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Research note

Dynamic correlations: The implications for portfolio construction

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Executive summary. It is common to hear of the value of diversification during uncertain or volatile times. Indeed, a broadly diversified, balanced portfolio is less likely to perform as poorly as a portfolio focused entirely on stocks if and when stocks enter a bear market or experience seemingly abnormal volatility. Perhaps this is a primary reason why the market environment since the global financial crisis has spawned such disappointment and a perception that diversification no longer works. Since 2008, most risky asset classes have seemingly moved in lockstep, with correlations to US equities over the past three years ranging from 0.06 (commodities) to 0.93 (developed international markets). Indeed, only Treasury bonds have proven to be a true diversifier, correlating at a -0.3 to US equities.

Correlation is a measure of the tendency of the returns of one asset to move in tandem with that of another asset. In other words, two assets that are 'uncorrelated' could be expected to show no systematic, linear relationship between their returns over time. By combining uncorrelated assets, the movements of one asset can be expected to at least partially mitigate the movements of the second asset, reducing the average volatility of a portfolio.

While carefully estimating and considering correlation is critical to the process of portfolio construction, great care must be exercised in using correlation as the foundation. Correlation is a statistical measure, subject to estimation error, and correlations among assets can vary both over time and in different

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circumstances. And as the recent market environment has shown, many risky assets can and do perform similarly during periods characterised by risk aversion and a general flight to quality.

While most investors have long-term investment goals, they are particularly averse to large losses, even over the short term. As a result, the second half of our analysis looks closely at what happens to correlations and ultimately diversification during periods of severe market stress. During such periods, diversification benefits can seem to vanish among some assets with low long-term correlation, while the diversification benefits of other assets may become more apparent.

So what can investors do with this information? How can an investor ensure that a portfolio is properly diversified? In this paper we discuss what correlation does and does not mean for diversification, the implications of dynamic correlations, the risk of relying on historical correlations during a flight to quality, and the benefit of focusing on fixed income instruments as a source of consistent diversification benefit to mitigate the near-term risk of the equity markets.¹

Notes on risk: All investments are subject to risk. Past performance is no guarantee of future results. Diversification does not ensure a profit or protect against a loss in a declining market. Investments in bonds are subject to interest rate, credit, and inflation risk. Foreign investing involves additional risks, including currency fluctuations and political uncertainty. Stocks of companies in emerging markets are generally more risky than stocks of companies in developed countries. Prices of mid- and small-cap stocks often fluctuate more than those of large-company stocks.

Investors must buy or sell ETF shares in the secondary market with the assistance of a stockbroker. In doing so, the investor will incur brokerage commissions and may pay more than net asset value when buying and receive less than net asset value when selling.

¹ During periods of severe equity market stress, cash has historically been the most consistent diversifier to risky assets such as stocks. However, cash is more generally associated with short-term needs rather than investing with the goal of increasing the real value of a long-term investment portfolio. For this reason, we have chosen not to focus on cash in this paper.

Setting the baseline: What does correlation tell us?

Correlation is a statistical measurement used to convey the strength and direction of a linear relationship between two random variables. In finance, these variables can be anything from an individual security to an entire asset class. Increasingly positive (negative) correlation indicates an increasingly strong (inverse) relationship between the two variables, up to 1 (-1), which indicates a perfectly positive (inverse) relationship. In other words, two stocks with perfect correlation would be expected to move up and down in fixed proportion over a given period of time. Of course, because distinct investments are by definition influenced differently by the same factors, perfect positive correlation is extremely rare. For example, for the period from 1 January 2000, through 31 December 2001, the returns of ExxonMobil and Chevron, two very similar oil services firms, correlate at 0.85 on a daily basis, and 0.74 on a monthly basis (data provided by Thomson Datastream). While the two companies moved in the same direction on 2,541 days, they moved in opposite directions on 589 days.

Even in the case of a preannounced stock-for-stock merger of two corporations (in which the equity of one entity will be converted into equity of another in fixed proportion at a given future date), correlations can be less than 1.0. And while correlation conveys information about tendencies in the direction of the change in value of two investments, the statistic itself conveys very little information about the absolute level of change in

value of the assets. For example, over the same period, ExxonMobil posted a 110% cumulative return while Chevron notched a more impressive 146% cumulative return. So while highly correlated, investing in one was not 'just as good' as investing in the other. In fact, investors must be equally aware of the things that correlation does not tell them.

Correlation and portfolio variance

Correlation differences may actually have a more modest diversification benefit than many investors perceive. In fact, in the case of combining stocks and bonds, the single largest factor contributing to the decline in portfolio volatility arises from the lower total volatility of bonds, not the fact that stocks and bonds have low correlation. From the mathematical definition of portfolio variance, the following relationship must hold for all two-asset portfolios:

$$\text{Portfolio Variance} = \text{Variance}_1 \times \text{Weight}_1^2 + \text{Variance}_2 \times \text{Weight}_2^2 + \text{Correlation effect}$$

where 'Correlation effect' is a function of the weights of the assets in the portfolio and their correlation with each other. A direct implication of this equation is that correlation is most relevant to diversification arguments, and most powerful in reducing portfolio volatility, when asset volatilities are more similar.

