

Vanguard's approach to 529 investing: A more "progressive" glide-path design for goals-based investing

Vanguard Research

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- The 529 college savings plan is designed to assist investors who are saving for the primary goal of college funding. A majority of 529 assets are held in glide-path based investments, in which the allocation between equity and fixed income funds automatically adjusts as the beneficiary ages, with the goal of reducing risk over time.
- This paper introduces a new glide-path construction methodology for 529s: Vanguard's target enrollment portfolios.
- The target enrollment portfolios for 529 investing are derived from Vanguard's Life Cycle Investing Model (VLCM). VLCM is a proprietary quantitative model developed by our Investment Strategy Group for the construction of glide paths for retirement and nonretirement goals such as education savings.
- Our VLCM framework for goals-based investing allows the incorporation of important drivers of glide-path design. These are: 1) capital market risk-return expectations; 2) different degrees of investor risk tolerance; 3) investor aversion to myopic losses (negative returns); and 4) an assessment of college costs and contribution rates required to successfully meet funding goals.

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Investors prefer glide-path investing

Generally, 529 account owners choose from a menu of investment options that include stock, bond, balanced, and short-term reserve or stable value funds. They also may elect to use glide-path investments such as Vanguard age-based tracks or Vanguard target enrollment portfolios. These invest in the same funds but automatically adjust the allocation to each fund as the beneficiary ages, with the goal of reducing risk over time.

Among total 529 assets, Vanguard research (De Luca, 2019) has shown that 55% are held in pure age-based glide-path allocations, while 45% are either self-directed or partially invested in age-based allocations. However, even those mixed investors hold an average 72% of their portfolio in age-based tracks. The popularity of glide-path options indicates that many account owners find value in a portfolio option that automatically shifts to lower equity allocations as their beneficiary approaches college age.

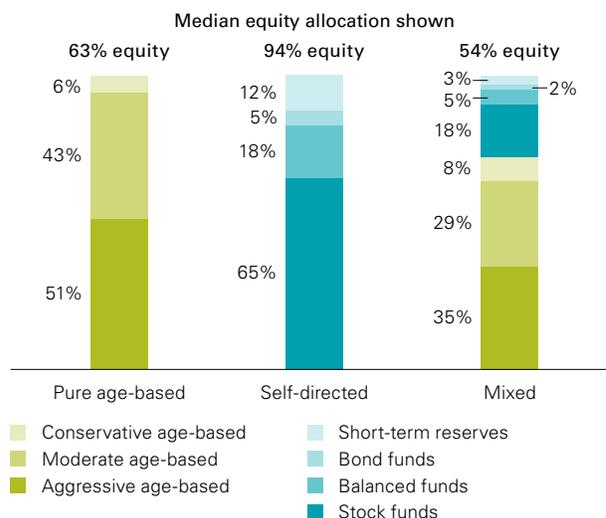
Current 529 assets are aggressively allocated

To provide flexibility and a solution better matched to an investor's self-determined risk tolerance, Vanguard currently offers three age-based savings tracks: aggressive, moderate, and conservative. An investor's account moves along its track through a set of progressively more conservative investment portfolios. As shown in Figure 1, pure age-based investors tend to follow aggressive and moderate tracks, while self-directed investors allocate a majority of their portfolios to stock funds.

Mixed investors also tend to prefer aggressive and moderate allocations in the age-based component and stock funds in the self-directed component. As illustrated in Figure 2, the typical self-directed investor holds a 100% equity portfolio until the beneficiary turns 14, whereas pure age-based investors, who also start at 100% equity, begin reducing risk when the beneficiary turns 5. By the time beneficiaries reach college age, pure age-based investors hold very conservative portfolios, while self-directed investors continue to hold equity allocations of more than 60%. Thus, although self-directed investors tend to be more aggressive, they also show a tendency to glide asset allocation with age.

Figure 1. Investment allocation

Average allocation to fund type by investment style



Sources: Vanguard and Ascensus, 2019.

