

# Global equity investing: The benefits of diversification and sizing your allocation

Vanguard Research

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- Regardless of where they live, investors have a significant opportunity to diversify their equity portfolios by investing outside their home market. Despite this opportunity, investors on average have maintained allocations to their home country that have been significantly larger than the country's market-capitalization weight in a globally diversified equity index.
- In each market we examined, our analysis indicated that volatility was reduced most with an allocation to international equities of between 35% and 55%. While this observation may help investors determine the appropriate mix of domestic and international equities, volatility reduction is not the only factor to consider.
- This paper concludes that although no one answer fits all investors, global market-capitalization weight serves as a helpful starting point in determining the appropriate allocation between domestic and international equities. In practice, many investors will consider an allocation to international equities well below global market-capitalization weight based on their sensitivity to a number of considerations, including volatility reduction, expected returns, implementation costs, taxes, regulation, and their own preferences.

**Acknowledgments:** This paper is a revision of a Vanguard research paper first published in 2008 as *International Equity: Considerations and Recommendations* by Christopher B. Philips. In 2014 the paper was revised and published as *Global Equities: Balancing Home Bias and Diversification* by Christopher B. Philips; in 2019 it was revised again and published as *Global Equity Investing: The Benefits of Diversification and Sizing Your Allocation* by Brian J. Scott, Kimberly A. Stockton, and Scott J. Donaldson.

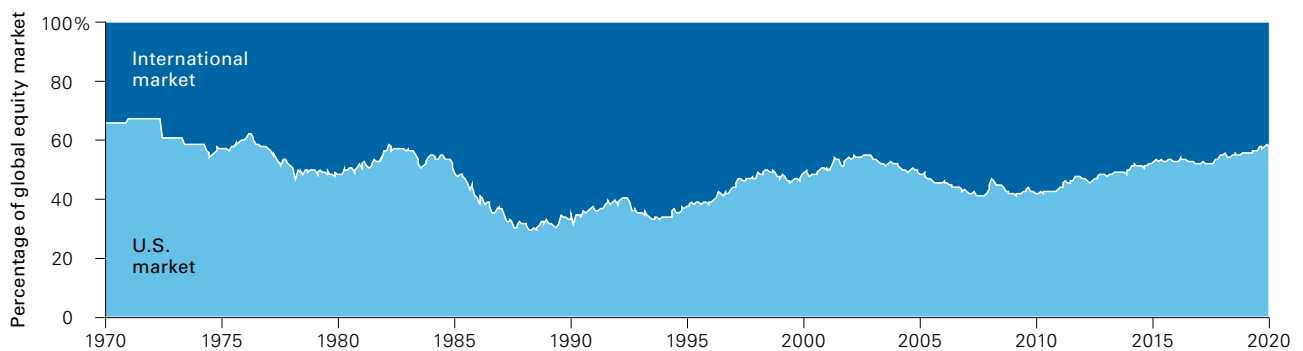
As of September 30, 2020, U.S. equities accounted for 58.3% of the global equity market and non-U.S. equities accounted for the remainder. Other developed equity markets that we will discuss in this paper and their percentage of global market capitalization include the euro area (8.6%), the United Kingdom (3.5%), Canada (2.7%), and Australia (1.8%).

While the United States is the largest developed market, its size relative to the entire global equity market has fluctuated over time and was as low as 29% in the 1980s (**Figure 1**). A portfolio invested solely within an investor's home market, regardless of domicile, excludes a large portion of the global opportunity set.

### The case for investing outside one's domestic market

Investing outside one's home market has diversified the returns of what had been a purely domestic market portfolio, on average and across time. The rationale for diversification is clear—domestic equities tend to be more exposed to the narrower economic and market forces of their home market while stocks outside an investor's home market tend to offer exposure to a wider array of economic and market forces. These differing economies and markets produce returns that can vary from those of an investor's home market.

**Figure 1. Historical mix of global equity market capitalization**



**Notes:** Data are as of September 30, 2020, for the period from January 1, 1970, to September 30, 2020. The U.S. market is represented by the MSCI USA Index. The non-U.S. market is represented by the MSCI World ex USA Index from January 1, 1970, through December 31, 1987, and the MSCI All Country World ex USA Index thereafter.  
**Sources:** Vanguard calculations, based on data from FactSet and MSCI.

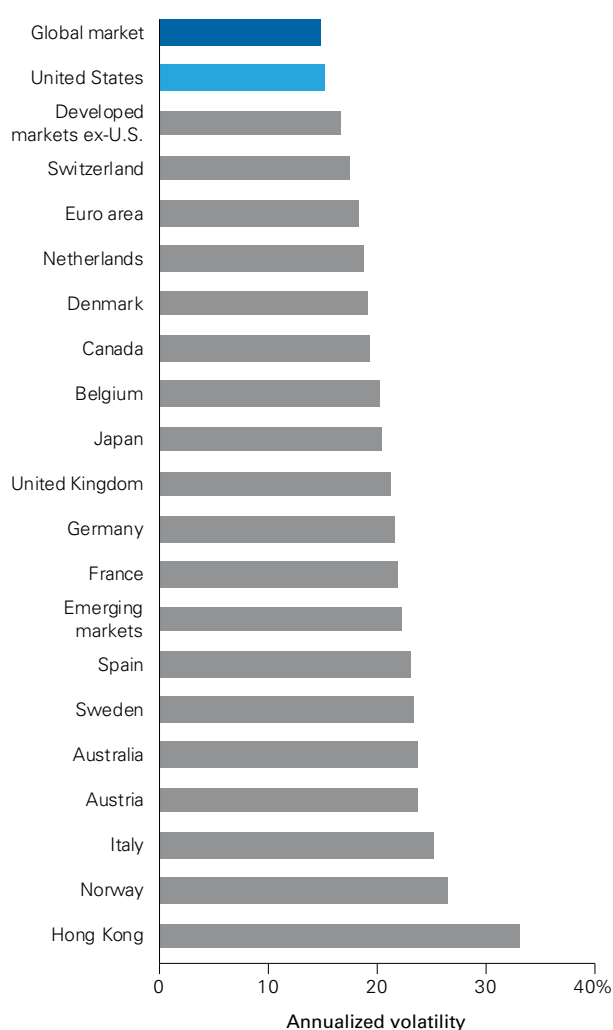
### Notes on risk

All investing is subject to risk, including possible loss of principal. 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. Diversification does not ensure a profit or protect against a loss. Investments in bonds are subject to interest rate, credit, and inflation risk.