The role of correlation in portfolio construction

Correlation is one of the primary building blocks of portfolio construction, along with expected returns and expected volatility. Because correlation summarises the historical relationship between two assets, investors often focus on correlation to frame expectations for how the portfolio may perform over time. Specifically, by combining imperfectly correlated assets, a portfolio's expected volatility may be reduced, often without a significant impact to returns.² As **Figure 1** illustrates, from 1 January 1926, through 31 December 2010, adding a 10% bond allocation³ to a US stock portfolio⁴ would have reduced volatility from 22.96% to 20.81%, but would have only reduced annualised returns from 10.17% to 9.95%. It's clear that the low average correlation between the US stock market and the US bond market (historically, 0.25), combined with significantly lower overall volatility for US bonds, produced a significant diversification benefit. This is particularly true in equity-heavy portfolios, where the reduction to portfolio volatility has been disproportionately large relative to the reduction in average returns. And as long as the observed correlation remains constant over time, this relationship will tend to hold. However, challenges to portfolio construction arise when the correlations among assets do not remain constant, and instead shift, sometimes significantly.

Dynamic correlations

Volatility is typically associated with returns; however, measured correlations can also be volatile, often to the detriment of portfolios believed to be adequately diversified. And the shorter the window of observation, the greater the likelihood that realised correlation will differ from the long-term average.

Figure 2 illustrates 5-year correlations between monthly US stock and US bond total returns over 5-year intervals since 1926 (17 distinct, non-overlapping periods). While the long-term average correlation between these two asset classes has been 0.25, the figure shows that correlations over shorter windows vary widely from this average, with a range of 0.72 for the 5-year period ended 1975 to -0.54 for the 5-year period ended 2005.⁵

Volatility in realised correlations can have serious implications for investors, as the diversification and portfolio efficiency that is realised may differ from expectations. For example, over the 20-year period ended 31 December 1985, the correlation between US stocks and US bonds was 0.57. This meant that the ex-post, realised reduction in portfolio volatility by adding bonds to a stock portfolio was reduced – adding a 10% allocation to bonds to a 100% stock portfolio reduced volatility 6.8% (versus the long-term average of 9.3%). In contrast, from 1986 through December 2011, the realised correlation between US stocks and US bonds was -0.10, which translated into a volatility reduction of 10.2% when a 10% bond allocation was added to a 100% stock portfolio.

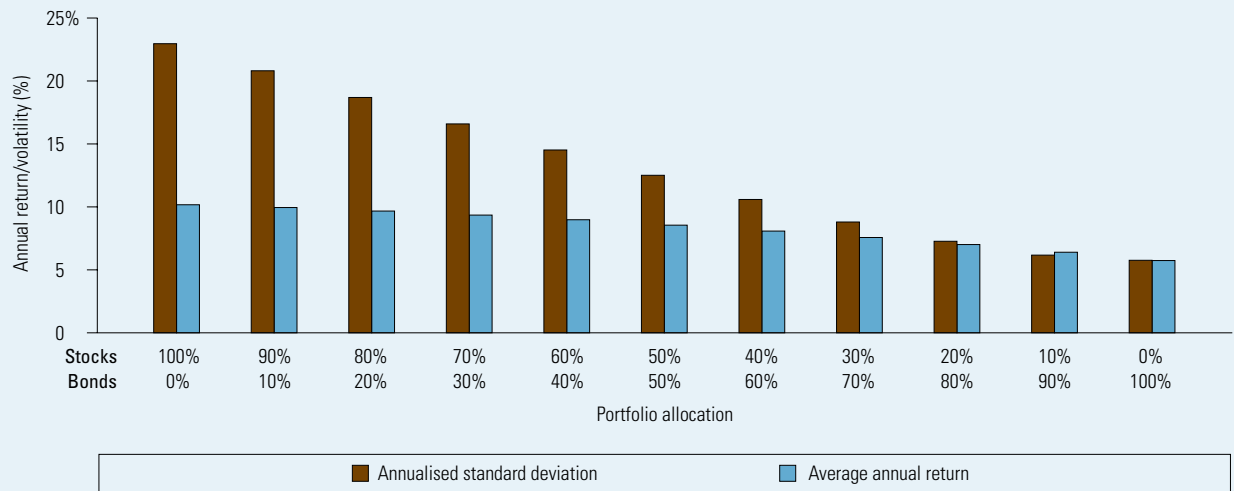
2 Correlation has been widely used when constructing investment portfolios ever since Harry M. Markowitz first developed the theory of mean-variance analysis in the 1950s. The basic premise of mean-variance analysis is that investors face a trade-off between risk and expected return. In mean-variance analysis, risky assets can be combined in a portfolio in an attempt to minimise the total portfolio risk at any desired level of expected return. Markowitz discovered that portfolio standard deviation is a function not only of the standard deviations of all the individual assets in a portfolio, but also of the covariance between the rates of return for all the assets in the portfolio. Optimal mean-variance combinations lie along the efficient frontier – a set of portfolios that has the maximum expected return for a given level of risk and the minimum risk for a given level of expected return. According to the theory, any risk-return combination that does not lie along the efficient frontier would be suboptimal. All rational investors would therefore wish to be positioned at some point along the efficient frontier commensurate with their return expectations and risk tolerance.