Notes on risk

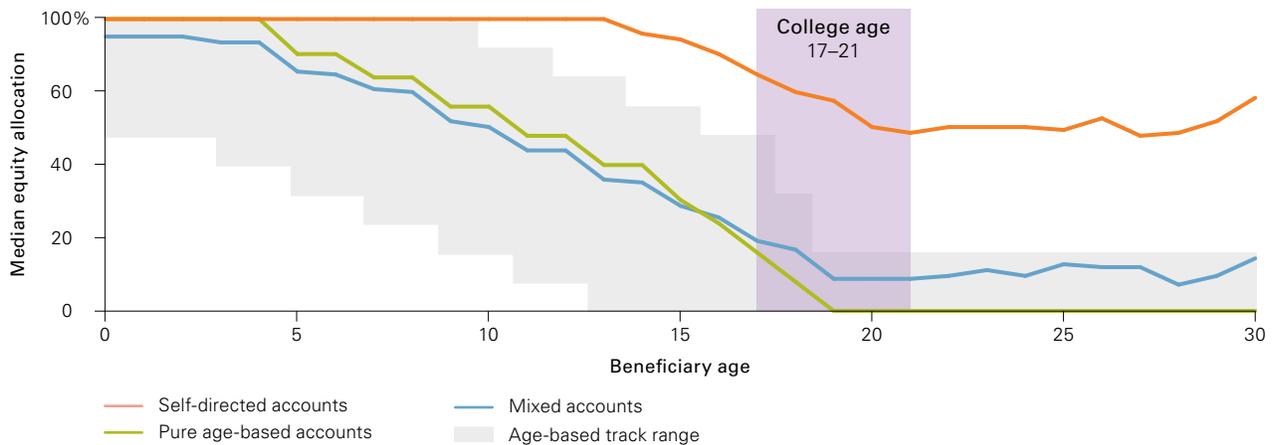
IMPORTANT: The projections or other information generated by the Vanguard Capital Markets Model® (VCMM) and the Vanguard Life-Cycle Model (VLCM) regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. Results will vary with each use and over time. Please see the appendix and page 4, Vanguard Life-Cycle (VLCM), for additional information about VCMM and VLCM.

All investing is subject to risk, including the possible loss of the money you invest. Past performance is no guarantee of future results. Diversification does not ensure a profit or protect against a loss. There is no guarantee that any particular asset allocation or mix of funds will meet your investment objectives or provide you with a given level of income. Investments in bond funds are subject to interest rate, credit, and inflation risk. Funds that concentrate on a relatively narrow market sector face the risk of higher share-price volatility. Foreign investing involves additional risks including currency fluctuations and political uncertainty. Currency hedging transactions may not perfectly offset a fund's foreign currency exposures and may eliminate any chance for a fund to benefit from favorable fluctuations in those currencies. The fund will incur expenses to hedge its currency exposures.

A stable value investment is neither insured nor guaranteed by the U.S. government. There is no assurance that the investment will be able to maintain a stable net asset value, and it is possible to lose money in such an investment. U.S. government backing of Treasury or agency securities applies only to the underlying securities and does not prevent share-price fluctuations.

Figure 2. Portfolio risk by investment style

All 529 plan sample accounts

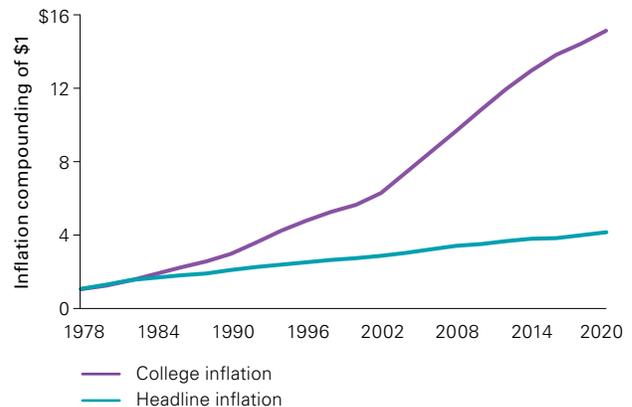


Sources: Vanguard and Ascensus, 2019.

What is the reason behind investors’ aggressive allocation? One factor is the rate of college inflation relative to headline inflation. **Figure 3** provides a holistic view of the escalation in total college costs, showing how its growth has compared with headline inflation from 1978 to 2020. Starting in 1978, college costs began to increase much faster than the costs of other goods and services. This is an important consideration when assessing how much college may cost in the future and, thus, how much one may need to save. A 529 glide-path portfolio can address these rising costs in two ways: by taking on more risk, or by saving more. Again, Figure 2 clearly highlights the preference for relatively higher risk. The high price tag of college tuition has an influence on the willingness of investors to take on risk.

How should we construct a glide path for an education savings goal? In the following sections, we first describe our proprietary model for glide-path construction for goals-based investing. We introduce a new 529 glide path derived from this model, the Vanguard target enrollment portfolios, and we then compare it with traditional age-based glide paths, along with analytics for risk-return, wealth accumulation, and success metrics. We find that the Vanguard target enrollment glide path falls between the moderate and aggressive age-based tracks as it attempts to strike the right balance between two opposing forces—market risk and shortfall risk. We also highlight the key principles behind our portfolio construction philosophy.

Figure 3. Headline inflation versus college inflation: two very different paths



Notes: Price index is re-based to \$1 as of January 1978. Headline inflation is based on the Consumer Price Index (CPI). College inflation is based on the CPI: College Tuition and Fees.

Sources: Vanguard calculations, based on data from U.S. Bureau of Labor Statistics.