Investments in stocks or bonds issued by non-U.S. companies are subject to risks including country/regional risk and currency risk. These risks are especially high in emerging markets. Past performance is not a guarantee of future results. The performance of an index is not an exact representation of any particular investment, as you cannot invest directly in an index.

At a high level, the benefit of global diversification can be shown by comparing the volatility of a global index with that of indexes focused on individual countries. In **Figure 2**, we show the benefit of diversification. While the United States had the lowest volatility of any individual country examined, its volatility was slightly higher than that of the global market index. Other countries examined had volatilities that were 15% to 100% greater than the global market index.

**Figure 2. Volatility of returns by market**



**Notes:** Data are as of September 30, 2020, for the period from January 1, 1970, to September 30, 2020. Country returns are represented by MSCI country indexes; the global market return includes both developed and emerging markets. Emerging markets are represented by the MSCI Emerging Markets Index, which began on January 1, 1988. The euro area is represented by the MSCI Europe ex UK ex Switzerland Index from January 1, 1970, through December 31, 1987, and the MSCI EMU Index thereafter.

**Sources:** Vanguard calculations, based on data from FactSet, Morningstar, and MSCI.

### Can multinational corporations provide enough exposure?

One common question about exposure to stocks outside one's home market is whether domestic multinational companies have enough coverage of foreign markets embedded in their prices. The thinking goes that, because many large domestic firms generate a significant portion of their revenue from foreign operations, the diversification benefits of global investing are already reflected in their prices and performance.

While this aspect of globalization cannot be ignored (and certainly can have an impact on investors' portfolios), we believe it still makes sense for investors to hold international equities, for several reasons.

First, simply focusing on domestic companies means an investor has no stake in leading global companies that are domiciled outside their home market. Second, many firms seek to hedge away currency fluctuations of their foreign operations. Although this can help smooth revenue streams, foreign exchange can be a diversifier for an investor's portfolio. Finally, a portfolio made up solely of domestic firms is likely to have less-diversified sector exposures than the global equity market portfolio.

### How much global exposure?

The decision to invest globally is only the first step. The next step is to determine an appropriate allocation.

The standard asset allocation approach, whether for a global allocation or for an allocation within a specific market, is to invest proportionally according to market capitalization. This method assumes that markets are efficient and that asset prices reflect all available information, investment positions, and expectations of the investing community.

U.S. investors who follow a market-capitalization-weighted approach would invest 58.3% of their equity portfolio in U.S. equities while investors in countries such as Germany, the United Kingdom, Canada, and Australia would allocate less than 10% of their equity portfolio to their domestic stock market. Scott et al. (2017) found that, in practice, most investors in these markets exhibit a strong home bias and overweight domestic equities relative to their global market-capitalization weight.

Another factor to consider in determining how much to allocate outside domestic equity markets is diversification. One way to evaluate the expected diversification benefits of international equities is to analyze the impact on portfolio volatility as incremental allocations of international equities are added to a domestic equity portfolio. **Figure 3** on page 5 shows the results from the Vanguard Capital Markets Model® (VCMM) of a 10-year forward-looking analysis between domestic stocks and international stocks across five developed markets—the United States, the euro area, Canada, the United Kingdom, and Australia.

A combination of imperfectly correlated returns across countries and lower global market volatility means that investors in each market examined will likely realize diversification benefits from incremental allocations to international stocks. In each market, the marginal benefit to international diversification declines as allocations to international equities increase. The downward-curving lines in Figure 3 illustrate that volatility generally begins to rise with allocations of greater than 35% to 55% to international equities. Similar conclusions can be drawn from a historical analysis in most of these markets; see **Figure A-1** in the Appendix. The euro area is the exception; because of notably higher volatility (both historical and expected) relative to other markets, full allocation to non-euro area stocks results in the lowest expected portfolio volatility.

### Qualitative considerations

In determining their appropriate allocation to international equities, local investors across the world also are influenced by embedded home biases. These biases can result from regulatory constraints, tax considerations, and behavioral tendencies.

For example, U.S. investors maintained an allocation to U.S. stocks that was approximately 1.4 times greater than the market capitalization of U.S. stocks. Next-closest in terms of bias to their home market were U.K. investors, who maintained an allocation to U.K. stocks that was approximately 4.9 times greater than the market capitalization of U.K. stocks (see **Figure A-2** in the Appendix). Real-world considerations may support allocations to international equities that differ from those suggested by market proportions or a minimum-variance analysis like the one used in Figures 3 and A-1.