3 Throughout this analysis, references to 'bonds' or 'US bonds' or 'investment-grade bonds' are synonymous with the broad US bond market. We represent the US bond market by combining the following historical benchmarks: The S&P High Grade Corporate Bond Index from 1926 through 1968; the Citigroup High Grade Index from 1969 through 1972; the Barclays Capital U.S. Long Credit Aa Bond Index from 1973 through 1975; the Barclays Capital U.S. Aggregate Bond Index thereafter.

4 Throughout this analysis, references to 'stocks' or 'US stocks' are synonymous with the broad US stock market. We represent the US stock market by combining the following historical benchmarks: The S&P 500 Index from 1926 through 1970; the Dow Jones U.S. Total Stock Market Index from 1971 through 22 April 2005; the MSCI U.S. Broad Market Index thereafter.

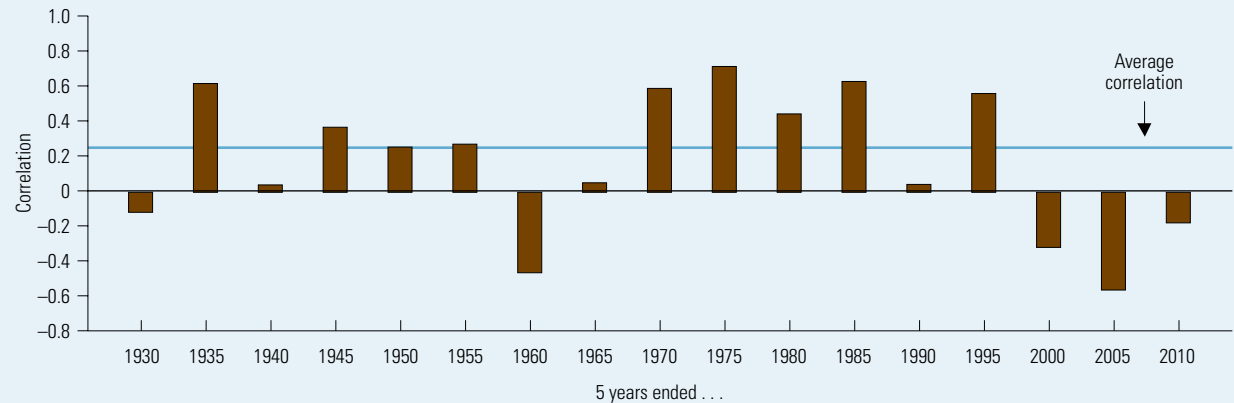
5 The correlation between monthly US stock and US bond returns from 1/1/2011 through 31/12/2011 was -0.91.

Figure 1. Historical average volatility and returns relative to various stock/bond portfolios



Source: Vanguard calculations using data from Standard & Poor's, Dow Jones, MSCI, Citigroup and Barclays Capital. Data cover the period 1 January 1926, through 31 December 2011.

Figure 2. 5-year non-overlapping correlations between US stocks and US bonds



Source: Vanguard calculations using data from Standard & Poor's, Dow Jones, MSCI, Citigroup, and Barclays Capital. Data cover the period 1 January 1926, through 31 December 2010.

Why does measured correlation differ from its long-term average? The fact that observed correlation varies, even over relatively long periods of time, does not necessarily mean that 'correlations are changing', although this may be the case. It simply reflects randomness in the return variables themselves, which generally produces ex-post outcomes that differ from the 'true' underlying statistic or longer-term average, particularly over shorter periods.

Previous research suggests that not only does randomness affect measures of realised correlation through time, but also that the underlying correlations between asset returns change over time and in particular circumstances and have important relationships to events such as volatility shocks. Ilmanen (2003) finds that factors increasing the correlation between US stocks and bonds include high inflation and significant changes in GDP growth. Ilmanen also finds that stock-bond correlation tends to be lowest when equities are weak and volatile, such as during flights to quality. Other research provides similar evidence. Gulko (2002) finds that stock-bond correlations are positively related during normal market conditions, but decrease during stock market plunges. Connolly, Stivers, and Sun (2005) show that stock-bond correlation is lower when the implied volatility from equity index options is higher.

