2023 Diversification Landscape

A look at how key asset classes performed in 2022, how correlations have changed, and the implications for portfolio building.

Portfolio and Planning Research
11 April 2023

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Amy C. Arnott, CFA
Portfolio Strategist
amy.arnott@morningstar.com

Christine Benz
Director of Personal Finance and Retirement Planning
christine.benz@morningstar.com

Karen Zaya, Ph.D.
Manager Research Analyst
karen.zaya@morningstar.com

Emory Zink
Associate Director
emory.zink@morningstar.com

Corrections and Clarifications
Correction issued April 14, 2023.

Key Takeaways

- Portfolio diversification wasn't a panacea during 2022's brutal market environment, but it did provide some benefits. While the most basic version of a 60/40 portfolio (made up of U.S. stocks and U.S. investment-grade bonds) dropped nearly 17%, a more diversified version held up slightly better, losing about 14% for the year.
- That was the first time in a while that broad portfolio diversification added value. Although portfolio diversification improved returns during most rolling periods between January 2000 and May 2010, our test portfolio (comprising 11 different asset classes) suffered relatively weak risk-adjusted returns over nearly every three-year period starting in June 2010. The basic 60/40 portfolio, on the other hand, improved results versus an all-stock benchmark in more than 98% of the trailing three-year periods between 2000 and 2022.
- International diversification also improved returns in 2022 after a long period of underperformance. However, correlations between the United States and other developed markets around the world have remained high, raising questions about the long-term value of international diversification.
- Over the past 20 years, correlations versus an all-stock benchmark have edged up for several asset classes (including corporate bonds, global bonds, high yield, REITs, and Treasury Inflation-Protected Securities), and many of these categories have posted losses in periods of equity market stress. In such periods, gold, commodities, and some alternative investment strategies have been more compelling from a diversification standpoint.
- Diversification strategies that have worked in the past may not work in the future. That is particularly true now that the landscape has shifted for both interest rates and inflation. In a period of ongoing interest-rate increases and/or above-average inflation, Treasuries and other high-quality bonds would likely be less reliable diversifiers, although they still have merit as core portfolio holdings. Bonds look especially appealing now that bond yields have risen significantly from their all-time lows.

Introduction

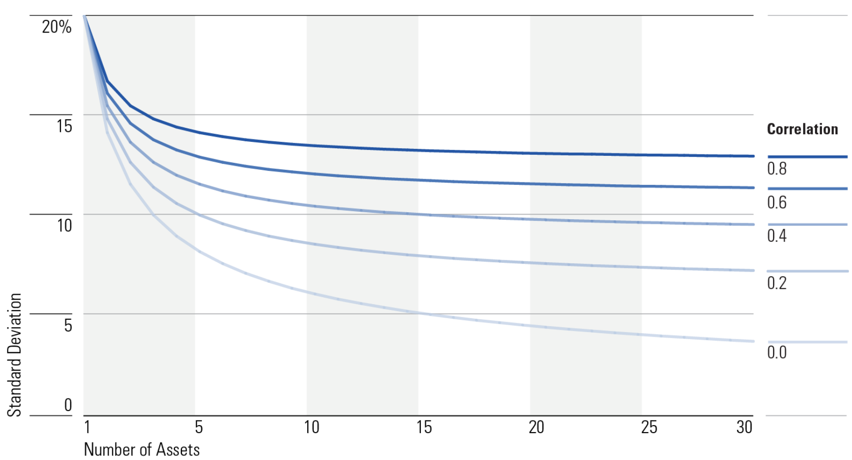
Diversification has often been called the only free lunch in investing. As Harry Markowitz first established in his landmark research[1] in 1952, a portfolio's risk level isn't just the sum of its individual components but also depends on how the holdings interact with each other. This interaction is referred to as *correlation*, which is a statistical measure that captures how two securities move in relation to each other (although it captures only the direction, not the magnitude, of returns). A correlation coefficient of 1 means the two securities have historically moved in lockstep in the same direction, while a coefficient

1 Markowitz, H. 1952. "Portfolio Selection." *J. Finance,* Vol. 7, P. 77.

of negative 1 means they move in lockstep but in opposite directions. A correlation coefficient of 0 means the two securities have historically had no relationship.