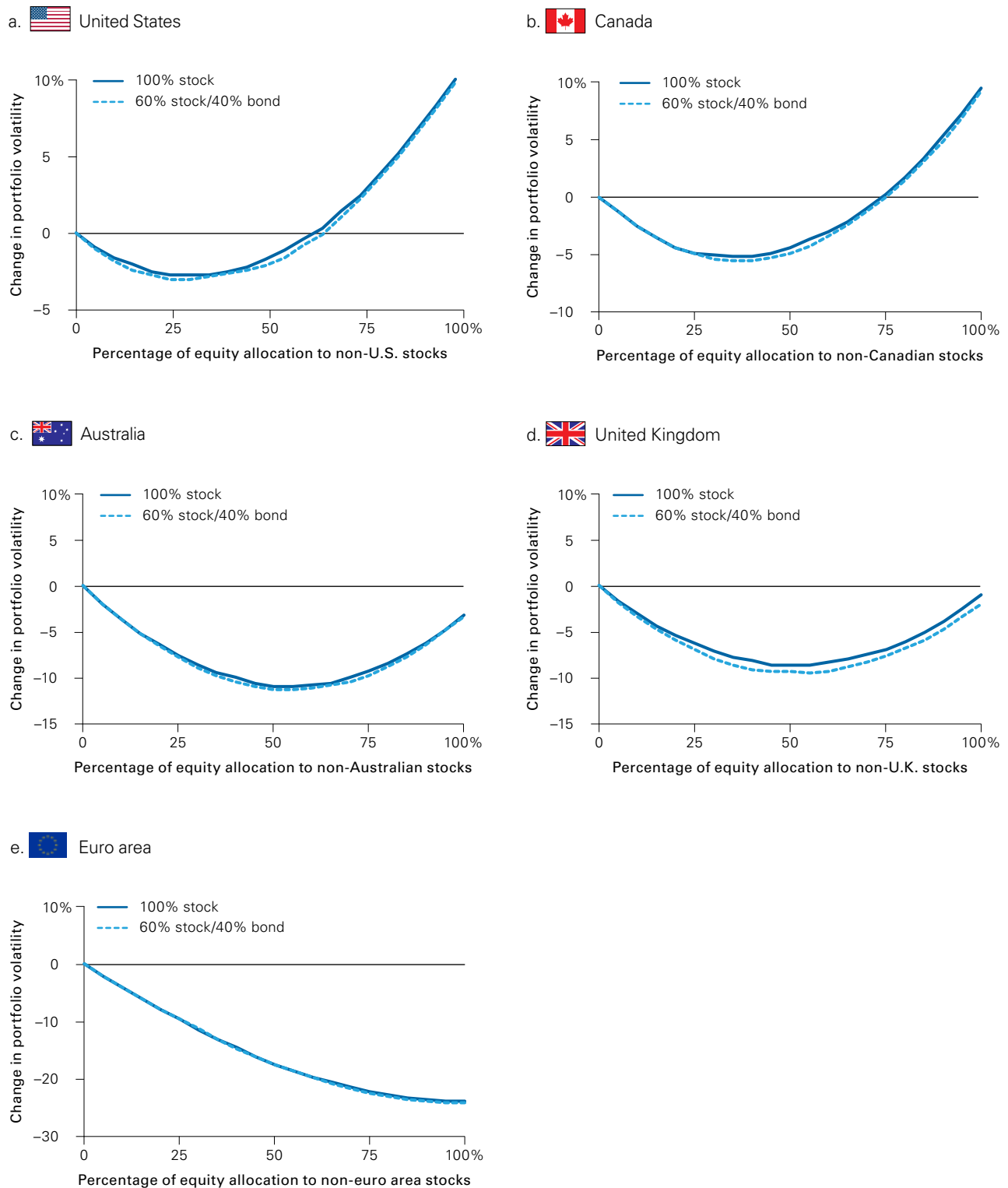
Broadly, such considerations involve barriers to investment, such as limitations on the repatriation of investment income, tax considerations, and higher transaction and friction costs (for instance, commissions, opportunity costs, and market-impact costs). Although barriers to cross-border investment have been falling, investment costs may be higher outside an investor's home market.

While market-capitalization weight is a valuable starting point, a number of other critical factors should be examined when considering an appropriate allocation to international equities. Investors should carefully weigh the trade-offs, such as volatility reduction, expected returns, implementation cost, tax considerations, and their own goals and ability to take on active or model risk.

**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 September 30, 2020. Results from the model may vary with each use and over time. For more information, please see the Appendix section "About the Vanguard Capital Markets Model."

**Figure 3. Adding international equity is expected to reduce the total volatility of a portfolio across markets**

10-year expected reduction in volatility



**Notes:** Ten-year expected returns are based on the median of 10,000 VCMM simulations as of September 30, 2020, in local currency. Euro area bond allocation is defined as the global market capitalization of euro-denominated bonds. For all other countries and regions, domestic/international bond allocations are based on Vanguard's recommendations for offsetting home bias.

**Source:** Vanguard.

### Changing diversification benefit

A primary change in the global equity market that has influenced global diversification is the increase in average return correlations. As shown in **Figure 4**, correlations between returns of stocks in the United States and those outside the United States have increased significantly, with the 10-year correlation rising from 0.51 as of December 31, 1989, to 0.86 as of September 30, 2020. Although longer-term correlations were stable through the 1980s and early 1990s, they increased fairly dramatically between 1994 and 2005. Since then, the trend in long-term correlations across equity markets has begun to flatten, perhaps implying that a ceiling to correlations among equity markets has been reached.

An economic rationale for this outcome is that, despite globalization, factors unique to a country's markets and economy will prevent perfect correlation between the equity markets of any two countries.

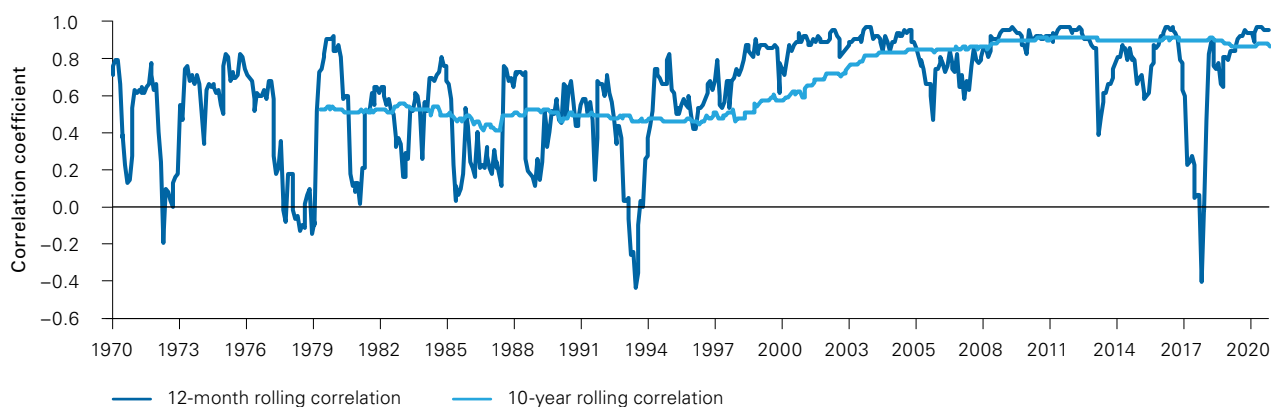
Vanguard's long-term forecasts of correlations across countries support this rationale. Using our asset simulation model, the VCMM, we generated forward-looking correlations for domestic and international equity over a 30-year period. The results in **Figure 5** on page 7 illustrate that from the Canadian, U.S., Australian, euro area, and U.K. investor perspectives, domestic equity market correlations with international equity markets are all expected to be imperfect, implying a continued diversification benefit.