Although market volatility has emerged as a key driver that tends to decrease correlations between stocks and bonds, volatility is also a major driver that tends to increase correlations when looking at subcomponents of the same asset class. For example, numerous studies have found that correlations between US and international stocks increase substantially during volatile market episodes.⁶ Longin and Solnik (2001) find that correlation is not related to market volatility per se, but to the market trend, with correlation increasing during bear markets but not in bull markets.⁷

Implications for portfolio construction

Because bonds have relatively low volatility in addition to low average correlations to stocks, investors have traditionally used bonds to diversify their stock allocations. However, investment products such as Exchange Traded Funds (ETFs) have arisen in recent years, providing simplified, low-cost access to a greater number of risk-premium asset classes and sub-asset classes beyond US bonds. As a result, it's no surprise that attention has been drawn to the potential diversifying properties of investments such as commodities, real estate, emerging-market bonds, and micro-cap stocks, to name a few. Academic research and historical experience suggest that many of these higher-risk, yet potentially diversifying, assets may provide returns higher than those available in a typical bond portfolio, even as they have been relatively uncorrelated to US stocks and bonds. **Figure 3** shows the average monthly correlations between some of these market segments and US stocks and US bonds.⁸

By adding assets such as those in Figure 3 to a portfolio (and by extension, reducing the existing stock and/or bond allocations), the investor hopes to lower total portfolio volatility, increase total portfolio returns, or generate some combination of higher returns and lower volatility. This proved effective during the bear market from 2000 through 2002 (US stocks returned -42%), during which REITs (+44%), commodities (+37%), international bonds (+19%), and high-yield bonds (+5%) realised positive returns, providing considerable diversification potential.⁹ However, while many assets are imperfectly correlated over time, the long-run historical correlations may not always hold during short-term periods of acute market stress. This is because during a flight to quality, increased systematic risk tends to swamp asset-specific risk, and risky assets have a tendency to suddenly

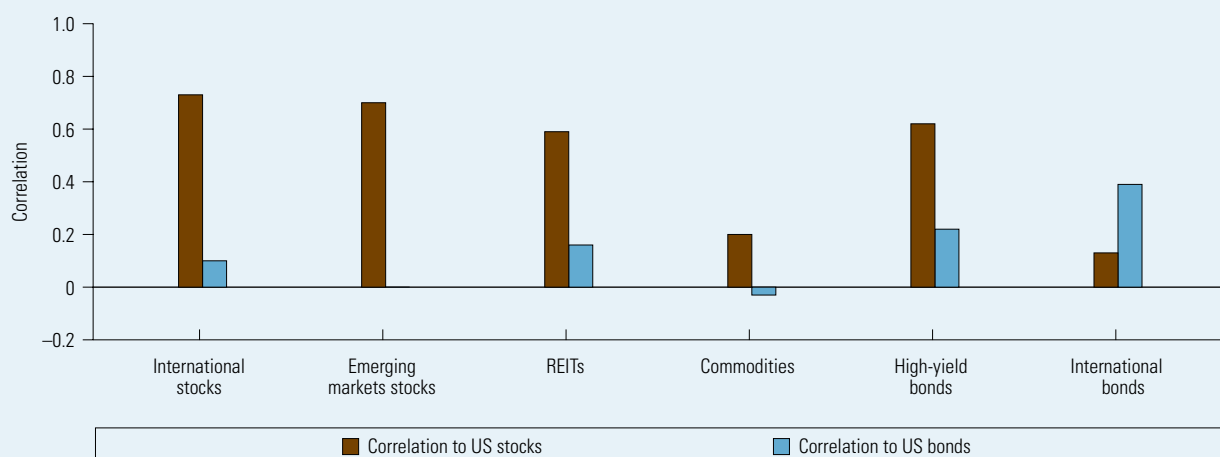
6 For a discussion of the correlation between US and international equities, see Philips (2012).

7 Other factors may also contribute to changing correlations. For example, increasing global interdependence among countries may cause correlations between US and international stocks to increase over time. Solnik (2002) has argued that increasing correlations are a natural progression as markets mature, develop, and become more integrated.

8 We also looked at the correlation of hedge funds to US stocks and US bonds. However, the Lipper/Tremont Hedge Fund Index starts in 1994. As a result, we excluded the results from the main body. That said, since 1994, hedge funds and US equities have realised a 0.61 correlation, similar to that of US stocks to REITs.

9 Covers the period April 2000 through February 2003.

Figure 3. Monthly correlations between select market segments and traditional asset classes: 1988-2011



US stocks are represented by the Dow Jones U.S. Total Stock Market Index from 1988 through 22 April 2005, and MSCI US Broad Market Index thereafter; US bonds are represented by the Barclays Capital U.S. Aggregate Bond Index; international stocks are represented by the MSCI EAFE Index; emerging market stocks are represented by the MSCI Emerging Markets Index; REITs are represented by the FTSE NAREIT Index; commodities are represented by the S&P GSCI Total Return Index from 1998 through 1990 and the Dow Jones UBS Commodities Index thereafter; high-yield bonds are represented by the Barclays Capital High Yield Bond Index; and international bonds are represented by the Citigroup World Global Bond Index ex U.S. from 1988 through 1989 and the Barclays Capital Global Aggregate ex U.S. Bond Index thereafter.

