Vanguard

Vanguard research | Portfolio perspectives May 2023

Making the grade: A goals-based framework for 529s

- Investors planning to help fund a child's college education face a complicated matrix of savings and investing decisions.
- Vanguard research provides insights into what investors with different incomes can expect to pay for college. We use these insights to establish baseline savings rates for different investor cohorts—which then inform our assessment of 529 plan asset allocations that can help investors maximize the risk-adjusted value of their college savings.
- Vanguard has developed a glide path for our Target Enrollment Portfolios that seeks to maximize this risk-adjusted value for most investors saving for college. In this *Portfolio Perspectives*, we elaborate on the drivers of this glide-path design: Vanguard's capital market risk-return expectations; investor risk preferences; and college costs and savings rates. We also explore how deviations from baseline assumptions about these drivers might change the glide path.

529 101: Goals-based investing and saving for college

Parents saving for their child's college education wrestle with a number of unknowns: What school will the child attend? How much will the school cost? What kinds of grants or loans could be available? How much should they save to help their child pay the bill? Even as they grapple with these questions, however, they also need to determine what asset allocation will best suit their needs.

For parents who use a 529 plan—which allows investors to save for college while benefiting from the advantageous tax treatment of these savings—the asset allocation decision is crucial. Vanguard has developed a 529 plan asset allocation framework that can help college savers evaluate the relationship among expected college costs, savings behavior, and appropriate asset allocation.

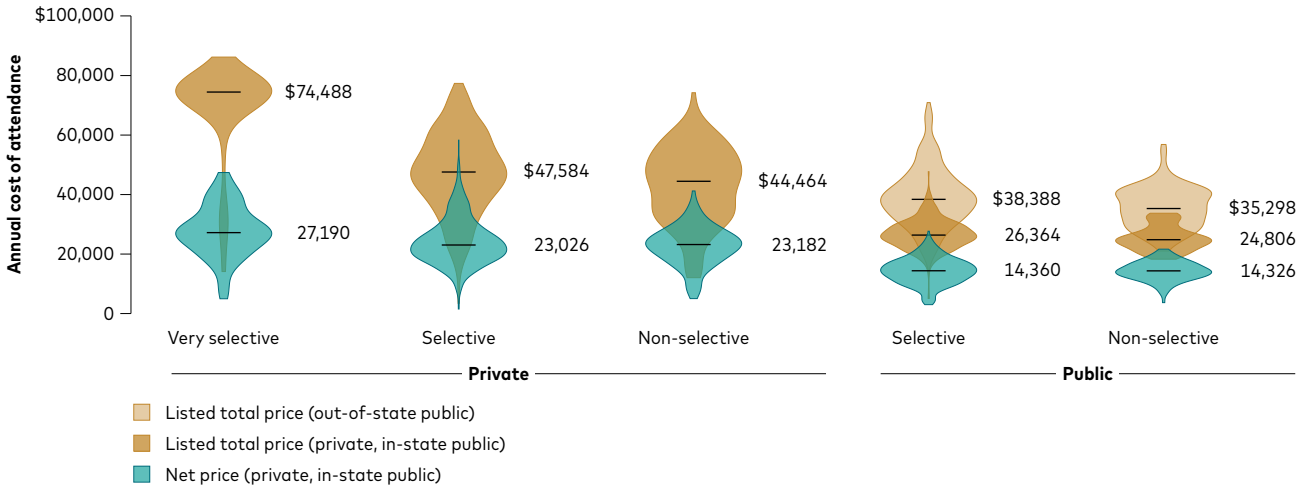
Getting smart on college costs

Higher education costs can vary significantly across schools, or even among different students at the same school. Vanguard research has shown that the "sticker price" of a college education can mislead an investor into setting an unnecessarily high target, as it often differs significantly from the true out-of-pocket cost (the "net" cost).[1] While individual financial aid and loan considerations introduce variability, our work on the "net price" of college provides clarity about how much investors should aim to save (see **Figure 1**).

