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Constructing return-target portfolios: A time-varying, valuation-aware approach to asset allocation

- Ten-year annualized returns for the stock and bond markets can fluctuate drastically over time, with historical lows of –5% and 0%, respectively. These depressed medium-term returns could have serious implications for investors who seek to fulfill their spending needs through a portfolio. A time-varying, valuation-aware asset allocation approach that targets a medium-term expected return level may be suitable in such circumstances.
- This paper presents our approach to construct return-target portfolios. Time-varying, valuation-aware return forecasts over a 10-year horizon from the Vanguard Capital Markets Model® are an essential input into our asset allocation-optimization engine, the Vanguard Asset Allocation Model. We show that a static portfolio may periodically fall short of the investment objective, whereas the return-target portfolio has better odds.
- Periodic portfolio adjustments—to account for changes in market outlook and increase the expected likelihood of meeting the return target—are a key feature of the return-target portfolio construction framework. Because the adjustments are influenced by a time-varying market outlook, the investor must be willing to accept model risk.

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Introduction

In this paper, we discuss an asset allocation framework for creating a return-target portfolio with a specific expected return target. Our approach uses capital market forecasts with a 10-year horizon to periodically reassess how the return objective may be achieved in a total-return-efficient manner, consistent with Vanguard's portfolio construction framework (Aliaga-Díaz et al., 2022). The optimal mix of asset classes will vary over time, depending on the forward-looking asset return expectations.

In our view, this framework may be suitable for individual or institutional investors meeting two criteria:

- **They have a specific, medium-term return objective (for example, 4%) in order to fulfill their spending needs.** In addition to individual investors, endowments and foundations may have such a return objective. Consistently falling short of returns needed to fund spending may result in the corpus (or portfolio's capital) shrinking over time and eventually being unable to support spending.
- **They are comfortable with varying the portfolio's allocation based on 10-year asset return projections.** In other words, they are willing to accept model risk (medium-term forecast risk) in pursuit of their investment objectives.

As discussed by Aliaga-Díaz (2022), the time-varying nature of this asset allocation framework differs from the common definition of tactical asset allocation. Although both approaches involve actively adjusting asset exposures based on market conditions, the time horizon and technique differ. Tactical asset allocation is commonly understood to include attempts to time short-term market dislocations ("market timing") within 12 months or less. Time-varying asset allocation takes a longer-term view, focusing on capital market forecasts over a 5-year to 10-year horizon. Rather than relying on market timing, this approach relies on inputs such as current equity valuations, interest rate levels, and other economic signals.

Return expectations change based on evolving asset valuations

Modeling time-varying expected returns has been an area of intense study by academics over the last three decades, giving rise to what Cochrane (1999) termed the "new facts in finance" (NFF). Cochrane compared asset return forecasting to a coin flip and to the weather. Under the traditional view, return forecasts are like a coin flip—with each flip, the probabilities of a given outcome are the same, 50/50, which means that the outcome is completely unpredictable. The weather, by contrast, changes over time. For example, the expected temperature in the summer is quite different from that in the winter.

NFF suggests that, just as it is impossible to know what the exact temperature will be tomorrow but a given range could be expected based on the season, there are also "seasons" to stock returns and our expectations of returns will differ over time based on changing market valuations. As a result, time-varying expected returns are hard to predict perfectly over the short term; rather, they materialize over the long term and directionally (Wallick et al., 2020).

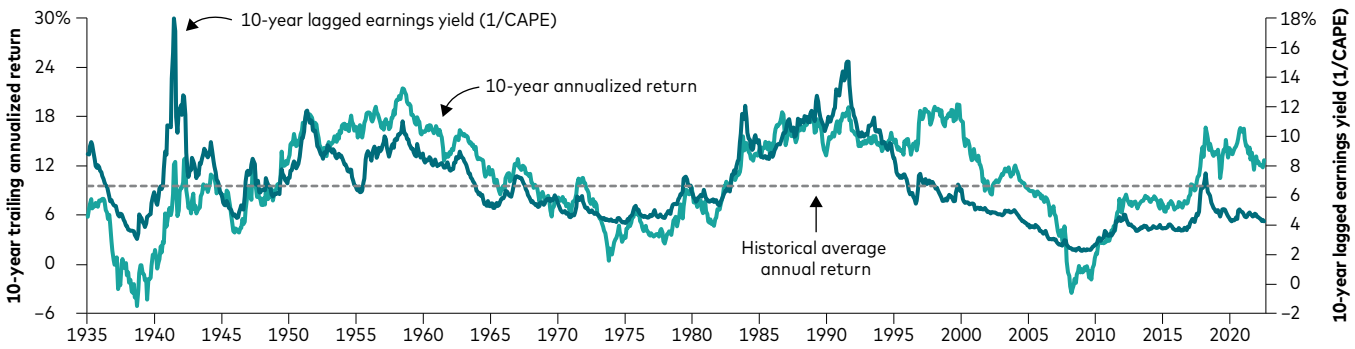
Figure 1 highlights this "seasonal" or cyclical pattern in the realized returns for U.S. stocks and bonds. The rolling 10-year annualized nominal returns deviate from their historical averages of 9.8% for U.S. equities and 5.5% for U.S. bonds. Moreover, the market performance over rolling 10-year periods has historically oscillated between about –5% and 20% for stocks, and between about 0% and 14% for bonds. Return variability across extended periods, such as the Great Depression, the mid-1960s through 1970s, and 1999 to 2009, can significantly reduce the odds of achieving the investment goals for investors who have medium-term horizons (typically 10 years) and a percentage-of-portfolio spending need.