Source: Vanguard calculations using data provided by Thomson Datastream.

become more positively correlated, often in contrast with how they perform during 'normal' times. This also highlights an important distinction – risk diversification, such as that achieved through US Treasury bonds, versus return diversification, such as that achieved through REITs or emerging markets equities. As we will see, in normal times, the differences between the two may be minor, but during events characterised by a flight to quality, the differences and implications can be significant.

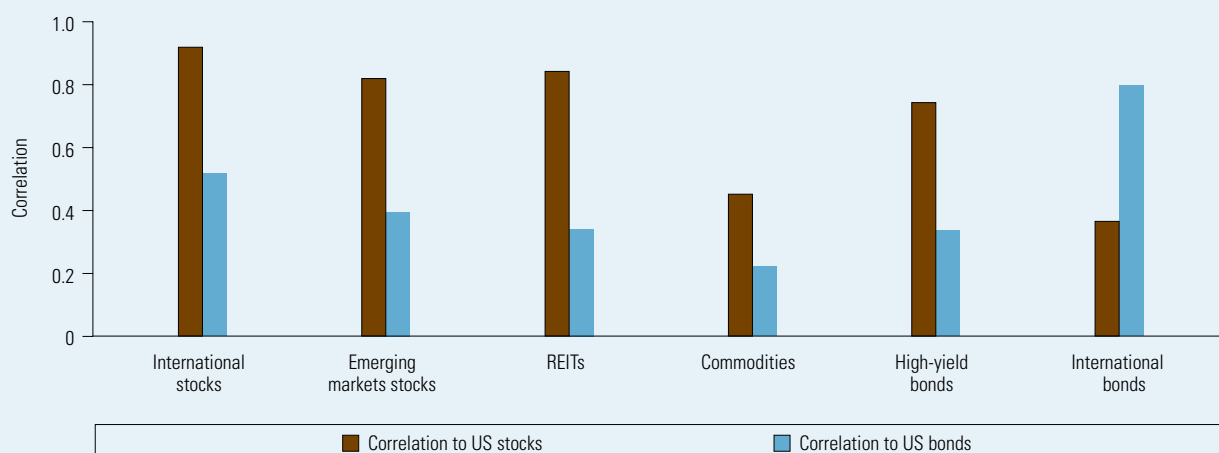
From 1988 through 2007 (1988 representing the start of the Emerging Markets data series), a portfolio allocated 50% to US stocks and 50% to US bonds would have averaged a 9.9% annual return with a standard deviation of 7.4%. On the other hand, a

portfolio equally weighted among the six categories of assets shown in Figure 3 in addition to US stocks and US bonds (12.5% allocated to each) would have averaged a 10.9% annual return with a standard deviation of 7.6%.¹⁰ In hindsight it is clear that it would have made sense to invest in the more diversified portfolio over this particular time period.¹¹ But the 'long-term history' for many types of assets is not nearly as long as that of US stocks, bonds, and cash, for which we can reliably go back to at least 1926, a period covering many economic and market regimes. For many of the asset classes and sub-asset classes commonly used to diversify equity market risk, we can only go back 20 or 30 years, a

10 Another potential strategy is to maintain the equity allocation and diversify the bond allocation across these assets. Over this period, such a portfolio would have averaged an 11.4% annual return but with higher volatility (9.6%) than that of the starting portfolio.

11 For a broader and more detailed discussion of the implications of combining nontraditional assets in a portfolio, see Kinniry and Philips, 2007.

Figure 4. October 2007-February 2009 correlations between select market segments and traditional asset classes



Note: A similar spike in correlations was observed in 1998, a period characterised by the Asian Contagion, the Russian debt default and the collapse of Long Term Capital Management.

See Figure 3 for benchmark descriptions.

Source: Vanguard calculations using data provided by Thomson Datastream.

period characterised by disinflation, long intervals of relatively low volatility, and a relatively stable economic environment.

As is now widely known, the the global equity bear market that started in October 2007 and lasted through early March 2009 was unique in many respects. The global financial crisis was characterised primarily by a flight to quality. And in a flight to quality, risky assets tend to perform more similarly than differently. **Figure 4** shows the observed correlations for the same assets from October 2007 through February 2009. Comparing the long-term correlations in Figure 3 to the correlations presented in Figure 4, we can see the impact of a flight to quality. Correlations to both US stocks and US bonds increased significantly – virtually across the board. As a result, the long-term diversifying properties at least temporarily largely disappeared.¹²

Of course an increase in correlation was not the full extent of the impact. By moving from a 50% stock, 50% bond portfolio to a portfolio equally weighted across eight different asset and sub-asset classes, the investor ended up with only

12.5% of the portfolio in US bonds and 87.5% of the portfolio in riskier assets. And while those risky assets increased average returns without significantly increasing average portfolio volatility (particularly from 2000 through 2007), the risk bled through during the global financial crisis. So, while the 50/50 portfolio returned -26% with a worst month (October 2008) of -10.0%, the eight-asset portfolio returned -38.4% with a worst month (October 2008) of -17.6%. The result? Not only has the ‘diversified’ portfolio underperformed the 50% stock; 50% bond portfolio since 2008, it has done so with significantly higher volatility, as we show in **Figure 5**.