### Diversification of return opportunities

Another benefit of global diversification is the opportunity to participate in whichever regional market is outperforming. This is a critical component of diversification that correlation does not effectively capture. For example, while the United States may lead over some periods, another country or region will invariably lead at other points.

**Figure 4. Historically, correlations have risen, meaning less impact from global diversification**

12-month and 10-year rolling correlations between U.S. and international stocks








**Notes:** Data are as of September 30, 2020, for the period from January 1, 1970, to September 30, 2020. U.S. equities are represented by the MSCI USA Index from January 1, 1970, through May 31, 1994, and the MSCI USA Investable Market Index thereafter. Non-U.S. equities are represented by the MSCI World ex USA Index from January 1, 1970, through December 31, 1987, and the MSCI All Country World ex USA Index thereafter.

**Sources:** Vanguard calculations, based on data from MSCI and FactSet.

**Figure 5. Imperfect correlations across domestic and international equity markets are likely to continue**

Domestic equity and unhedged international equity 30-year median correlations

| Country/region                                                                                   | 30-year correlation |
|--------------------------------------------------------------------------------------------------|---------------------|
|  Australia      | 0.62                |
|  Canada         | 0.64                |
|  United Kingdom | 0.65                |
|  United States  | 0.72                |
|  Euro area      | 0.76                |

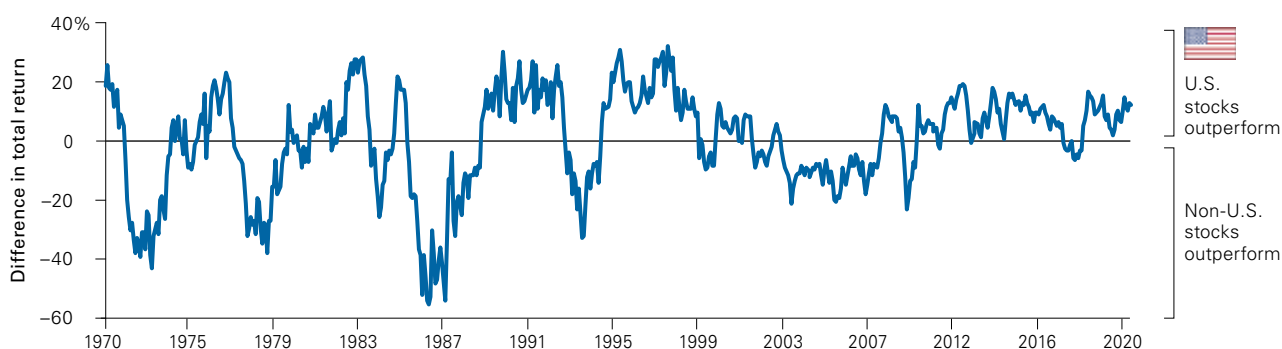
**Note:** Correlations are for domestic equities to each country/region's international equity market.

**Source:** Vanguard calculations, from VCMM forecasts as of September 30, 2020. (See the Appendix section "About the Vanguard Capital Markets Model" for more information.)

**Figure 6** demonstrates the near-term benefits of global diversification. By including both broadly diversified U.S. and non-U.S. equities in a portfolio, the investor should obtain a return that falls between those of the U.S. market and those of the non-U.S. market. For example, in the mid-1980s and most of the 2000s, exposure to diversified non-U.S. equities would have allowed a U.S. investor to participate in the outperformance of those markets. On the other hand, exposure to U.S. equities for most of the 2010s would have benefited global investors domiciled outside the United States.

Return differentials between equities in the United Kingdom, the euro area, Australia, and Canada and equities in their international markets have also been observed over time, supporting the case for international diversification in multiple markets (see **Figure A-3** in the Appendix).

**Figure 6. Trailing 12-month return differential between U.S. and non-U.S. stocks**



**Notes:** Data are as of September 30, 2020, for the period from January 1, 1970, to September 30, 2020. U.S. equities are represented by the MSCI USA Index from January 1, 1970, through May 31, 1994, and the MSCI USA Investable Market Index thereafter. Non-U.S. equities are represented by the MSCI World ex USA Index from January 1, 1970, through December 31, 1987, and the MSCI All Country World ex USA Index thereafter.

**Sources:** Vanguard calculations, based on data from MSCI and FactSet.






We expect that the return patterns between domestic and international equities will continue to differ regardless of where an investor lives, leading to a continued benefit from diversification. Again using the VCMM, **Figure 7** illustrates the forecasted distribution of 10-year returns for domestic and global equity markets. Note that Vanguard expects domestic equity returns to differ from historical and forward-looking global equity returns, illustrating the time-varying nature of equity market performance on a relative and an absolute basis. DiCiurcio et al. (2020), in analyzing the drivers of the return differences, reaffirm the benefits of a globally diversified equity portfolio for U.S. investors in the years to come.