Additionally, as shown in Figure 1, the realized returns in a 10-year period are directly proportional to the valuations of assets at the beginning of the period (for example, the 10-year lagged earning yields represented by cyclically adjusted price/earnings (1/CAPE) for stocks; and 10-year trailing Treasury yields for bonds). The relationship between the time variation of realized returns and the underlying drivers is essential when we form our asset return outlook for the next decade (Davis et al., 2014).

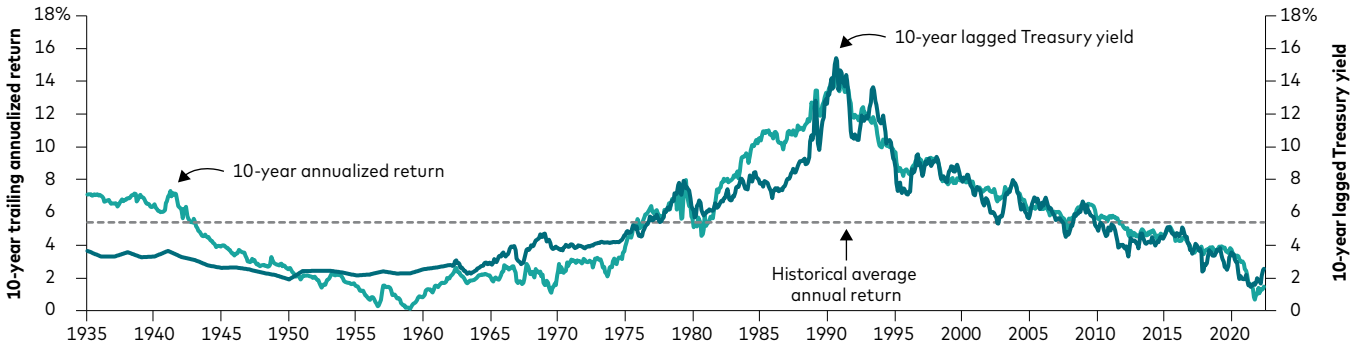
FIGURE 1

Long-term returns are time varying

a. U.S. stocks



b. U.S. fixed income



Notes: U.S. stock returns are represented by the Standard & Poor's 500 Index. U.S. fixed income returns are represented by the Standard & Poor's High Grade Corporate Index from 1926 to 1968, the Citigroup High Grade Index from 1969 to 1972, the Lehman Brothers U.S. Long Credit AA Index from 1973 to 1975, and the Bloomberg U.S. Aggregate Bond Index thereafter. Earnings yield is represented by 1/CAPE, and 10-year Treasury yields are represented by the Long Interest Rates, both from Robert Shiller. Return data are from 1926 to 2023, with the first 10-year return period starting in 1935.

Sources: Vanguard calculations, based on data from FactSet and Robert Shiller's website, at www.econ.yale.edu/~shiller/data.htm.

Past performance is no guarantee of future returns. The performance of an index is not an exact representation of any particular investment, as you cannot invest directly in an index.