Because of such contagion risks, it is critical for investors to understand the potential value of an allocation to bonds. During the global financial crisis, even as risky assets largely declined in lockstep, US bonds as measured by the Barclays Capital U.S. Aggregate Bond Index returned 7.0%.¹³ Similarly, in August 1998, a prior contagion event, US bonds returned 1.6%, while other types of assets posted negative returns: US stocks, -15.6%; high-yield bonds, -5.5%; REITs, -9.4%; international developed

¹² As with average correlations, we also evaluated hedge funds over the course of the global financial crisis, finding that correlations to equities increased. Specifically, the correlation of hedge funds to equities increased to 0.72.

¹³ During the global financial crisis, the Barclays Capital U.S. Treasury Bond Index returned 14.2%.

Figure 5a. Return and Volatility Statistics for 50% equity, 50% bond portfolio

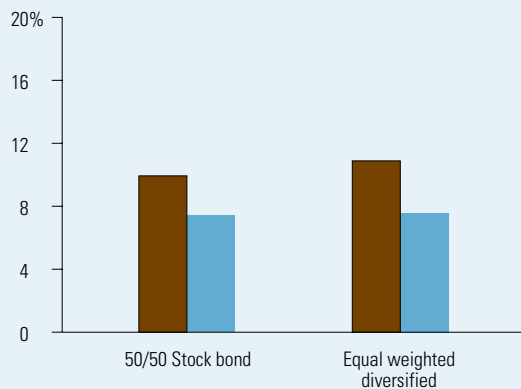
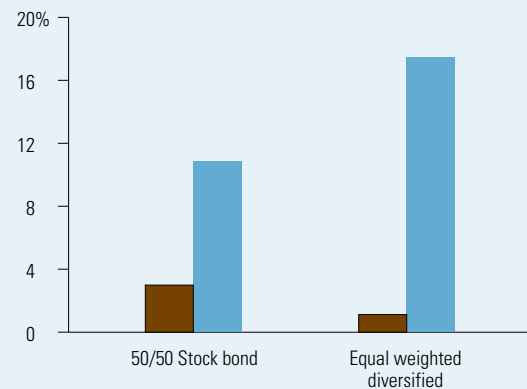


Figure 5b. Return and Volatility Statistics for 8-asset portfolio



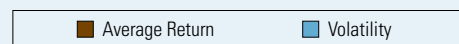
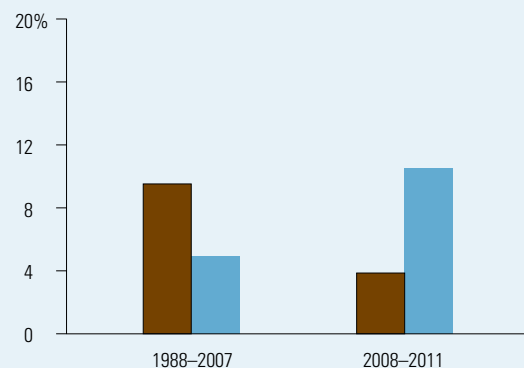
Source: Vanguard calculations using data provided by Thomson Datastream.

markets, -12.4%; international emerging markets, -28.9%; and commodities, -5.9%. Other than US bonds, only international bonds (+2.5%) saw gains.

As we demonstrated in Figure 1, the long-term diversification properties of bonds are significant. And as realised during periods of risk aversion and flight from risky assets, high-quality bonds, particularly Treasury bonds, prove to be a destination of choice. So while bonds may not provide the long-term expected returns of other asset and sub-asset classes that are now accessible, bonds have been one of the more reliable assets that we have investigated to mitigate losses in the worst of times.¹⁴

Figure 6 illustrates the role of bonds in a portfolio. Maintaining the original allocation to US bonds and diversifying the allocation to US stocks across the six alternative assets identified in Figures 3, 4, and 5 significantly reduced the average volatility of the portfolio leading up to 2008. The cost was slightly lower total return from 1998 through 2007. Since the global financial crisis, however, by maintaining the bond allocation, an investor would have been able to maintain their portfolio volatility levels, and even

Figure 6. Return and Volatility Statistics for 8-asset portfolio: Maintain 50% bond allocation