Vanguard Life-Cycle Model (VLCM)

VLCM is a quantitative model developed by Vanguard’s Investment Strategy Group to create glide paths for retirement and nonretirement goals such as education. For a college savings goal, the model assesses how annual contributions grow over time and the utility of consuming portfolio assets over college spending years. The growth of investments is dependent not only on asset allocation, but also on probabilistic asset return expectations, which are obtained from the Vanguard Capital Markets Model (VCMM, Davis et al., 2014). VLCM is a goal-oriented model for glide-path construction under return uncertainty.

The forecast of asset return distributions results in a probabilistic distribution of feasible college spending during enrollment years for any glide path. This distribution is “scored” with a utility function that considers both wealth accumulation and the uncertainty or risk of achieving that wealth. Finally, the model selects the glide path that produces the highest utility score. This score includes a discount for risk that is dependent on an investor’s risk aversion to uncertainty. Risk-averse investors prefer less uncertainty of invested wealth.

The model also has a feature that balances the stability of the wealth that is created using a myopic loss or negative returns aversion. In designing the target enrollment portfolios, assumptions and attributes specific to college goals are incorporated. Loss aversion defines a participant’s attitude toward short-term portfolio volatility. The model incorporates a “penalty” for portfolio volatility during the distribution years to reduce the probability of large market losses. As a result, a negative return has a lower utility than a positive return. Myopic loss aversion results in the glide path landing at a lower equity level.

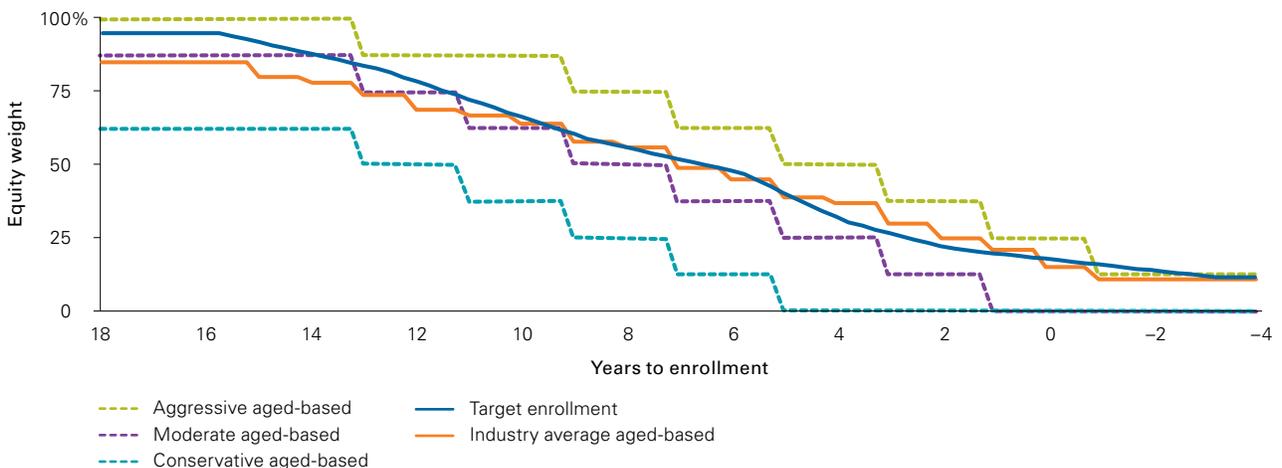
Vanguard target enrollment portfolios

The Vanguard target enrollment portfolios are an all-in-one investment for education savers. Derived from VLCM, they combine the sophistication of a robust construction methodology with the strategic, straightforward simplicity of diversified index funds that follow an easy-to-understand asset allocation glide path.

These portfolios provide a more user-friendly option that improves the prospect/account owner experience. The single, smoothed glide path automates investment selection decision-making—a common fallout point in the enrollment process. The portfolios also give account owners the ability to set multiple time horizons based on their student’s education savings goals (K–12, trade school, or college). The account owner chooses the year in which the beneficiary will need the money, and the portfolio’s asset allocation automatically adjusts to become more conservative as the need for funding approaches.

The new portfolios offer a smoother adjustment in asset allocation than the current Vanguard age-based glide paths. A quarterly step process changes the asset allocation more frequently, resulting in a more gradually shifting investment mix that can offer some peace of mind during volatile markets by not selling out of equities in large percentages just after a market downturn and locking in those losses. **Figure 4** shows the new Vanguard target enrollment portfolios’ glide path along with the current age-based conservative, moderate, and aggressive tracks.