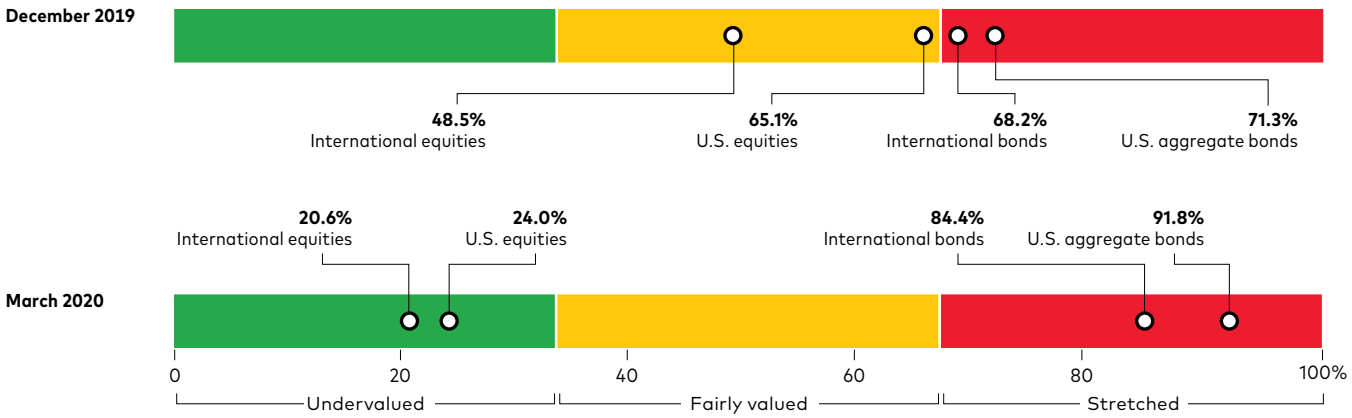
Evolving asset valuations impact expectations for future market returns and risks. Significant market events such as the global financial crisis in 2008 and the COVID-19 pandemic in 2020 shocked financial markets and altered valuations across equities and fixed income. Naturally, significant events like these will cause changes to market-return forecasts, as well as to return-target portfolio allocations. **Figure 2** shows a summary of asset valuations and return forecasts before and after the outbreak of COVID-19. Smaller market events will naturally have more minor impacts on return forecasts, but even these developments can cumulatively impact future expectations.

FIGURE 2

Comparing equity and fixed income valuations and return forecasts before and after the outbreak of COVID-19

a. Equity and fixed income valuations

Valuation percentile relative to fair value



b. Vanguard Capital Markets Model medium-term (10 years) return forecasts

		U.S. equities	International equities	U.S. aggregate bonds	International bonds
December 2019	**Median 10-year annualized expected return**	4.4%	7.3%	2.4%	2.0%
	Median volatility	16.6%	17.8%	4.9%	2.8%
March 2020	**Median 10-year annualized expected return**	6.5%	9.1%	1.4%	1.3%
	Median volatility	17.2%	19.0%	4.0%	3.5%

Sources: Vanguard Capital Markets Model projections.

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 as of December 2019 and March 2020. Results from the model may vary with each use and over time. For more information, please see the important information.

The Vanguard Capital Markets Model (VCMM) formalizes the relationship between current market conditions and forward-looking return expectations (Davis et al., 2014). Developed and enhanced over many years by Vanguard's Investment Strategy Group, VCMM's forward-looking forecasting techniques rely on the notions of central tendency, toward which fundamental valuation metrics tend to revert over time (Cochrane, 2017). VCMM also recognizes the inherent uncertainty in future market returns by presenting its forecasts as a probabilistic distribution, rather than single-point estimates.

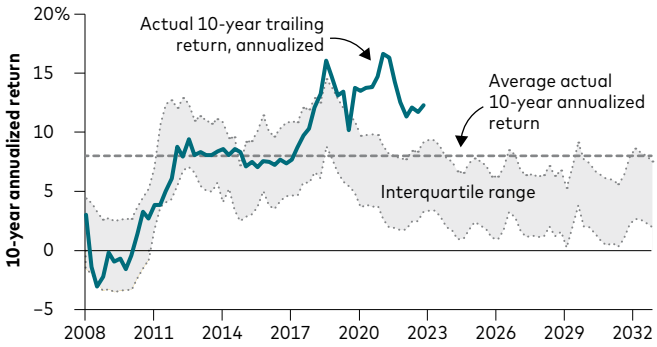
As **Figure 3** indicates, VCMM's 10-year return projections for equities and bonds over the next decade have been reasonably predictive, suggesting that the insights contained in VCMM's 10-year forecasts may be able to help investors optimize their investment decisions. Importantly, actual 10-year annualized returns fell within the predicted 25th to 75th percentiles about 56% and 67% of the time, respectively, for bonds and equities.

While return forecasts will never be precise, forming a reasonable level of return expectations is essential for the success of a time-varying strategy. Unlike long-term, historical-average returns (8.1% for U.S. equities and 4.3% for U.S. bonds from 1998 to 2023), VCMM-based, valuation-aware expected returns have been more in line with actual returns. As return expectations for various classes evolve over time, their expected contribution to portfolio risk and return also evolve, justifying the allocation shifts inherent in a time-varying strategy.