FIGURE 1

Depending on type of school and family income and assets, the gap between listed total pricing and net pricing can be quite wide

Average listed total and net price of private and public colleges by selectivity, 2019–2020



Notes: Figure shows average listed total pricing and net pricing across private not-for-profit and public four-year U.S. institutions by selectivity for the 2019–2020 school year. Median values are called out with horizontal lines. We used the 2018 Carnegie Classifications (carnegieclassifications.iu.edu) to remove any special-focus schools from the private universe. Our data is from the National Center for Education Statistics' Integrated Postsecondary Education Data System (IPEDS), which only reports net cost information for private or in-district/in-state students for public schools; out-of-state net pricing for public schools is not available. Listed total pricing includes tuition and fees, books and supplies, on-campus room and board (if available; otherwise, off-campus not-with-family housing is used), and other campus expenses. Selectivity is based on average admissions rates from the 2010–2019 school years. We define public schools as selective if the average admission rate is lower than or equal to 80% and as non-selective if that rate is higher than 80%. We define private schools as very selective if the average admissions rate is less than or equal to 40%, as selective if that rate is between 40% and 80%, and as non-selective if that rate exceeds 80%.

Sources: Vanguard calculations, using data from IPEDS; available at nces.ed.gov/ipeds.

IMPORTANT: The projections and other information generated by the Vanguard Capital Markets Model® (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. VCMM results will vary with each use and over time. See Appendix 1 for more information about the VCMM.

1 For more detail, see Kahler and Felton (2022).

These net price estimates allow us to more accurately determine the savings target (as a percentage of income) necessary to meet these costs (see **Figure 2**).[2] Our calculation also depends on assumptions about the asset allocation for these savings and return expectations.[3]

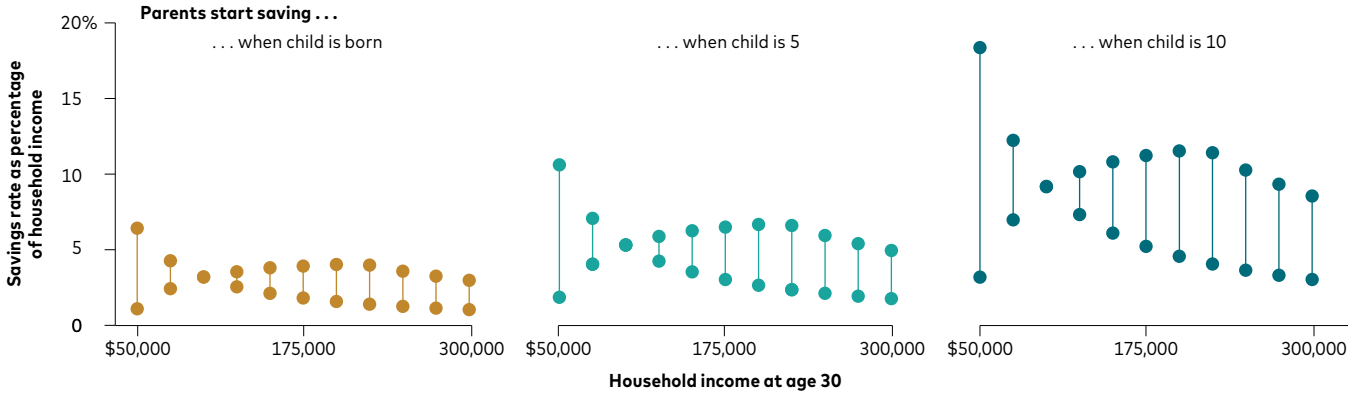
It would seem intuitive that lower-income investors' savings rates typically need to be higher than those of their wealthier counterparts. However, these investors will also tend to qualify for higher levels of need-based aid—aid that reduces their savings target (and, therefore, the savings rate needed to reach that target). We see a much more pronounced effect on the savings rate from starting to save later (when the child is 5 or 10 rather than a newborn). Particularly for investors with annual household income between $75,000 and $150,000, delaying savings can lead to a tripling (or more) of the required savings rate. While saving from birth is our baseline, those seeking an asset allocation solution for a later saver must also consider the higher required rate of savings.

How to invest these savings? That decision depends on the optimal trade-off between expected capital market returns and risks during both the college-savings period and the college-spending period.

FIGURE 2

When parents start saving when their child is born, the average contribution rate is significantly lower than if they wait

Contribution ranges by child age at time of initial contribution and household income level



Notes: Savings rates by age of child when savings begin are shown as a percentage of household income. Projections are for a family with two 30-year-old parents and one child born in the current year. Student is assumed to start college at age 18 and attend for four consecutive years. Parents are assumed to contribute income in equal amounts; child is assumed to have no personal assets. Schools are assumed to be either public or private, with the private category limited to not-for-profit four-year colleges. Our calculations use listed total annual cost averages—non-selective in-state public, $25,000; average private, $50,000; and very selective private, $70,000—determined from data from the National Center for Education Statistics' Integrated Postsecondary Education Data System (IPEDS).