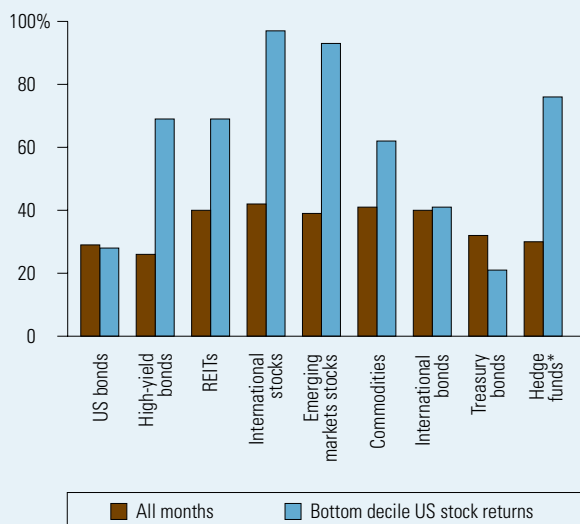


Source: Vanguard calculations using data provided by Thomson Datastream.

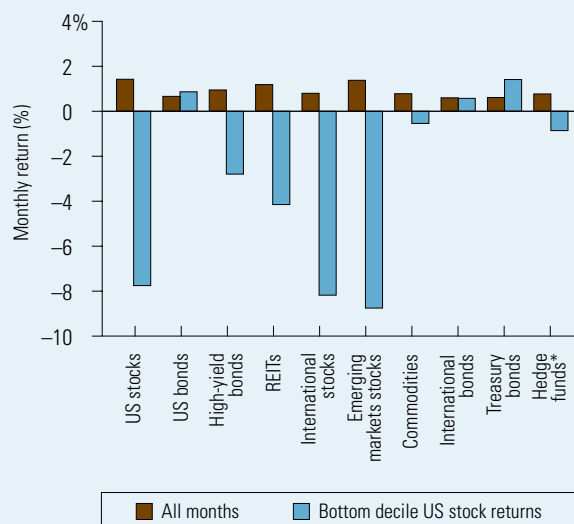
¹⁴ Other assets or tools that may be just as effective, if not more effective than bonds at hedging downside equity risk would include Treasury bills, derivatives or ETFs linked to the VIX, inverse funds and ETFs, put options, and other forms of portfolio insurance.

Figure 7. The performance of risky assets during poor US equity markets

Percentage of monthly returns that are negative:
January 1988-December 2011



Median monthly return:
January 1988-December 2011



*Hedge fund returns consist of the Credit Suisse/Tremont Hedge Fund Index and cover the period January 1994 through December 2011.

See Figure 3 for benchmark descriptions.

Source: Vanguard calculations using data provided by Thomson Datastream.

modestly boost returns. So for investors who maintained their exposure to bonds, diversification worked exactly as we would expect it to work, even accounting for increased correlations across risky assets coupled with significantly poor returns.

In **Figure 7**, we expand the analysis to encompass the worst 10% of calendar months for US equity returns. We also shift our focus away from correlations and instead examine the return relationship from two additional perspectives. The graph on the left focuses on the percentage of months that the risk premium asset classes experienced negative returns in conjunction with US stocks, while the graph on the right shows the median returns during those same periods. Whether looking at percentage of negative months or median returns, it is clear that during the worst months for US stocks, these asset classes tend to perform more similarly than simple long-term averages would

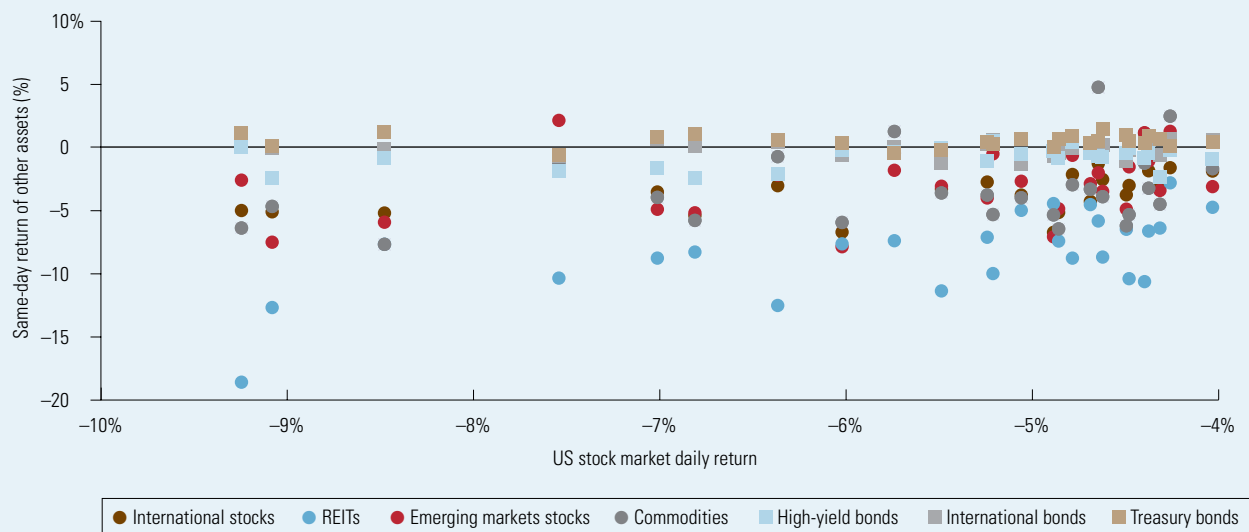
indicate. And interestingly, while the riskier assets tended to perform more similarly during the worst periods for US stocks, bonds tended to perform in line with their averages.