### Impact of currency exposure

Investments in foreign markets are exposed to fluctuations in foreign exchange rates. Long term, currency has no intrinsic return—there is no yield, no coupon, no earnings growth. Therefore, long term, currency exposure affects only return volatility. Primary factors to consider in the equity-hedge decision include currency contribution to volatility, currency correlation with the underlying asset, and investor risk tolerance.<sup>1</sup>

While currency volatility can be a major driver of risk for fixed income return volatility, for international equities, currency volatility generally plays less of a role long term. In **Figure 8** on page 9, we illustrate the annualized volatility of unhedged international equities and the currency-hedging impact. In all regions, the hedging effect is relatively marginal and, sometimes, reduces volatility.

**Figure 7. Vanguard 10-year return expectations—domestic versus international equity**

|                                                                                     |                                     | Distribution of geometric returns (percentiles) |       |      |      |       |       | Median volatility |
|-------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------------------|-------|------|------|-------|-------|-------------------|
|                                                                                     |                                     | 5                                               | 10    | 25   | 50   | 75    | 90    |                   |
|  | <b>Australian equity</b>            | 0.0%                                            | 1.5%  | 3.9% | 6.7% | 9.6%  | 12.2% | 20.1%             |
|                                                                                     | Unhedged global equity ex-Australia | −1.9%                                           | −0.3% | 2.8% | 6.1% | 9.6%  | 13.0% | 19.4%             |
|  | <b>Canadian equity</b>              | −0.1%                                           | 1.2%  | 3.4% | 5.8% | 8.3%  | 10.5% | 17.1%             |
|                                                                                     | Unhedged global equity ex-Canada    | −1.4%                                           | 0.2%  | 2.9% | 5.9% | 8.9%  | 11.8% | 18.8%             |
|  | <b>Euro area equity</b>             | −4.4%                                           | −2.2% | 1.5% | 5.8% | 10.3% | 14.4% | 25.4%             |
|                                                                                     | Unhedged global equity ex-euro area | −3.0%                                           | −1.5% | 1.3% | 4.4% | 7.6%  | 10.5% | 19.3%             |
|  | <b>U.K. equity</b>                  | −0.2%                                           | 1.6%  | 4.5% | 7.4% | 10.2% | 12.9% | 19.4%             |
|                                                                                     | Unhedged global equity ex-U.K.      | −2.2%                                           | −0.6% | 2.2% | 5.5% | 8.7%  | 11.9% | 19.2%             |
|  | <b>U.S. equity</b>                  | −2.1%                                           | −0.4% | 2.0% | 4.7% | 7.4%  | 10.0% | 16.9%             |
|                                                                                     | Unhedged global equity ex-U.S.      | 1.6%                                            | 3.0%  | 5.4% | 8.0% | 10.6% | 13.1% | 18.6%             |

**Note:** Ten-year expected returns are based on the median of 10,000 VCMM simulations as of September 30, 2020, in local currency.

**Source:** Vanguard.

<sup>1</sup> A number of other factors affect the currency-hedging decision, such as local market size, currency liquidity in a crisis, hedging costs, and home bias. For a full analysis of the currency-hedging decision, see *The Portfolio Currency-Hedging Decision, by Objective and Block by Block* (Roberts et al., 2018).



As Figure 8 shows, there are times when hedging may actually lead to higher volatility—note the slightly higher risk for Australian and Canadian investors over the period studied. These results are driven in part by the relationship between the local currency and the underlying asset. For the countries we analyzed, the equity/currency correlation has been dynamic and varied through time. Depending on the investor’s home market, there have been periods when hedging one’s international equity increased volatility (positive correlation) and times when hedging the international equity reduced volatility (negative correlation).

Therefore, the equity hedge decision also depends on investor objective. Those with a long investment horizon who are comfortable with equity’s high potential return and volatility may be disposed to accept short-term currency volatility. Those with shorter horizons or an explicit objective to minimize volatility may prefer to hedge the currency risk.

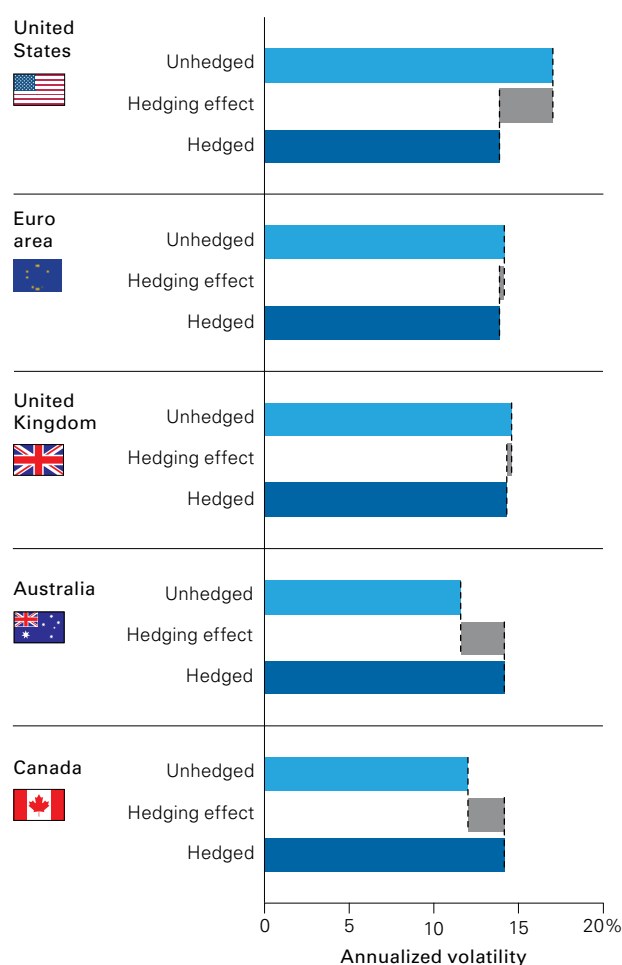
### Role of emerging markets

Emerging markets are economies or markets that are just entering the global arena or do not meet the criteria to be considered developed economies. For example, the World Bank classifies emerging markets as economies below the upper-middle-income threshold.<sup>2</sup> MSCI, FTSE, and other benchmark providers may consider additional criteria, such as the maturity of financial markets, the structure of transaction settlement, and the freedom of capital, among others.