Sources: Vanguard calculations, using data from VCMM, glide-path construction from Donaldson et al. (2020), which is specifically built for 529 plans, the National Center for Education Statistics' Integrated Postsecondary Education Data System (IPEDS; available at nces.ed.gov/ipeds), and a wage scale modeled off the U.S. Social Security Administration's wage index. See Appendix 1 for more information about the VCMM.

IMPORTANT: The projections and other information generated by the Vanguard Capital Markets Model (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 are as of December 31, 2020. Results from the model may vary with each use and over time. For more information on VCMM, see Appendix 1.

2 "Savings target" here is defined as supporting a 50% probability of meeting the full out-of-pocket tuition.

3 Net price estimates were developed using wealth assumptions ranging from between 50% and 200% of household income. Savings and return expectations were calculated using the glide path for Vanguard Target Enrollment Portfolios and VCMM return projections. For important information about the VCMM, see Appendix 1.

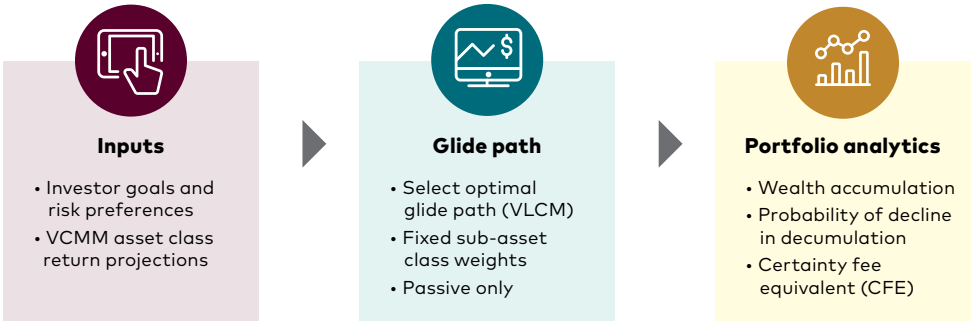
Vanguard's approach to goals-based asset allocation

Establishing a reasonable plan to save for college tuition is generally an attainable goal for investors. Like any goals-based asset allocation solution, a 529 plan should have the attainment of its end goal be the central focus of its design. When designing an investment portfolio for an investor in a 529 plan, Vanguard starts with broadly diversified portfolios and an eye towards the long term. The college savings goal then becomes a key area of focus within that long-term picture. After that, the framework that Vanguard applies to goals-based investing can be used.

When it comes to selecting the optimal asset allocation for a goals-based investing strategy, Vanguard splits this decision into three key stages (**Figure 3**). The primary way that we engage with these stages is through the Vanguard Life-Cycle Model (VLCM). As detailed by Aliaga-Díaz et al. (2021), the VLCM uses financial utility analysis to determine the trade-offs between returns, spending, and portfolio stability in determining an optimal asset allocation. The resulting asset allocation recommendation is provided in the form of a glide path, or series of asset allocations over time.

FIGURE 3

The three key stages of Vanguard glide-path construction



Source: Vanguard.

The current glide path for Vanguard Target Enrollment Portfolios (**Figure 4**), introduced by Donaldson et al. (2020), was constructed through this process.[4]

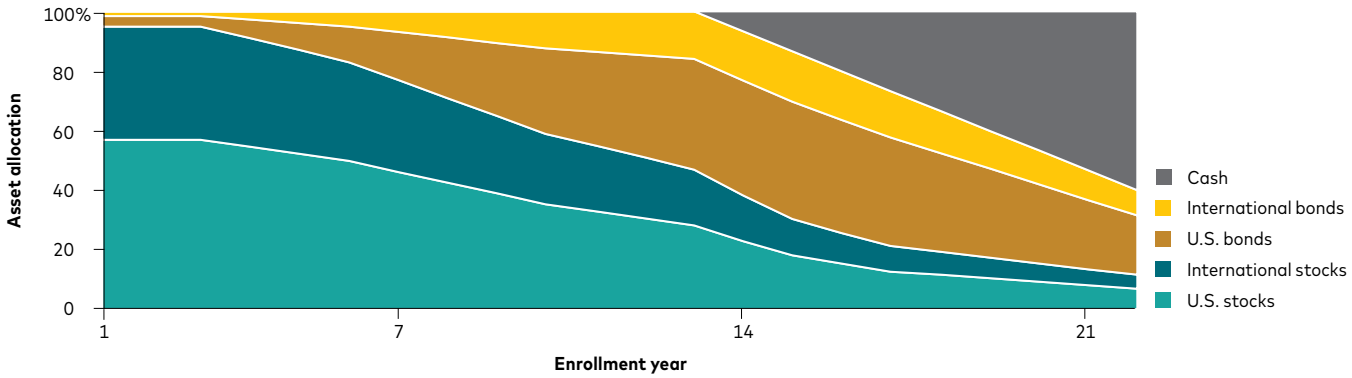
Just as this framework and the VLCM can be leveraged to select an optimal glide path, they can also be used to evaluate when it may be reasonable to select a different glide path. Here we focus on the final stage of the methodology shown in Figure 3—portfolio analytics—which informs the materiality of glide-path difference for the investor via our probability of success and certainty fee equivalent (CFE) metrics. Probability of success simply shows the likelihood of an investor meeting their spending goal, defined here as the estimated annual cost of college. The CFE shows the price, in basis points (bps), that an investor would be willing to pay to receive an optimal glide path; it reflects the value of customization that an investor can receive, and it will be higher for investors with the most unique needs or characteristics.