Diversification is not only about correlation

When thinking about portfolio diversification, investors instinctively focus on correlation. And as we have shown, combining assets with low historical correlation does not eliminate risk, because low historical correlation does not eliminate the possibility of adverse co-movement in times of crisis. However, discussions of the benefits of diversification often overlook the fact that while assets with low historical correlation can move in the same direction, they rarely, if ever, move in the same direction *with the same magnitude*. **Figure 8** plots the returns of the same asset and sub-asset classes that we have discussed previously in this

Figure 8. Diversification also comes in the form of magnitude

Days when US stocks were down 4% or more: October 2007-December 2011



See Figure 3 for benchmark descriptions.

Source: Vanguard calculations using data provided by Thomson Datastream.

paper from October 2007 through December 2011, a period representing the entirety of the recent bear market as well as the subsequent rebound. This particular figure focuses on those days when the US stock market was down 4% or more – significantly negative returns by any measurement. It's clear that in many of these significantly negative days for US stocks, other risky assets tended to move in the same direction (similar to the correlation analysis shown in Figure 4). Ultimately, the fact that a number of risky assets declined at the same time prompted many to proclaim 'the death of diversification'.

While most risky assets declined in value on these significantly negative days, it's important to point out that no two risky assets moved in the same magnitude. For example, on 1 December 2008, when US stocks returned -9.2%, only REITs lost more (-18.6%). Commodities, developed markets,

emerging markets, and high-yield bonds each declined, but to a lesser degree. From this perspective, these asset and sub-asset classes did in fact offer a form of diversification to significant downside US equity market risk. The message is clear: When assessing the value of diversification, investors should not simply look at directional movements, particularly in the short term. Indeed, even bonds, the most common diversifier for equity risk, can move in conjunction with equities for periods of time (as we saw in Figure 2). But this does not mean that investors should abandon bonds in a long-term portfolio. The benefits of diversification, low correlation, and sensible portfolio construction tend to bear out over longer periods (3, 5 and 10-years), even though they may not be as clear in the very short term.

Conclusion

Correlation is a critical metric that can provide useful information in the portfolio construction process. Nevertheless, it is important for investors to understand that correlation is a property of random variables, and so does not describe a fixed relationship between variables: Assets with low and unchanging correlation can and do move in the same direction from time to time. In addition, correlations between asset class returns can and do change over time or in particular circumstances. Future correlations may also differ from those in the past because of changing economic and market regimes. Investors should take these factors into consideration when using correlation as a key input for constructing investment portfolios, not relying solely on statistical measures, but mixing in common sense and qualitative judgment as well. In addition, investors should recognise that low historical or estimated correlation does not insure against loss, particularly in times of stress, and that bonds and other low-risk assets can provide valuable protection during such periods. The goal of portfolio construction should be to minimise risk while maximising returns but with a core understanding of how different assets react to different market environments and with the knowledge that low average portfolio variance is only one dimension of risk.

Investing over the long term will almost inevitably include short-term periods of (sometimes severe) market stress, during which the value of diversification for risky assets is less evident. Because investors tend to pay significant attention to large losses, it can be particularly troubling when 'correlations go to 1'. It is in these periods that

downside protection is needed the most, and the value of bonds – particularly high-quality bonds – shines. Of course, while correlations 'go to 1' during market dislocations, investors can take some solace that a modicum of diversification can be achieved when assets do not move by the same amount, even when they move in the same direction. Investors can also feel some reassurance that systematic factors will occasionally drive 'uncorrelated' assets higher in tandem during periods of relief from systemic crisis.

History supports the notion that over longer-term periods, diversification within and across asset classes offers substantial benefit. As a result, investors should continue to focus on their strategic asset allocation with regard to overall risk and return objectives/constraints, and the long-term expected returns, risks, and correlations of the assets in which they invest. For those investors with greater sensitivity to significant near-term loss, lower-risk, lower-returning asset classes such as investment-grade bonds or even cash – whose diversifying properties tend to hold up during periods of market stress – may make more sense. On the other hand, investors who are less sensitive to significant near-term losses, or who are willing to endure significant near-term loss in the pursuit of long-term higher returns, may find it reasonable to allow higher risk-premium asset classes to play a more substantial role in their portfolios. Each of these approaches can be considered prudent and the decision of which path to take ultimately depends on the broad objectives of the investor.

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