Many countries (among the better-known ones are the BRICS: Brazil, Russia, India, China, and South Africa) may meet one or more of these criteria, but not all. Those that manage to develop successfully economically, politically, and financially (such as the United States from the 1800s through the 1900s) would be expected to enjoy strong long-term equity market returns.

Because of the higher idiosyncratic, political, economic, and financial risks in emerging-market countries, equities in these markets have historically exhibited greater downside risk than those in developed markets. However, because individual emerging markets are relatively uncorrelated across countries, the risk of investing in all countries is lower. In addition, the unique development patterns of these emerging markets help them to diversify the returns of developed and international markets. Emerging markets also have delivered higher average returns, albeit with higher volatility, than those of developed markets.

Figure 8. Currency contribution to equity volatility



**Notes:** Data are as of September 30, 2020, for the period from January 1, 2000, to September 30, 2020. Annualized volatility is calculated from monthly returns of global equities and is represented for each country/region by, respectively from top to bottom, the MSCI All Country World ex USA, ex EMU, ex UK, ex Australia, and ex Canada (Local/Unhedged) Indexes.

**Sources:** Vanguard calculations, based on data from FactSet and MSCI.

The combination of higher expected returns, higher expected volatility, and moderate correlations between emerging and developed markets suggests that a modest allocation to emerging markets is warranted. For many investors, a market-cap-weighted allocation via a mutual fund or exchange-traded fund that is invested across international equities can be a good way to incorporate emerging markets into a diversified portfolio. Such an allocation can help investors stay relatively insulated from emerging markets’ potentially severe swings in performance while still gaining some of their benefits.

<sup>2</sup> Countries are ranked by the World Bank each July and divided into four income groups (based on annual gross national income per capita). As of July 1, 2020, the groups are: low-income, \$1,036 or less; lower-middle-income, \$1,036–\$4,045; upper-middle-income, \$4,046–\$12,535; and high-income, \$12,535 or more.

## Conclusion

In light of our quantitative analysis and qualitative considerations, we have demonstrated that domestic investors should consider allocating part of their portfolios to international equities. In determining how much to allocate between domestic and international equities, a helpful starting point for investors is global market-capitalization weight. In practice, many investors will consider an allocation below this starting point based on their sensitivity to a number of considerations, including volatility reduction, implementation costs, taxes, regulation, and their own preferences.


## References

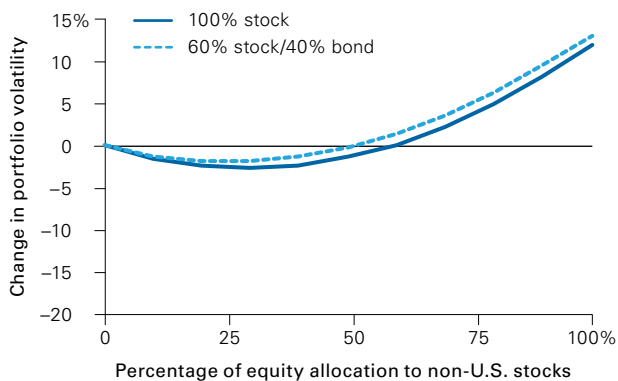
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## Appendix

**Figure A-1. Adding international stocks has historically reduced the volatility of a domestic stock portfolio**

(Panels cover different periods because of data availability. In each case, we used the longest period possible with the available data.)

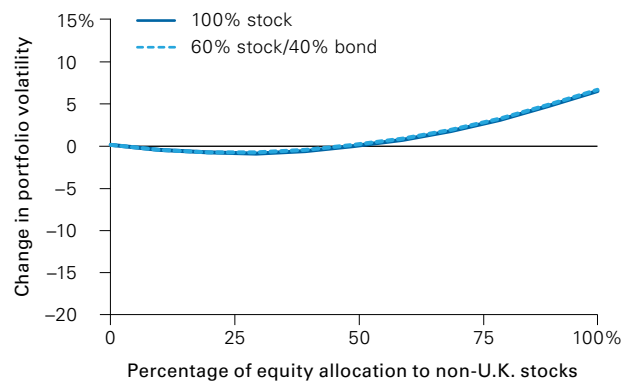
a.  Average annualized change in portfolio volatility when adding non-U.S. stocks to a U.S. portfolio



**Notes:** Data are as of September 30, 2020, for the period from January 1, 1985, to September 30, 2020. U.S. equities are represented by the MSCI USA Index through May 31, 1994, and the MSCI USA Investable Market Index thereafter. Non-U.S. equities are represented by the MSCI World ex USA Index through December 31, 1987, and the MSCI All Country World ex USA Index thereafter. Global bonds are represented by the Citigroup WGBI ex-USD (USD hedged) to December 31, 1998, and the Bloomberg Barclays Global Aggregate ex-USD Bond Index (USD Hedged) thereafter. U.S. bond returns are represented by the Bloomberg Barclays U.S. Aggregate Bond Index. The domestic/international bond allocation is 70%/30%, respectively.