Figure 4. Vanguard target enrollment glide path compared to conservative, moderate, and aggressive age-based paths



Evaluating glide paths through forward-looking analytics

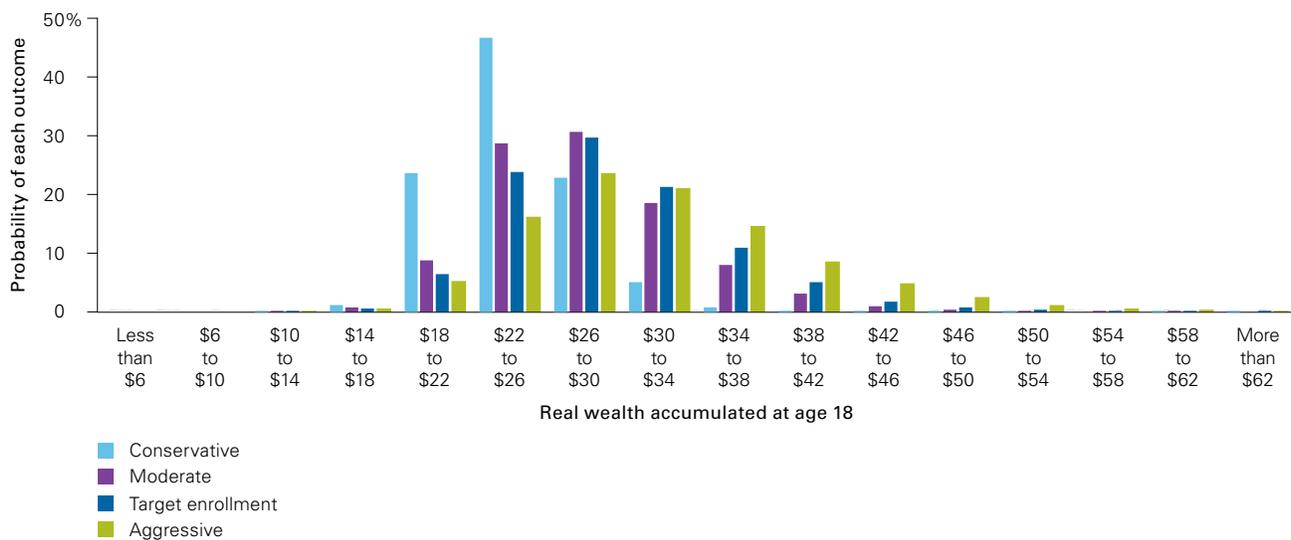
In evaluating the previously established age-based glide paths, we used VCMM asset return distributions (10,000 simulations) representing various financial scenarios for each of the tracks as well as the VLCM-derived target enrollment glide path. The simulation outcomes indicate the probabilities of various levels of return and wealth accumulation. The key assumptions of the simulations are:

- Annual contributions begin at birth and continue to age 18.
- Contributions are adjusted for inflation annually.¹
- All figures are adjusted for inflation based on the headline Consumer Price Index.
- Asset risk-return statistics are from VCMM projections. See the Appendix for information about the methodology used to create these projections.

Figure 5 shows the results of the simulations in probabilistic terms. The horizontal distribution of the bars reflects the range of potential wealth accumulation outcomes for each track (conservative, moderate, aggressive, and target enrollment), and the height of each bar indicates the likelihood of that outcome according to the VCMM.

The results shown in Figure 5 vary as expected. The aggressive track provides the highest expected wealth at age 18, while the conservative track provides the lowest, with the moderate track in between the two. The new target enrollment track, however, provides potential outcomes closer to the aggressive track in upside wealth creation along with probabilities of lower wealth outcomes similar to the moderate track.

Figure 5. Target enrollment and age-based glide paths: wealth accumulation at age 18



Source: Vanguard.

¹ For simplicity, we have set the contribution level at \$1 a year in the examples. Contributions in each simulation are adjusted each year based on the inflation rate projected for the preceding year. For example, if inflation is projected to be 3% in the first year, the contribution in the second year will be \$1.03. If inflation during the second year is projected to be 2%, the contribution for the third year will be $1.03 \times (1 + 0.02)$, or approximately \$1.05, and so on.

The probabilities of achieving the worst outcomes from a wealth creation standpoint shown in Figure 5 are lower for the target enrollment portfolio glide path than for all of the current age-based glide paths. This highlights the model's framework for incorporating and balancing the dual objectives of maximizing the expected utility of college spending and balancing short-term losses during enrollment. For instance, the target enrollment track has only a slightly (7%) lower median wealth at age 18, as shown in Figure 6, but a 17% lower probability of a five-percentage-point portfolio decline in any year compared to the aggressive track, as shown in Figure 7.

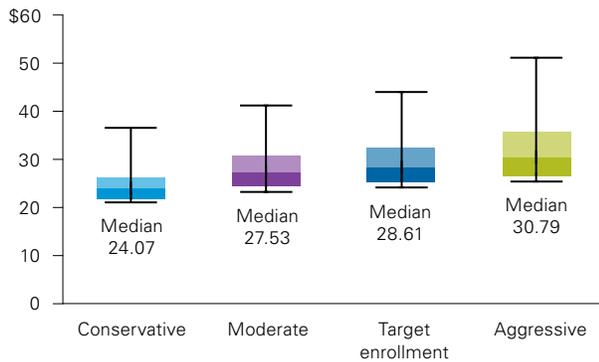
In evaluating an appropriate asset allocation to meet financial goals, it is important to consider the risk of not generating a return adequate enough to help achieve that

goal. Market risk is certainly an important consideration for risk-averse investors. But sacrificing returns to protect against potential market losses also increases the risk of falling short.