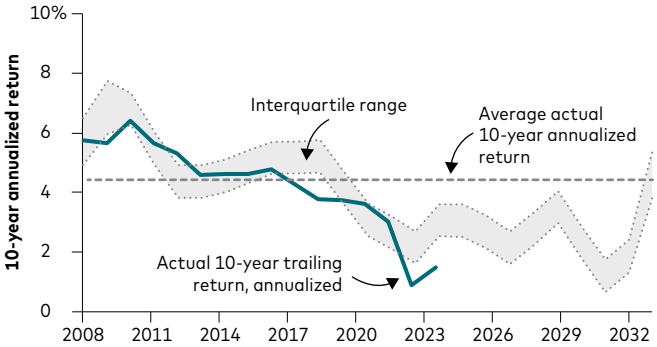
FIGURE 3

Assessing the accuracy of VCMM return distributions versus historical averages

a. U.S. stocks



b. U.S. fixed income



Notes: Vanguard calculations in USD, gross, using actual 10-years-ahead annualized returns and VCMM 10-year annualized forecasts for the MSCI US Broad Market Index and Bloomberg U.S. Aggregate Bond Index from September 1998 to June 2023. VCMM forecasts are generated "out of sample" without look-ahead bias by simulating what the current model would have predicted 10 years prior, using estimation data only up until when the forecast is made.

Sources: Vanguard calculations, as of June 30, 2023, using data from MSCI and Bloomberg.

Constructing a return-target portfolio

We create a return-target portfolio following a process shown in **Figure 4** to illustrate how this may work in practice, using our medium-term, 10-year horizon market outlook for an investor with a 5% +/– 1% expected return target and a moderate risk profile. The Vanguard Asset Allocation Model (VAAM), a proprietary optimization engine, is used to determine the asset allocation (Aliaga-Díaz et al., 2019). Unlike a static portfolio (market-cap-weighted 60% equity/40% bond), the return-target portfolio allows for an overweight/underweight to the subsets of U.S. equity such as U.S. real estate investment trusts, and the subsets of U.S. bonds such as short-term Treasuries, long-term Treasuries, and credit bonds.

FIGURE 4

Steps for constructing a return-target portfolio

1	2	3	4	5
Determine an appropriate return target for the investor's objectives and risk profile.	Identify preferred asset class exposure; gather 10-year forward-looking return forecasts (for example, VCMM) for each asset class identified.	Set a return-target range (for example, +/– 1% around the return target), as well as any other investor-specific constraints.	Run an optimization process (for example, VAAM) to identify an asset allocation with optimal expected risk-adjusted return, considering the return budget, portfolio constraints, and investor's risk profile.	Establish *recalibration* and *rebalancing* policies. Review portfolio drifts and monitor market conditions to determine if an off-cycle recalibration is warranted.

Notes: Recalibration refers to rerunning the optimization process (for example, VAAM) to solve for the portfolio with maximum expected risk-adjusted return at that point in time for a given investor risk profile. Rebalancing refers to periodically adjusting the portfolio back to the previously established allocation without running the optimization process.

Source: Vanguard.

A static portfolio's expected return can fall below the investor's goal

Historically, a static 60/40 portfolio would have generated a 10-year annualized return below 4% during the Great Depression in the 1930s, as well as during the 1973 energy crisis and the 2008 global financial crisis, as shown in **Figure 5a**. The worst 10-year annualized return experienced since 1935 was 1.12% from 1929–1939, while the worst since 1990 was 1.80% from 1999–2009. Such results, if repeated in the future, can detrimentally impact the investor's wealth if they continue to fund their target spending from the portfolio.

On the other hand, the return-target portfolio's allocation has, by definition, a 4% or higher expected return. More generally, the return-target portfolio offers a higher expected probability of meeting the return requirement than the 60/40 portfolio, sometimes with even lower expected volatility. This is because the asset allocation varies in the stock-bond mix and at the sub-asset-class level, as **Figure 5b** shows.

