income markets, international fixed income markets, U.S. money markets, commodities, and certain alternative investment strategies. The theoretical and empirical foundation for the Vanguard Capital Markets Model is that the returns of various asset classes

reflect the compensation investors require for bearing different types of systematic risk (beta).

At the core of the model are estimates of the dynamic statistical relationship between risk factors and asset returns, obtained from statistical analysis based on available monthly financial and economic data from as early as 1960. Using a system of estimated equations, the model then applies a Monte Carlo simulation method to project the estimated interrelationships among risk factors and asset classes as well as uncertainty and randomness over time. The model generates a large set of simulated outcomes for each asset class over several time horizons. Forecasts are obtained by computing measures of central tendency in these simulations. Results produced by the tool will vary with each use and over time.

The Vanguard Life-Cycle Investing Model (VLCM) is designed to identify the product design that represents the best investment solution for a theoretical, representative investor who uses the target-date funds to accumulate wealth for retirement. The VLCM generates an optimal custom glide path for a participant population by assessing the trade-offs between the expected (median) wealth accumulation and the uncertainty about that wealth outcome for thousands of potential glide paths. The VLCM does this by combining two sets of inputs: the asset class return projections from the VCMM and the average characteristics of the participant population. Along with the optimal custom glide path, the VLCM generates a wide range of portfolio metrics such as a distribution of potential wealth accumulation outcomes, risk and return distributions for the asset allocation, and probability of ruin, such as the odds of participants depleting their wealth by age 95.

The VLCM inherits the distributional forecasting framework of the VCMM and applies to it the calculation of wealth outcomes from any given portfolio.

The most impactful drivers of glide path changes within the VLCM tend to be risk aversion, the presence of a defined benefit plan, retirement age, saving rate and starting compensation. The VLCM chooses among glide paths by scoring them according to the utility function described and choosing the one with the highest score. The VLCM does not optimize the levels of spending and contribution rates. Rather, the VLCM optimizes the glide path for a given customizable level of spending, growth rate of contributions, and other plan sponsor characteristics.

A full dynamic stochastic life-cycle model, including optimization of a savings strategy and dynamic spending in retirement is beyond the scope of this framework.

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Investments in target-date funds are subject to the risks of their underlying funds. The year in the fund name refers to the approximate year (the target date) when an investor in the fund would retire and leave the workforce. The fund will gradually shift its emphasis from more aggressive investments to more conservative ones based on its target date. An investment in target-date funds is not guaranteed at any time, including on or after the target date.

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