As Figure 8 highlights, the target enrollment portfolio exhibits about twice the market risk of the conservative age-based track but significantly reduces the overall risk of not meeting college costs. The conservative track has a 61% probability of not meeting the goal, while the target enrollment portfolio glide path has a 23% chance. The opposite pattern can be seen when comparing the target enrollment portfolio with the aggressive track. The portfolio attempts to strike the right balance between the two risks (the point where the two lines cross).

Figure 6. Distribution of real wealth at age 18

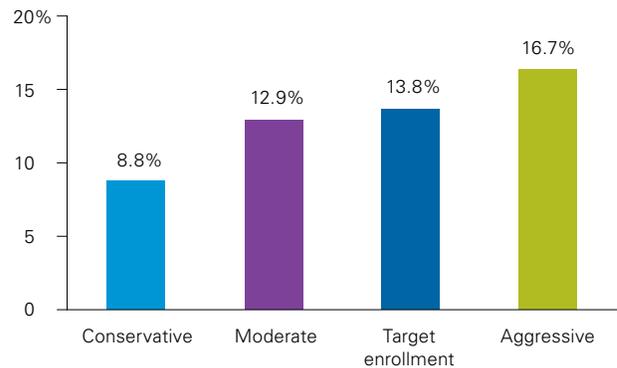
Wealth accumulation summary



Source: Vanguard.

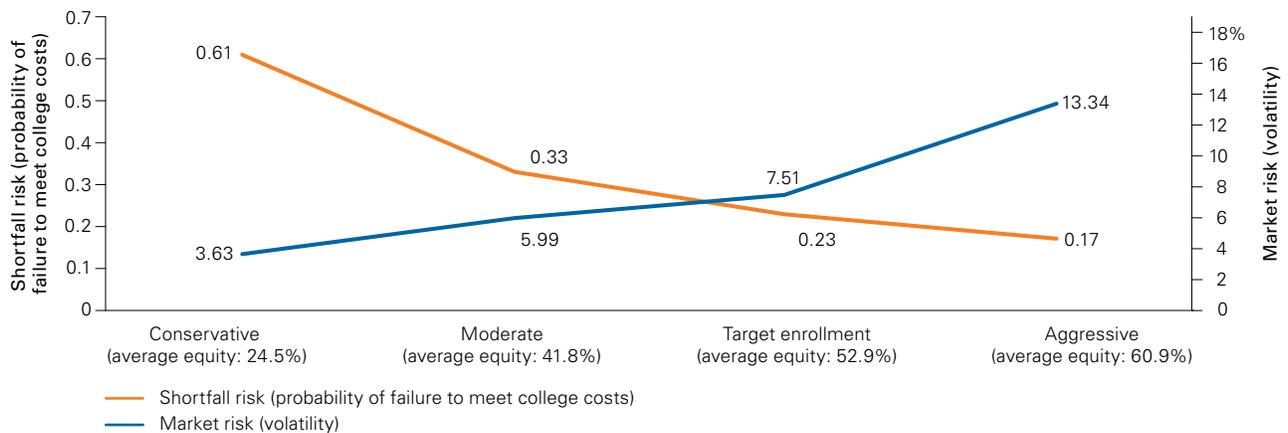
Figure 7. Probability of a 5% decline in any year

Probability



Source: Vanguard.

Figure 8. Having too little equity can be risky (shortfall risk versus market risk)



Source: Vanguard.

**Savings considerations:
impact of contribution amounts**

For 529 savers, outcomes depend largely on decisions about risk tolerance and contribution amounts. **Figure 9** shows the probabilities of meeting typical four-year college costs based on contribution scenarios using the age-based and target enrollment tracks.²

For instance, if investors on any of the glide paths were to contribute an inflation-adjusted \$1,000 each year for 18 years, they would have a 0% probability of ending with enough savings to pay for tuition, fees, and room and board at a four-year, public, in-state college—currently \$85,480 on average, according to the College Board. If those investors instead contributed an inflation-adjusted \$4,000 annually for 18 years, they would have a more than 82% probability of ending with a large-enough balance.

This pattern is repeated for the other average cost levels shown; the larger the contribution, the greater the probability of ending with a large-enough balance.

When constructing glide-path portfolios, Vanguard considers varying contribution amounts and the trade-off between higher contributions and risk tolerance. We suggest that account owners faced with a low probability of reaching college savings goals consider increasing their contribution amounts before increasing risk exposure.

Regardless of whether an investor selects a target enrollment track, an age-based 529 track, or a static balanced investment option, our analysis also underscores the importance of balancing risk tolerance with a savings plan based on realistic assumptions about college costs and college inflation.