Final exams: Evaluating the glide path for Vanguard Target Enrollment Portfolios

Determining the net price of college helps us understand how investors might best set their savings and spending targets. Our goals-based investing approach informs how we determine an optimal asset allocation—and it also allows us to evaluate the appropriateness of that choice for different investors. When we combine all of these tools and insights, we have our framework for building and evaluating 529 plan glide paths.

FIGURE 4

Asset allocation in the Vanguard Target Enrollment Portfolio glide path



Source: Vanguard.

4 For more detail, see Kahler and Felton (2022).

Our glide path for Vanguard Target Enrollment Portfolios path serves as our starting point in this analysis. We then update our inputs to that glide path by incorporating our college cost research, as it provides an improved lens for effective planning. Our investor now saves with the intention of having a reasonable expectation of meeting the net price of college, and their savings and spending targets reflect that (**Figure 5**).

FIGURE 5

Inputs and values used in the glide path for Vanguard Target Enrollment Portfolios

Input	Value
Savings target	Fixed (real) dollar amount over 18 years based on college costs
Spending target	College tuition over 4 years
Spending rule	Wealth/number of years
Risk aversion	Baseline
Loss aversion	High
Household assets	Average
Age of child when saving begins	Birth

Source: Vanguard.

Reviewing our Target Enrollment Portfolios, we see that our glide path remains well-aligned with our target investor.[5] However, this only reflects the value we would provide a single baseline investor. To provide further clarity to the value these portfolios could provide, we then test a range of investor personas, with variations in the following characteristics:[6]

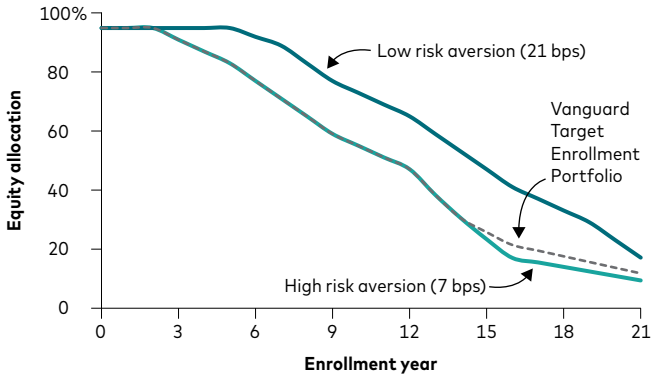
- Savings pattern (below average, above average)
- Spending target (higher, lower)
- College inflation (greater than expected)
- Household assets (higher, lower)
- Age of child when saving starts (5, 10)
- Risk aversion (higher, lower)

This sensitivity analysis was conducted using the VLCM to evaluate this range of investor personas, allowing us to capture a broad range of individuals who would access Vanguard Target Enrollment Portfolios for their college savings goals. We find that a limited number of investor personas gain notable value in customizing the glide path. Specifically, we observe low-to-moderate benefit to customization for investors who exhibited either non-standard risk aversion or a later starting age for savings (**Figure 6**).