Combining asset classes that have correlations below 1.0 can reduce the portfolio's overall risk profile. It is one of the few cases where the whole can be more than the sum of the parts: A well-constructed portfolio can have better risk-adjusted returns than its individual components. The chart below shows the basic math of diversification. The lower the correlation, the greater the reduction in volatility from adding additional assets.

Exhibit 1 Risk Reduction From Additional Assets



Source: Morningstar analysts. Chart shows portfolio volatility by number of assets assuming a correlation coefficient of 0.0, 0.2, 0.4, 0.6, or 0.8.

The problem is that correlation coefficients shift over time, so what worked in the past won't necessarily work in the future. In addition, adding asset classes to reduce volatility can also drag down returns, sometimes over multiyear periods. Moreover, correlations between many assets spike during periods of market crisis—in other words, exactly when you need diversification the most. The catalysts for crisis periods that lead to equity market declines can also vary dramatically. Market shocks and other unforeseen events can drive declines (as they did during 2008 and early 2020) but so can rising interest rates, higher inflation, slower economic growth, and so on. Those underlying conditions can affect which diversifiers fare best.

In this paper, we dig into the diversification benefits of adding various asset classes and styles to a U.S. equity portfolio, including taxable and municipal bonds in the U.S., international equity, commodities, alternatives, sector-specific indexes, investment styles, factor indexes, private equity, and cryptocurrencies.

We used Morningstar's index series to measure correlations whenever possible. The correlation metrics are based on monthly returns during each period in all but the section dedicated to private equity, in which case only quarterly returns are available. In a few cases, we used third-party indexes or fund categories as proxies for different investment areas. Unless otherwise noted, all benchmark returns referenced in this report are total returns denominated in U.S. dollars.

We approach diversification from the perspective of a U.S.-based investor and measured correlations relative to the Morningstar US Market Index as a primary benchmark. Investors often construct portfolios with a foundation of U.S. equities, which currently make up about two thirds of global market capitalization. As a result, it is likely that most investors could use other holdings that would help balance their U.S. equity exposure.

2022 Overview and Long-Term Trends

Portfolio diversification wasn't a panacea during 2022's brutal market environment, but it did provide some benefits. While the most basic version of a 60/40 portfolio (made up of U.S. stocks and U.S. investment-grade bonds) dropped nearly 17%, a more diversified version held up slightly better, losing about 14% for the year.

To test the value of portfolio diversification, we created a portfolio made up of 11 different asset classes. We allocated 20% of the portfolio to larger-cap domestic stocks; 10% each to developed- and emerging-markets stocks, Treasuries, U.S. core bonds, global bonds, and high-yield bonds; and 5% each to small-cap stocks, commodities, gold, and REITs[2]. Apart from REITs, every "diversified" asset class fared better than the Morningstar US Market Index in 2022. Thanks to slightly lower correlations between many of these asset classes, the diversified portfolio would have also done a better job reducing risk than the basic 60/40 portfolio.

Exhibit 2 Effect of Diversification in 2022

	Total Return %	Standard Deviation
Morningstar US Market	-19.43	23.20
Morningstar US Core Bond	-12.99	8.24
60/40 Portfolio	-16.85	15.98
Diversified Portfolio	-14.16	13.96

Source: Morningstar Direct. Data as of Dec. 31, 2022. 60/40 portfolio consists of a 60% weighting in the Morningstar US Market Index and 40% in the Morningstar US Core Bond Index. Diversified portfolio includes a 20% weighting in larger-cap domestic stocks; 10% each in developed- and emerging-markets stocks, Treasuries, U.S. core bonds, global bonds, and high-yield bonds; and 5% each in small-cap stocks, commodities, gold, and REITs.