Figure 9. Probability of accumulating at least the average college cost over 18 years

	Annual contribution at start	Public		Private	
		In-state (\$85,480)	Out-of-state (\$149,720)	Average school (\$194,040)	Expensive school (\$256,720)
Conservative age-based track	\$1,000	0%	0%	0%	0%
	4,000	82	0	0	0
	8,000	100	97	48	3
Moderate age-based track	1,000	0	0	0	0
	4,000	93	6	0	0
	8,000	100	99	76	20
Target enrollment track	1,000	0	0	0	0
	4,000	95	9	1	0
	8,000	100	99	82	28
Aggressive age-based track	1,000	0	0	0	0
	4,000	95	21	4	0
	8,000	100	99	86	43

Notes: These probabilities were calculated by the VCMM using the allocation glide paths shown in Figure 4 and applying projected asset class returns. Contributions are assumed to be made at the beginning of each year. In the probability calculations, all figures are adjusted for annual (forecasted) headline inflation. The average college costs are based on 2018–2019 data from the College Board and represent four years of tuition, room, and board.

Sources: Vanguard, based on VCMM calculations. See the Appendix for more information on the VCMM.

² These projections are based on the central tendencies of VCMM simulations and their potential risks. All investing involves risk, and as mentioned earlier, success in college savings also depends heavily on the time horizon over which you are saving. If you are accumulating assets during a bear market, it will be more difficult to reach your goals than had you been investing during market upswings that provided strongly positive returns.

Portfolio construction philosophy for Vanguard-recommended glide paths

Generally speaking, the shape of a 529, target retirement, or any other glide path is downward-sloping from a higher level of stocks in the early years to a lower level as contributions stop and spending begins. The present value of the stream of future contributions into the investment portfolio is similar to that of a bond. As the value of these future cash flows goes down over time, the portfolio needs to be rebalanced from stocks to bonds to reflect this decreasing bond-like investment.

This concept is the foundation for the design of Vanguard's 529 glide-path options. Stocks have a larger allocation when the beneficiary is further from college age; the bond allocation becomes dominant as the college years draw closer. The Vanguard target enrollment portfolios and the existing age-based glide paths maintain the same enduring portfolio construction philosophy regarding asset allocation and diversification. See **Figure A-2** in the Appendix for sub-asset allocation along the target enrollment glide path.

Strategic asset allocation

Extensive research has shown that asset allocation is the most important determinant of the return variability and long-term performance of a broadly diversified portfolio engaging in limited market-timing (see for example Brinson and Hood, 1986; and Scott, Balsamo, McShane, and Tasapoulos, 2016). For that reason, Vanguard's 529 glide-path options represent a strategic allocation to a broadly diversified set of asset classes—not a tactical or dynamic allocation predicated on timing systematic market and economic risk factors.

Passive versus active strategies

Vanguard's recommended 529 glide-path portfolios use passive strategies, with the exception of the cash portfolio. Indexing offers broad diversification, low costs, direct market exposure, and transparency. Although active management offers the opportunity to outperform the market, it may involve higher costs and additional risks, including manager risk, security selection, and underperformance. Ongoing oversight of active managers may be a more complex task from a fiduciary viewpoint because of these risks.

Low-cost active management can play an important role in other parts of a college savings plan for investors willing to accept the risks. Investors must weigh whether to take on that added risk as opposed to just assuming it as part of an age-based glide path.³ Index investing makes sense as a starting point for many, while low-cost active management can be a good choice for some. Plan sponsors may choose to offer active investment strategies as stand-alone portfolios outside of the age-based or target enrollment tracks.

Alternative assets

A common rationale for including alternatives in any portfolio is broader diversification. Alternative assets such as private equity, and private real estate can offer investment benefits in strategic, long-term, diversified portfolios such as enhanced return potential relative to public investments. However, these types of private assets require investors to accept 1) illiquidity of capital invested, as it cannot be easily traded at its full market value, often requiring a sale at a discount and 2) inflexibility in the size and timing of cash outflows (capital calls or commitments) and uncertainty in cash inflows (capital distributions). Vanguard currently does not recommend alternative assets in 529 glide-path portfolios due to the added layer of illiquidity risk and long term commitment of capital needed, which may not align with an individual investor's goals and liquidity requirements.

Equity sub-allocations

Vanguard believes that most investors are best served by obtaining stock exposure through broad-based, market-capitalization-weighted index funds. Diversification within asset classes is paramount because it reduces exposure to risks associated with a particular company, sector, or market segment. Owning a portfolio with at least some exposure to many or all of the key market components gives the investor a chance to benefit from areas that are performing well while mitigating the impact of weaker areas. Performance leadership is quick to change, and a well-diversified portfolio is less prone to swings based on any one segment.