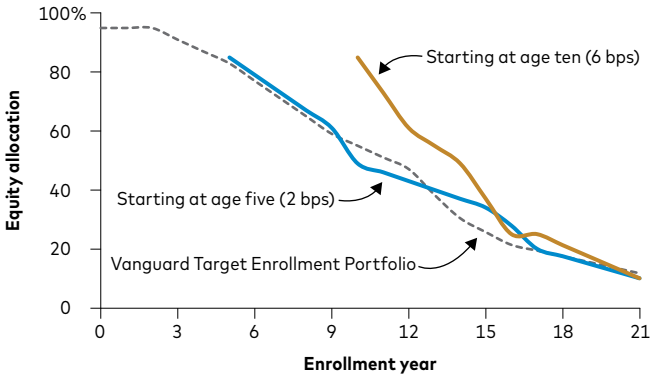
FIGURE 6

The impact of risk aversion, and the impact of starting to save late

a.



b.



Source: Vanguard.

5 Investor shows CFE of 0 basis points when optimized against Vanguard Target Enrollment Portfolio.

6 Comparisons run using VCMM simulations as of September 30, 2018. See Appendix 1 for more information about the VCMM.

In the case of risk-aversion customization, investors with significantly lower risk aversion than the typical Vanguard Target Enrollment Portfolio investor—in other words, risk-seeking investors—could receive 21 bps of value by taking additional equity risk. While this value is material, such investors may wish to consider achieving this risk exposure by using a Target Enrollment Portfolio with a later enrollment date, as that portfolio will have a higher level of equity exposure. Conversely, investors with higher risk aversion could find 7 bps of value in taking a more conservative approach during the college years—and they could execute that approach by shifting to a Target Enrollment Portfolio with an earlier enrollment date.

Investors who start saving later (tested here at child ages 5 and 10) receive small benefit (2 and 6 bps) from a customized glide path from the assumption of additional equity risk. For the investor who begins saving when the child is 10, this results in a steeper glide path that more quickly de-risks, but on average increases equity exposure. Although we detect some customization benefit, its small size highlights the flexibility of our framework to accommodate a wide range of investor preferences.

We investigated additional investor personas to see if taking their preferences into account would result in any change to the glide path for Vanguard Target Enrollment Portfolios. It did not. This indicates that the glide path for the Target Enrollment Portfolios remains optimal even for these investors. College-cost differences and savings behavior changes elicit no recommended changes to the glide path. As these additional investor personas effectively test the validity of the glide path in the context of a mismatch between savings and spending, our analysis confirms our intuition that investors should not seek to address insufficient savings using asset allocation.

Conclusion

When considering a glide path solution for a college savings goal, Vanguard proposes an investment framework where the intent and specification of the goal inform the appropriateness of the glide path. Within this framework, we place an emphasis on appropriate goal-setting. That emphasis allows us to leverage Vanguard research on planning for college costs, which informs our investor persona and spending targets. Using these enhanced spending targets, we can validate that our Vanguard Target Enrollment Portfolio is not only appropriate, but robust in utility for a number of different scenarios. Moving forward, this framework allows us to focus more sharply on the investor preferences that directly affect the value of asset allocation. We can then determine the opportune moments to tailor asset allocation to more appropriately meet an investor's goals.

References

Aliaga-Díaz, Roger, Harshdeep Ahluwalia, Victor Zhu, Scott Donaldson, Ankul Daga, and David Pakula, 2021. *Vanguard's Life-Cycle Investing Model (VLCM): A General Portfolio Framework for Goals-Based Investing*. Valley Forge, Pa.: The Vanguard Group.

Davis, Joseph, Roger Aliaga-Díaz, Harshdeep Ahluwalia, Frank Polanco, and Christos Tasopoulos, 2014. *Vanguard Global Capital Markets Model*. Valley Forge, Pa.: The Vanguard Group.

Donaldson, Scott, Victor Zhu, Harshdeep Ahluwalia, and Roger Aliaga-Díaz, 2020. *Vanguard's Approach to 529 Investing: A More "Progressive" Glide-Path Design for Goals-Based Investing*. Valley Forge, Pa.: The Vanguard Group. Available at https://corporate.vanguard.com/content/dam/corp/research/pdf/Vanguards-approach-to-529-investing-A-more-progressive-glide-path-design-US-ISG529A_082020_Online-2.pdf.

Kahler, Jonathan and Clifford Felton, 2022. *What's My Target? Estimating College Costs*. Valley Forge, Pa.: The Vanguard Group. Available at https://corporate.vanguard.com/content/dam/corp/research/pdf/ISGWTAR_052022_Online_Final.pdf.

Ma, Jennifer, and Matea Pender, 2021. *Trends in College Pricing and Student Aid 2021*. New York: College Board. Available at https://research.collegeboard.org/media/pdf/trends-college-pricing-student-aid-2021.pdf.