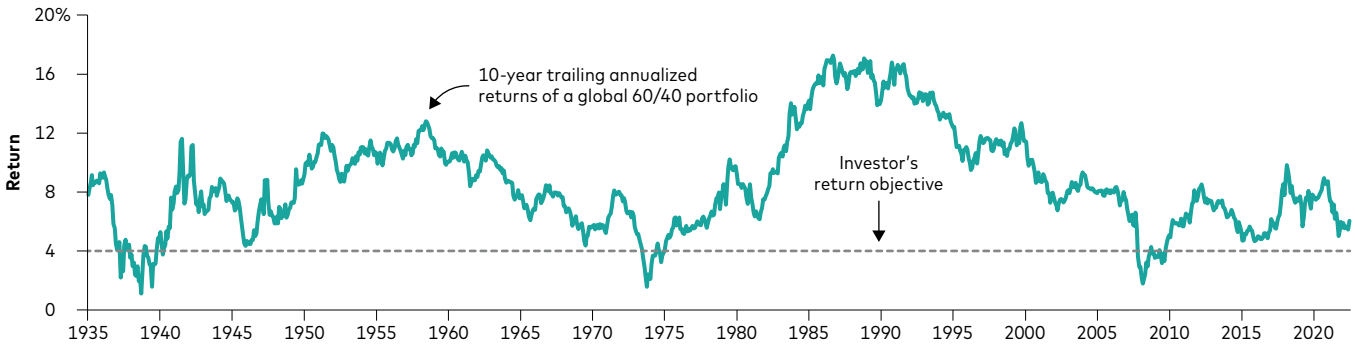
Figures 5c and **5d** compare various forward-looking attributes for the return-target portfolio and the 60/40 benchmark at each year-end between 2017 and 2022. Importantly, we observe that the 10-year annualized expected return of a static 60/40 portfolio dropped below the investor's objective of 4% in December 2017 and again at year-end 2021. Figure 5c also demonstrates lower annualized volatility for the return-target portfolio versus the 60/40 benchmark in December 2017, December 2021, and December 2022.

The return-target portfolio approach identifies a portfolio that best serves the return objective, given the investor's risk tolerance. While the expected outcomes of the return-target portfolios are likely to be better than the static benchmark, it is also possible for them to underperform in comparison, especially over shorter periods.

FIGURE 5

Comparing a market-cap-weighted 60/40 portfolio with a return-target portfolio

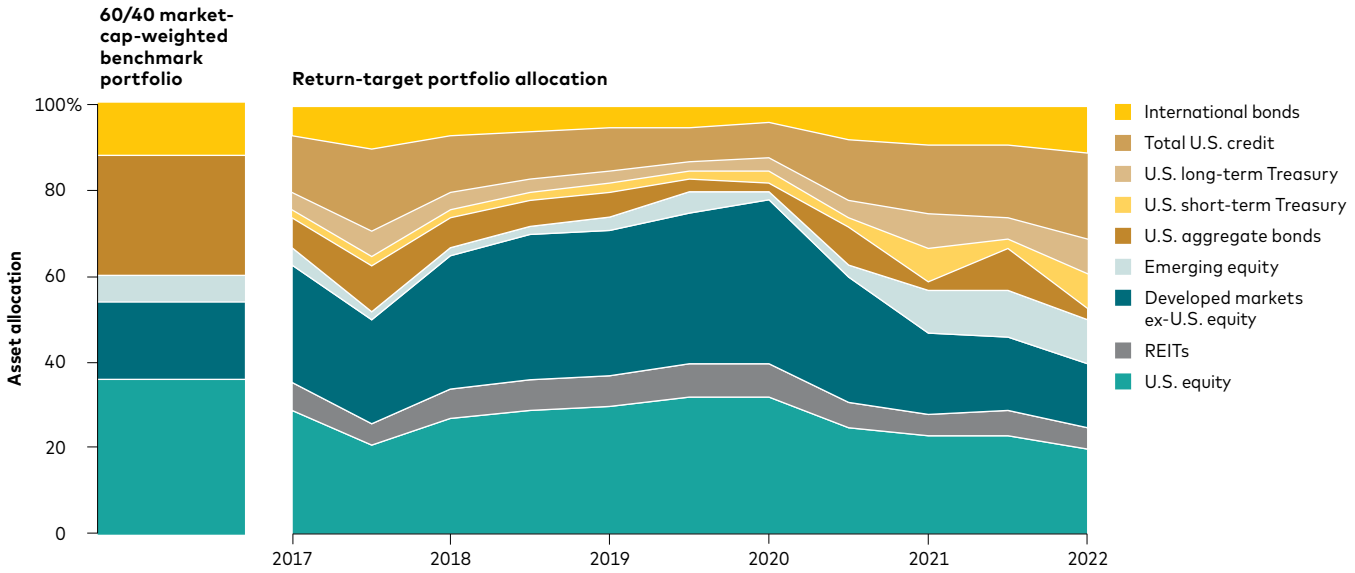
a. Historical 10-year annualized returns of a global 60/40 portfolio



Notes: The 10-year annualized returns are calculated for the period from December 1935 to June 2023. The global 60/40 stock/bond portfolio is 36% U.S. stocks, 24% international stocks, 28% U.S. bonds, and 12% international bonds. The assets are represented by, respectively, the MSCI USA Investable Market Index, MSCI ACWI ex USA Index, Bloomberg U.S. Aggregate Bond Index, and Bloomberg Global Aggregate ex USD Index.