Non-U.S. equity

Although historical analysis strongly supports the benefits of increasing global diversification, it also demonstrates that the mean variance optimal portfolio has not been market-capitalization-weighted.⁴ Our research has shown that allocations of 20% non-U.S. equities have provided about 85% of the maximum diversification benefit. Higher amounts, such as 30% and 40%, have provided more than 95% of this benefit. Therefore, in addition to market-cap weight, we also consider other factors such as investors' home-country preference, costs, liquidity, concentration, and regulatory constraints.

We believe that if these factors are reasonably balanced against the incremental diversification benefit achieved, non-U.S. equity allocations of between 20% and full market cap can be appropriate. We currently recommend allocating 40% of equity to non-U.S. equities.

The portfolios in the target enrollment and age-based tracks obtain stock exposure through broad-based market-cap-weighted index funds. Therefore, they gain exposure to equity sub-asset classes such as REITs (real estate investment trusts) and emerging markets at the market weight of these securities in the indexes.

Fixed income sub-allocations

U.S. nominal bonds

Vanguard follows a similar market-proportional approach toward the U.S. nominal investment-grade bond market. We recommend that portfolios match this market's risk-return characteristics, including credit quality, issuer type, and maturity.

The portfolios hold no high-yield ("junk") bonds for two reasons. First, these bonds make up only a small portion of the taxable U.S. bond market and, if held at market weight, historically would not have significantly altered the overall risk-return makeup of a broadly diversified portfolio. Second, Vanguard research has found that historically, an above-market allocation to high-yield bonds would not have provided significant diversification benefit to a balanced portfolio but would have added volatility and downside risk (if replacing investment-grade bonds) or reduced average expectations for returns (if replacing equities).

Non-U.S. bonds

As with non-U.S. equity, we consider diversification benefits, market efficiency, costs, and home bias in determining non-U.S. fixed income allocation. We currently recommend 30% of fixed income be allocated to hedged non-U.S. fixed income. As with non-U.S. equity, we believe further movement to market-capitalization weights can be prudent. However, because of the differing risk-return characteristics of non-U.S. fixed income and equities, appropriate allocations may differ.

Non-U.S. fixed income is the largest asset class in the investable universe, representing about one-third of the global liquid market. Risk factors such as interest rate fluctuations, inflation, economic cycles, and issues associated with changing or unstable global political regimes should be viewed in the appropriate context. Although the bonds of any one country may be more volatile than comparable U.S. bonds, a portfolio that includes the bonds of many countries and issuers would benefit from imperfect correlations.

Currency fluctuations account for a significant portion of the volatility in international bonds—volatility that is mitigated by Vanguard's decision to hedge this exposure. Our research suggests that a strategic allocation to hedged international bonds can moderate risk in a diversified portfolio.

Inflation protection

Vanguard believes that in earlier stages of saving for college, the risk of inflation should be countered by the higher return potential of stocks. During the near-college and college years, however, the volatility risk associated with equities may begin to outweigh their potential for offsetting inflation. Investors at that stage must balance the need to preserve capital with the need to preserve purchasing power.

For investors on conservative or moderate tracks, we suggest inflation protection in this period be obtained from assets that are less volatile and quickly adjust to changes in inflation, such as short-term Treasury Inflation-Protected Securities (TIPS).⁵ In the target enrollment portfolios, TIPS are substituted for a larger allocation to cash reserves/stable value to diversify the higher equity allocation during the years leading up to enrollment and into the distribution period.

⁴ Non-U.S. market-cap weight has ranged from 31% to 71% of the total equity market since 1970. As of December 31, 2019, non-U.S. market-cap weight is approximately 50% of the total equity market.

⁵ TIPS are indexed to the Consumer Price Index-Urban Consumer (CPI-U) and are positively correlated with inflation. Short-term TIPS feature the same inflation protection mechanism as longer-maturity TIPS but are less volatile because of their shorter duration. Although there is no "perfect hedge" for college inflation, allocating to short-term TIPS balances the desire for college inflation protection with the volatility risk from remaining too aggressive in equities and bonds in the years leading up to college.

Cash reserves/stable value

As beneficiaries reach college age and begin to use 529 plan assets for tuition and other expenses, capital preservation becomes a primary objective. Thus, Vanguard's suggested conservative, moderate, and target enrollment 529 tracks have an allocation to cash reserves at this point to preserve principal in the account.

Stable value products are a viable cash vehicle for 529 plans. Vanguard stable value funds seek to provide principal preservation by maintaining \$1 net asset values while attempting to provide returns similar to those of short- or intermediate-term bond funds. The funds invest primarily in a combination of synthetic investment contracts (backed by high-credit-quality commingled trusts and mutual funds), traditional investment contracts, and cash. If stable value products are not available to the plan sponsor, money market portfolios are also a viable cash option.

Conclusion

Based on applying Vanguard's market and economic research to extensive 529-specific modeling, we conclude that Vanguard target enrollment or age-based glide-path tracks using portfolios grounded in traditional broad-based, market-proportional asset classes can serve as a prudent foundation for an education savings program. In forming the Vanguard target enrollment portfolios, we used a rigorous goals-based model: the VLCM. The glide paths proposed find the appropriate risk-reward balance.