National Center for Education Statistics' Integrated Postsecondary Education Data System (IPEDS). Available at https://nces.ed.gov/ipeds.

Appendix 1

About the Vanguard Capital Markets Model
IMPORTANT: The projections and other information generated by the Vanguard Capital Markets Model regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. VCMM results will vary with each use and over time. VCMM results presented are as of December 31, 2020.

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 VCMM is a proprietary financial simulation tool developed and maintained by Vanguard's Investment Strategy Group. 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. 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 asset-return distributions shown in this paper are drawn from 10,000 VCMM simulations based on market data and other information available. The model uses index returns, without any fees or expenses, to represent asset classes. Taxes are not factored into the analysis. See the research paper *Vanguard Global Capital Markets Model* (Davis et al., 2014) for further details.

Appendix 2

The Vanguard Life-Cycle Investing Model

The Vanguard Life-Cycle Investing Model (VLCM) is a proprietary model for glide-path construction that can assist in the creation of custom investment portfolios for retirement as well as nonretirement goals, such as saving for college. The main principle behind life-cycle investing and VLCM is to maximize the expected utility of consumption and wealth for people's financial goals. The VLCM selects optimal glide paths for given risk tolerances, goals, and demographic characteristics by assessing the trade-offs, across someone's life and/or time horizon, between taking investment risk to increase potential wealth and spending and the downside of increased uncertainty and volatility associated with more investment risk. Thousands of glide paths are compared, and the glide path with the highest utility score (the one that strikes the optimal balance between expected outcome and risk) is the best solution for the investor's preferences, circumstances, and goal.

The VLCM utilizes the distributional forecasting framework of the Vanguard Capital Markets Model (VCMM) and uses asset return simulations to calculate consumption and wealth outcomes for any glide path across 10,000 future possible scenarios.

Appendix 3

529 methodology

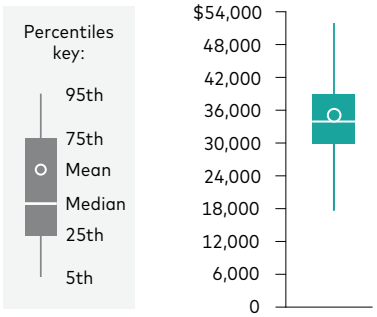
Our methodology to validate and optimize the Vanguard Target Enrollment Portfolios involves three key elements across three distinct stages:

- **Inputs.** We start with a stylistic set of inputs, wherein the investor saves a fixed amount that increases with inflation over an 18-year period (typically, from the birth of a child to when they would begin college), to fund college education over a 4-year period.
- **Glide path.** We then leverage the asset return projections from Vanguard Capital Markets Model (VCMM) to identify the optimal glide path using Vanguard Life-Cycle Investing Model (VLCM). We implement this using a fixed sub-asset allocation with home bias and indexed investments to minimize costs.
- **Portfolio analytics.** Our final step is to evaluate the solution recommended by the VLCM by using a set of portfolio metrics. These include wealth accumulation by age 18 and the probability of a 5% decline over any of the years (**Figures 7a and 7b**).

FIGURE 7

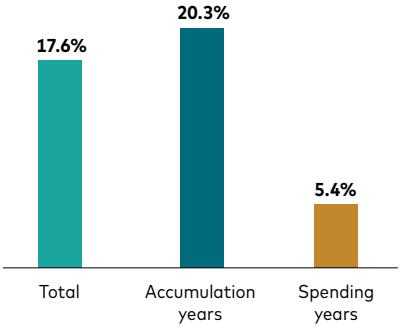
Portfolio analytics

a. Wealth accumulation at age 18*



* Assumes annual real savings of $1,200.

b. Probability of decline in any year



Source: Vanguard.

Authors

Ankul Daga, CFA

Bryan Hassett, CFA

Connect with Vanguard®
vanguard.com

For more information about any 529 college savings plan, contact the plan provider to obtain a Program Description, which includes investment objectives, risks, charges, expenses, and other information; read and consider it carefully before investing. If you are not a taxpayer of the state offering the plan, consider before investing whether your or the designated beneficiary's home state offers any state tax or other benefits that are only available for investments in such state's qualified tuition program. Vanguard Marketing Corporation serves as distributor for some 529 plans.

All investing is subject to risk, including the possible loss of the money you invest.

CFA® is a registered trademark owned by CFA Institute.

Vanguard®

ISGMTG 022024