Sources: Vanguard calculations, based on data from FactSet.

b. Asset allocation, December 2017 to December 2022



Notes: Time-varying portfolio allocations were determined by the VAAM. The assets under consideration were U.S. equity, real estate investment trusts, developed market ex-U.S. equity, emerging market equity, U.S. aggregate bond, short-term and long-term Treasuries, U.S. credit bonds, and global ex-U.S. aggregate bonds. The policy benchmark is a 60% stock/40% bond portfolio in which U.S. equity equals 60% of total equity, developed market ex-U.S. equity takes 30% of total equity, and U.S. aggregate bonds equal 70% of total bond allocation across the portfolios. VCMM 10-year projections as of December 2017, June 2018, December 2018, June 2019, December 2019, June 2020, December 2020, June 2021, December 2021, June 2022, and December 2022 were used.

Source: Vanguard.

(Continued on page 8)

FIGURE 5 (CONTINUED)

Comparing a market-cap-weighted 60/40 portfolio with a return-target portfolio

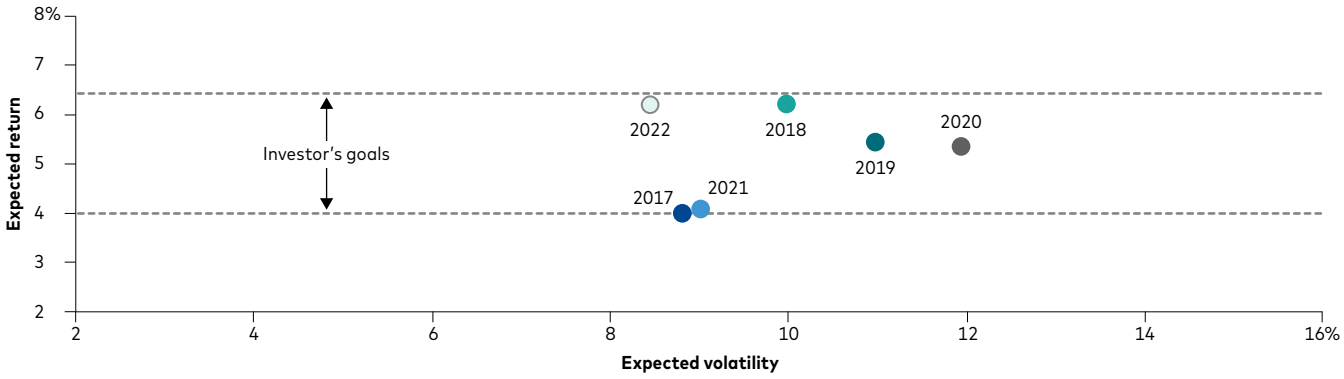
c. Forward-looking portfolio metrics, December 2017 to December 2022

10-year median expected portfolio analytics	Dec. 2017		Dec. 2018		Dec. 2019		Dec. 2020		Dec. 2021		Dec. 2022	
	TVAA	**MCW**	**TVAA**	**MCW**	**TVAA**	**MCW**	**TVAA**	**MCW**	**TVAA**	**MCW**	**TVAA**	**MCW**
Equity allocation	67%	60%	67%	60%	74%	60%	80%	60%	57%	60%	50%	60%
Annualized total return	4.0%	3.8%	6.2%	5.5%	5.4%	4.7%	5.4%	4.2%	4.1%	3.9%	6.2%	6.1%
Annualized volatility	9.0%	9.2%	10.0%	9.4%	11.0%	9.4%	11.9%	9.4%	9.0%	9.3%	8.4%	9.7%
Probability of meeting 4% return target	50.2%	43.5%	85.7%	77.5%	72.7%	63.5%	71.0%	53.5%	52.0%	47.4%	89.5%	83.3%
Probability of 10% loss or more in any given year	23.8%	20.7%	40.3%	39.0%	66.3%	49.4%	84.1%	54.5%	47.8%	56.4%	20.7%	37.9%
Maximum drawdown	–41.6%	–37.9%	–33.3%	–39.1%	–42.7%	–39.8%	–50.9%	–46.5%	–40.0%	–44.7%	–31.7%	–40.9%
Sharpe ratio	0.21	0.19	0.34	0.29	0.29	0.27	0.32	0.29	0.24	0.21	0.27	0.22

Notes: The 10-year expected portfolio analytics are calculated based on 10,000 VCMM 10-year simulations as of December 2017, December 2018, December 2019, December 2020, December 2021, and December 2022. The market-cap-weighted 60/40 portfolio is represented by MCW, while the return-target portfolio is represented by TVAA (time-varying asset allocation).