**Sources:** Vanguard calculations, based on data from Morningstar, FactSet, FTSE, Bloomberg, and MSCI.

b.  Average annualized change in portfolio volatility when adding non-U.K. stocks to a U.K. portfolio




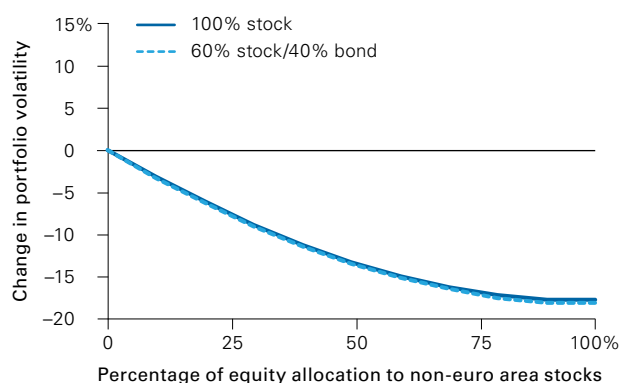
**Notes:** Data are as of September 30, 2020, for the period from January 1, 1999, to September 30, 2020. U.K. equities are represented by the MSCI UK Investable Market Index; non-U.K. equities are represented by the MSCI All Country World ex UK Index. Global bonds are represented by the Bloomberg Barclays Global Aggregate ex-GBP Bond Index (GBP Hedged); U.K. bond returns are represented by the Bloomberg Barclays Sterling Aggregate Index. The domestic/international bond allocation is 35%/65%, respectively.

**Sources:** Vanguard calculations, based on data from Morningstar, FactSet, FTSE, Bloomberg, and MSCI.

**Figure A-1. (Continued). Adding international stocks has historically reduced the volatility of a domestic stock portfolio**


(Panels cover different periods because of data availability. In each case, we used the longest period possible with the available data.)

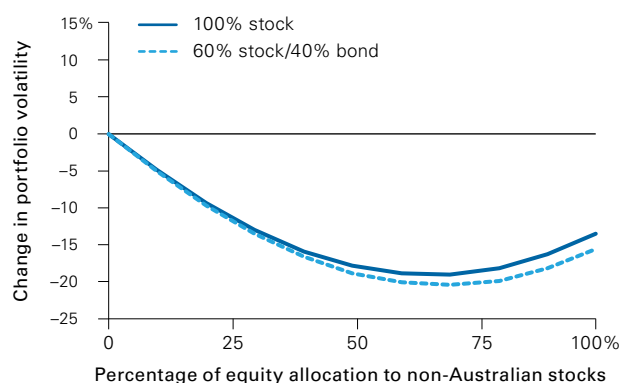
c.  Average annualized change in portfolio volatility when adding non-euro area stocks to a euro area portfolio



**Notes:** Data are as of September 30, 2020, for the period from February 1, 1999, to September 30, 2020. Euro area equities are represented by the MSCI EMU Investable Market Index; non-euro area equities are represented by the MSCI All Country World ex EMU Index. Global bonds are represented by the Bloomberg Barclays Global Aggregate ex-Euro Bond Index (Euro Hedged); euro area bond returns are represented by the Bloomberg Barclays Euro Aggregate Index. The euro area bond/non-euro area bond allocation is 25%/75%, respectively; it is based on global market capitalization.


**Sources:** Vanguard calculations, based on data from Morningstar, FactSet, FTSE, Bloomberg, and MSCI.

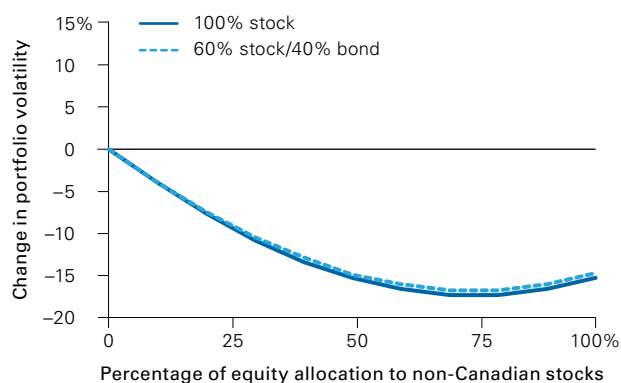
d.  Average annualized change in portfolio volatility when adding non-Australian stocks to an Australian portfolio



**Notes:** Data are as of September 30, 2020, for the period from January 1, 1999, to September 30, 2020. Australian equities are represented by the MSCI Australia Investable Market Index; non-Australian equities are represented by the MSCI All Country World ex Australia Index. Global bonds are represented by the Bloomberg Barclays Global Aggregate ex-AUD Bond Index (AUD Hedged); Australian bond returns are represented by the Bloomberg Barclays Australian Aggregate 300m Index. The domestic/ international bond allocation is 30%/70%, respectively.

**Sources:** Vanguard calculations, based on data from Morningstar, FactSet, FTSE, Bloomberg, and MSCI.

e.  Average annualized change in portfolio volatility when adding non-Canadian stocks to a Canadian portfolio

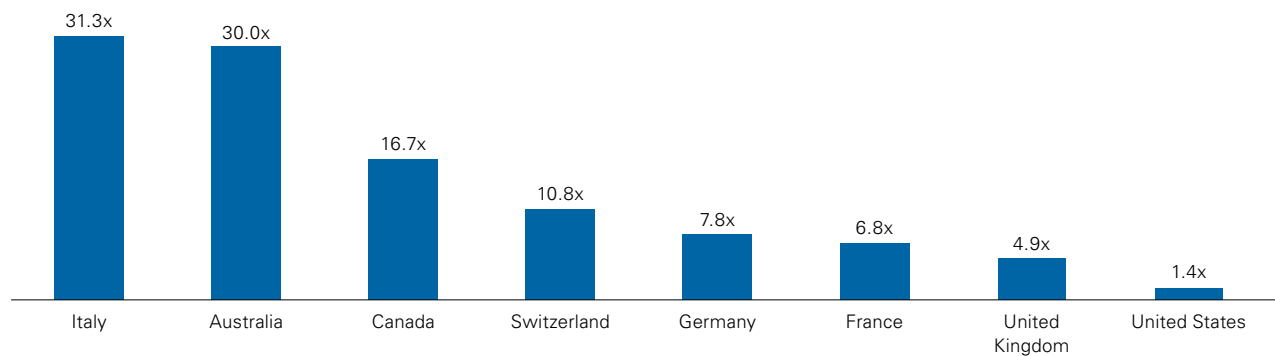


**Notes:** Data are as of September 30, 2020, for the period from January 1, 1999, to September 30, 2020. Canadian equities are represented by the MSCI Canada Investable Market Index; non-Canadian equities are represented by the MSCI All Country World Index ex Canada Index. Global bonds are represented by the Bloomberg Barclays Global Aggregate ex-CAD Bond Index (CAD Hedged); Canadian bond returns are represented by the FTSE Canadian GBI through October 31, 2000, and the Bloomberg Barclays Canada Aggregate Index thereafter. The domestic/ international bond allocation is 60%/40%, respectively.