The Vanguard target enrollment portfolios are sophisticated, user-friendly options that improve the prospect/account owner experience. The single, smoothed glide path simplifies investment selection decision-making—a common fallout point in the enrollment process.

These portfolios also give account owners the ability to set multiple time horizons based on their student's education savings goals (K–12, trade school, or college). The account owner chooses the year in which the beneficiary will need the money, and the asset allocation within the portfolio automatically makes smooth adjustments to a more conservative stance as the need for funding approaches.

Compared to the existing age-based glide paths, the new target enrollment glide path provides risk-return characteristics that improve objective-based metrics relative to existing paths. The Vanguard target enrollment portfolios delicately balance market risk with shortfall risk.

Regardless of whether an investor selects an age-based 529 glide path, a target enrollment date glide path, or a static balanced investment option, our analysis underscores the importance of balancing risk tolerance with a savings plan based on realistic assumptions about college costs and college inflation.

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Appendix

The Vanguard Capital Markets Model is a proprietary financial simulation tool developed and maintained by Vanguard's Investment Strategy Group. The VCMM uses a statistical analysis of historical data for interest rates, inflation, and other risk factors for global equities, fixed income, and commodity markets to generate forward-looking distributions of expected long-term returns. The asset-return distributions shown in this paper are drawn from 10,000 VCMM simulations based on market data and other information available as of December 31, 2019.

The VCMM is grounded in the empirical view that the returns of various asset classes reflect the compensation investors receive for bearing different types of systematic risk (or beta). Using a long span of historical monthly data, the VCMM estimates a dynamic statistical relationship among global risk factors and asset returns. Based on these calculations, the model uses regression-based Monte Carlo simulation methods to project relationships in the future. By explicitly accounting for important initial market conditions when generating its return distributions, the VCMM framework departs fundamentally from more basic Monte Carlo simulation techniques found in certain financial software.

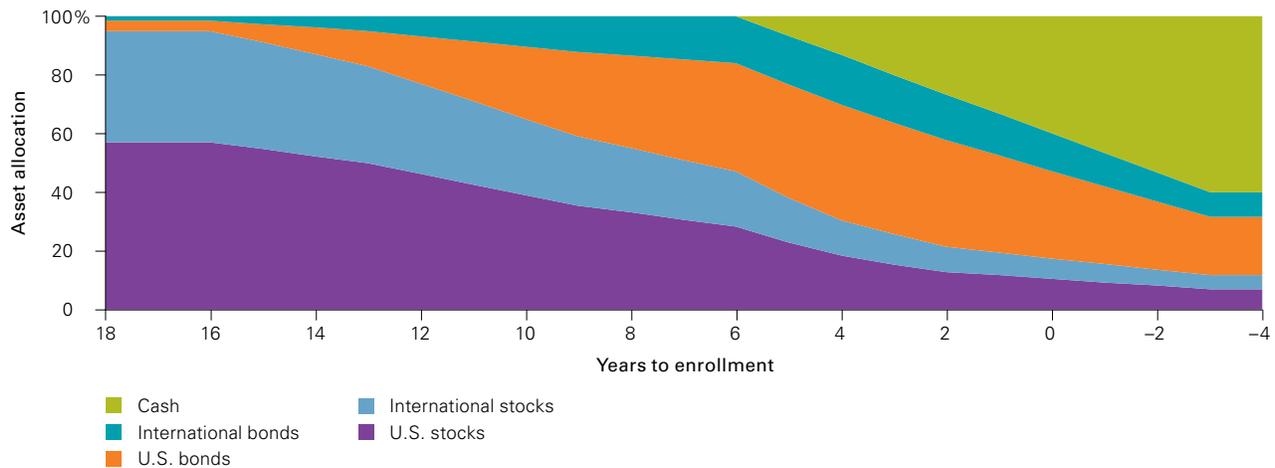
Figure A-1. VCMM nominal steady-state annualized return forecast

	5th percentile	25th percentile	50th percentile	75th percentile	95th percentile
U.S. equity	-0.75%	4.11%	7.53%	10.92%	16.19%
International equity	1.88%	6.11%	9.14%	12.27%	16.99%
U.S. bond	1.49%	3.19%	4.45%	5.76%	7.66%
International bond	1.44%	2.98%	4.13%	5.34%	7.17%
Cash	0.91%	2.09%	3.07%	4.10%	5.67%

Note: To derive steady-state returns for the Vanguard target enrollment glide path, we removed the first 20 years of the 30-year VCMM forecast.

Source: Vanguard.

Figure A-2. Vanguard target enrollment portfolio sub-asset allocation



Source: Vanguard.

Vanguard Life-Cycle Model:

For more detailed information on the VLCM methodology, please refer to the forthcoming 2020 research paper.

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