Sources: Vanguard Capital Markets Model projections.

d. Return-target portfolio: 10-year expected risk and return



Note: The 10-year expected portfolio analytics are calculated based on 10,000 VCMM 10-year simulations as of December 2017, December 2018, December 2019, December 2020, December 2021, and December 2022.

Sources: Vanguard Capital Markets Model projections.

Taking a closer look at the return-target portfolio's asset allocation shifts

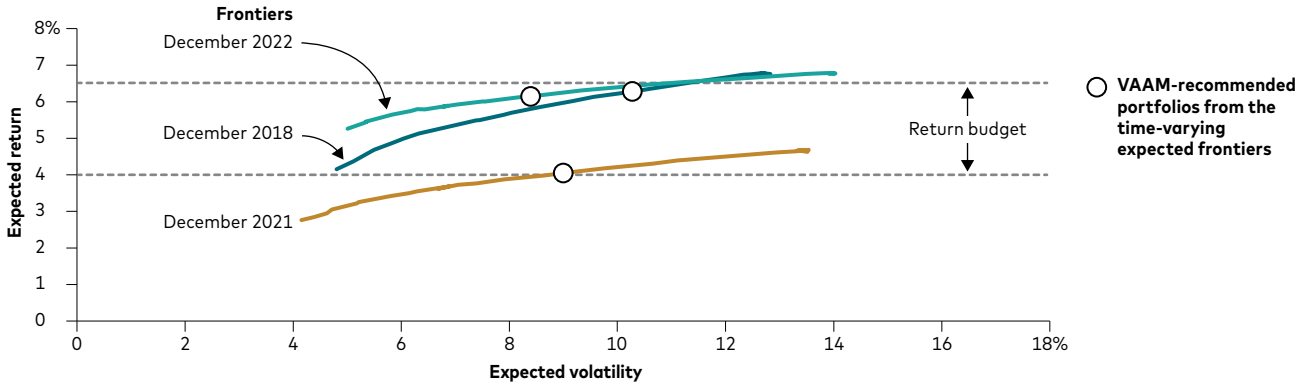
Although the asset allocation shifts are model driven, they should intuitively connect to a rational explanation about changes in the forward-looking return expectations. At the broad asset allocation level, it is widely understood that investors demand a higher return on equity investments over relatively safer investments such as investment-grade bonds. Expected equity risk premium (ERP) measures the excess return investors expect to receive on equity investments to compensate for the risk they are taking. An investor's forward-looking view of ERP and bond returns should impact their allocation decision between stocks and bonds.

Figure 6 illustrates three efficient frontiers (optimal portfolios for all risk aversions) and three optimal portfolios, given a moderate risk aversion. For return-target portfolios, whether the portfolio selected is more or less risky depends on three factors: 1) expected bond return (elevation of the left-hand side of the frontier), 2) expected ERP (slope of the frontier), and 3) the return target. In general, a higher elevation for the efficient frontier typically leads to a lower allocation to equity, all else being equal. Similarly, a lower slope typically leads to lower equity allocation; however, this relationship may reverse when the portfolio's expected return falls to the bottom of the return-target range. Additional equity exposure is required to ensure an adequate probability of achieving the return target despite a lower ERP.

Let's examine the three frontiers in Figure 6 in chronological order. The 2018 frontier is the steepest one, meaning the difference between equity and fixed income expected returns is relatively large. As a result, the December 2018 portfolio takes on higher equity exposure, as illustrated in Figure 5b and by the higher volatility in Figure 5c. By December 2021, there was a significant decrease in equity return expectations after a strong bull market characterized by elevated equity price/earnings ratios. With low expected bond returns, a 57% equity exposure was selected by the model simply to meet the 4% minimum return expectation. The frontier rose in December 2022, given higher return expectations for both bonds and stocks. Here, a less-risky portfolio with only 50% equity was selected, as it was expected to achieve the return objective without taking on excess risk.