**Sources:** Vanguard calculations, based on data from Morningstar, FactSet, FTSE, Bloomberg, and MSCI.

**Figure A-2. Equity market home bias by country**

Domestic stocks' allocation in home investors' portfolios compared with their weight in the global index

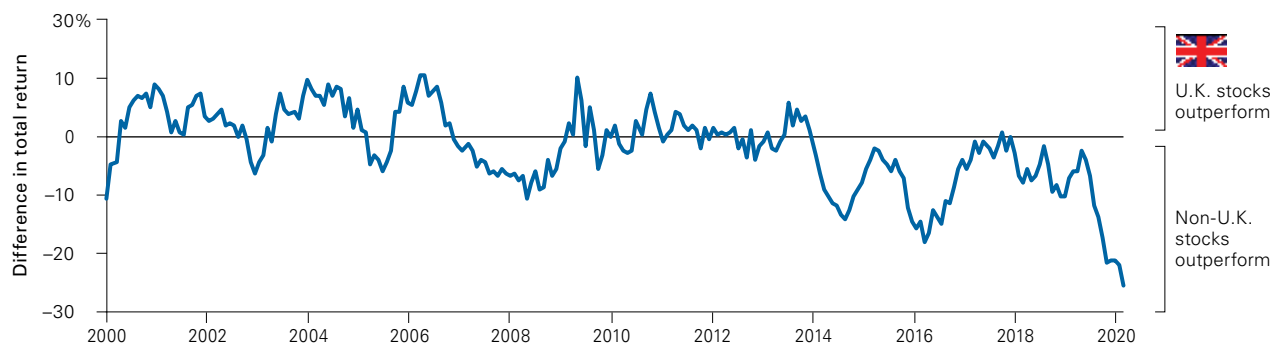


**Notes:** Data are as of December 31, 2019 (the latest available from the International Monetary Fund, or IMF), using U.S. dollars. Domestic investment is calculated by subtracting total foreign investment (as reported by the IMF) in a given country from its market capitalization in the MSCI All Country World Investable Market Index. Given that the IMF data are voluntary, there may be some discrepancies between the market values in the survey and the MSCI All Country World Index Investable Market Index.

**Sources:** Vanguard calculations, based on data from the IMF's Coordinated Portfolio Investment Survey (2019), FactSet, and MSCI.

**Figure A-3. Trailing 12-month return differentials**

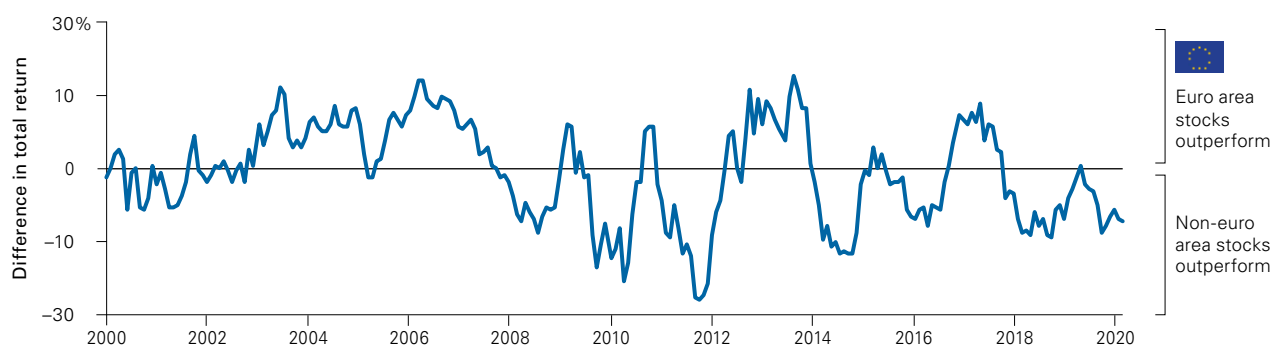
a. Trailing 12-month return differential between U.K. and non-U.K. stocks



**Notes:** Data are as of September 30, 2020, for the period from October 1, 1999, to September 30, 2020. U.K. equities are represented by the MSCI UK Investable Market Index; non-U.K. equities are represented by the MSCI All Country World ex UK Index.

**Sources:** Vanguard calculations, based on data from MSCI and FactSet.

b. Trailing 12-month return differential between euro area and non-euro area stocks



**Notes:** Data are as of September 30, 2020, for the period from October 1, 1999, to September 30, 2020. Euro area equities are represented by the MSCI EMU Investable Market Index; non-euro area equities are represented by the MSCI All Country World ex EMU Index.

**Sources:** Vanguard calculations, based on data from MSCI and FactSet.

**Figure A-3. (Continued). Trailing 12-month return differentials**

c. Trailing 12-month return differential between Canadian and non-Canadian stocks



**Notes:** Data are as of September 30, 2020, for the period from October 1, 1999, to September 30, 2020. Canadian equities are represented by the MSCI Canada Investable Market Index; non-Canadian equities are represented by the MSCI All Country World ex Canada Index.

**Sources:** Vanguard calculations, based on data from MSCI and FactSet.

d. Trailing 12-month differential between Australian and non-Australian stocks



**Notes:** Data are as of September 30, 2020, for the period from October 1, 1999, to September 30, 2020. Australian equities are represented by the MSCI Australia Investable Market Index; non-Australian equities are represented by the MSCI All Country World ex Australia Index.

**Sources:** Vanguard calculations, based on data from MSCI and FactSet.

## 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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