FIGURE 6

Comparing static and time-varying expected frontiers and portfolios

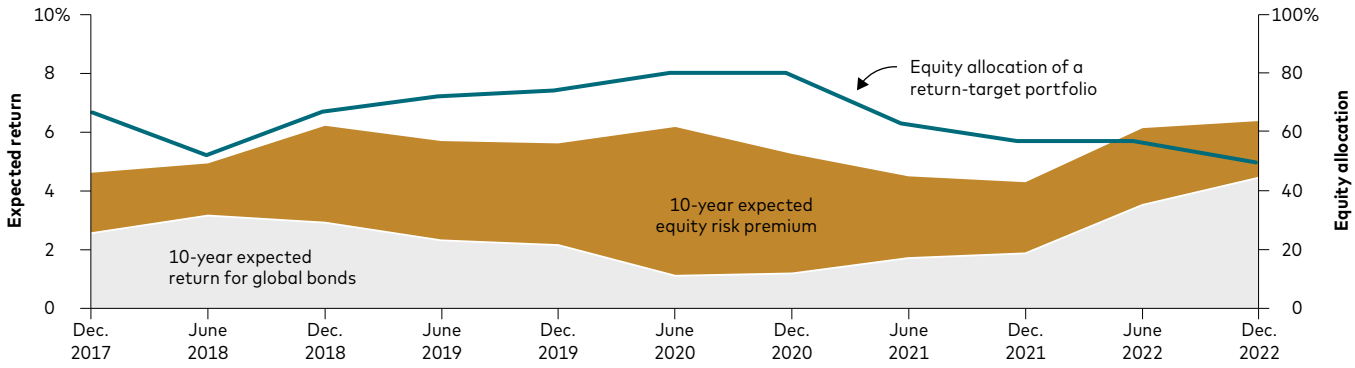


Source: Vanguard.

Similarly, **Figure 7** shows that the equity allocation in a return-target portfolio is highly dependent on the ERP and expected return on bonds. From June 2018 to December 2020, the equity allocation in the return-target portfolio increased gradually from 52% to 80% as the expectations for ERP increased while those for bond returns decreased. From December 2020 to December 2022, the portfolio reversed its risk-taking; optimal equity allocation decreased from 80% to 50% as ERP decreased and bond returns increased. Thus, these portfolios not only attempt to achieve the return target, but are also intuitively weighing risk-return tradeoffs while determining the allocation.

FIGURE 7

Equity allocation is highly dependent on expected equity risk premium and bond returns



Note: The 10-year expected equity risk premium is measured using the difference between the median VCMM's 10-year forecasts for global equities and global bonds.

Source: Vanguard.

Assessing the likelihood of success for a time-varying, return-target portfolio

How likely is it that a time-varying, return-target portfolio will deliver the stated return over a 10-year investment horizon? Unsurprisingly, the likelihood of success depends on several inputs, including the return-target level, investor risk profile, asset choice, and the associated asset constraints.

We have analyzed the likelihood of success as of December 2022 for a range of return-target levels and risk profiles.[1] **Figure 8** shows that probability of success increases as we move toward lower risk aversion and a lower return target. A higher return target is less achievable for investors with a conservative risk profile. Thus, it is important to select return targets in conjunction with the investor's risk tolerance. Specifically, it is more appropriate to accompany higher return targets with lower risk aversion.

FIGURE 8

Risk aversion and the return target can significantly impact the probability of success

	Probability of meeting the return target										
Return target	**Aggressive**			**Moderate**					**Conservative**		
4.0%	91.4%	91.3%	91.3%	91.3%	91.3%	89.8%	89.5%	89.3%	89.3%	89.2%	88.0%
4.5%	83.2	83.1	83.0	82.7	82.7	82.0	81.6	80.4	79.9	79.5	79.2
5.0%	75.7	75.6	75.4	75.4	74.9	74.9	73.4	73.0	72.4	71.5	70.7
5.5%	67.6	67.6	67.5	67.5	67.1	66.1	65.4	63.4	63.3	61.6	61.3
6.0%	60.7	60.6	60.3	59.4	58.5	57.0	56.6	55.0	53.0	52.1	50.1

Note: The probability of meeting the return target is calculated based on 10,000 VCMM 10-year simulations as of December 2022.
Source: Vanguard.

1 The success probabilities assume a single portfolio optimization as of December 2022. As articulated throughout this research, the purpose of periodically reoptimizing the portfolio is to recognize changes in expected returns and, therefore, increase the likelihood of achieving the stated return target. The success probabilities shown here do not account for the potentially beneficial impact of annual reoptimization.

Conclusion

Ten-year annualized returns for the stock and bond markets can fluctuate drastically over time, with their historical lows being –5% and 0%, respectively. These depressed medium-term returns could have serious implications for investors seeking to fulfill their spending needs through a portfolio. A valuation-aware, dynamic asset allocation approach, which targets a medium-term expected return level, may be suitable for investors with such a goal as long as they can accept taking on model risk (medium-term forecast risk).

As we discussed, a return-target portfolio strategy can have similar or better expected returns compared with a static portfolio, sometimes with even lower volatility. Thus, return-target portfolios not only attempt to achieve their return target, but also intuitively weigh risk-return tradeoffs while determining the allocation. Our analysis shows that the return-target portfolio strategy increases the likelihood of successfully meeting the return-target objective compared with a static portfolio.

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Appendix

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.

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.

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