Last year was the first time in a while that broad portfolio diversification added value. More-diversified portfolio strategies have also struggled over longer periods, at least over the past two decades. Over the trailing three-, five-, and 10-year periods, the diversified portfolio significantly reduced risk compared with a plain-vanilla mix of domestic stocks and bonds but not enough to result in better risk-adjusted returns, as measured by the Sharpe ratio. The more-diversified portfolio fared a bit better over longer periods. Although its risk-adjusted returns fell behind both stocks and the basic 60/40 portfolio over the trailing 15-year period, risk-adjusted returns looked better than stocks for the trailing 20-year period.

2 Our test portfolio is just one of many potential portfolios that could be tested. We focused on the asset classes most commonly used for diversification purposes and assigned the allocations in simple proportions based on our best estimates of how investors typically use these assets in practice. We assumed annual rebalancing for the sake of simplicity and to align with how everyday investors generally manage their portfolios.

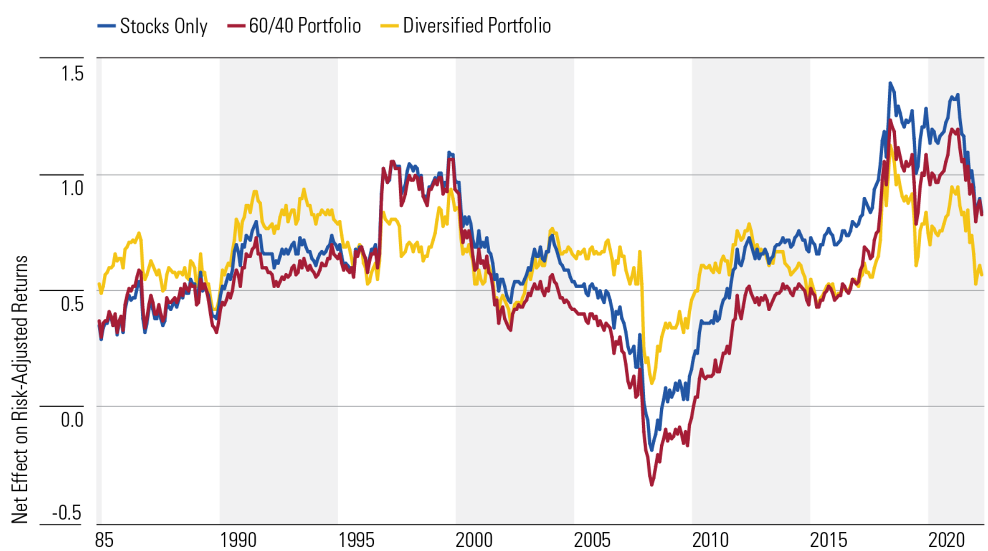
Exhibit 3 Effect of Diversification Over Trailing Periods

	3 Years			5 Years			10 Years			15 Years			20 Years		
	Total Return (%)	Std Dev	Sharpe Ratio	Total Return (%)	Std Dev	Sharpe Ratio	Total Return (%)	Std Dev	Sharpe Ratio	Total Return (%)	Std Dev	Sharpe Ratio	Total Return (%)	Std Dev	Sharpe Ratio
Morningstar US Market	7.01	21.75	0.38	8.83	19.17	0.47	12.17	15.13	0.78	8.75	16.73	0.55	10.02	15.15	0.62
Morningstar US Core Bond	-2.73	5.78	-0.59	0.02	5.02	-0.24	1.02	4.04	0.07	2.65	3.89	0.52	3.08	3.79	0.49
60/40 portfolio	3.33	14.03	0.24	5.51	12.23	0.39	7.89	9.57	0.76	6.77	10.24	0.62	7.61	9.28	0.70
Diversified Portfolio	1.96	12.65	0.15	3.56	10.87	0.25	4.97	8.76	0.50	5.02	10.40	0.46	7.38	9.60	0.66

Source: Morningstar Direct. Data as of Dec. 31, 2022.

To test the value of diversification over longer periods, we used the IA SBBI US Large Stock and IA SBBI US Intermediate Term Government indexes (which both have longer performance histories) as a baseline for a basic 60/40 portfolio. We used the same asset classes cited in Exhibit 2 to test performance for a more diversified portfolio over rolling 10-year periods starting in 1976.

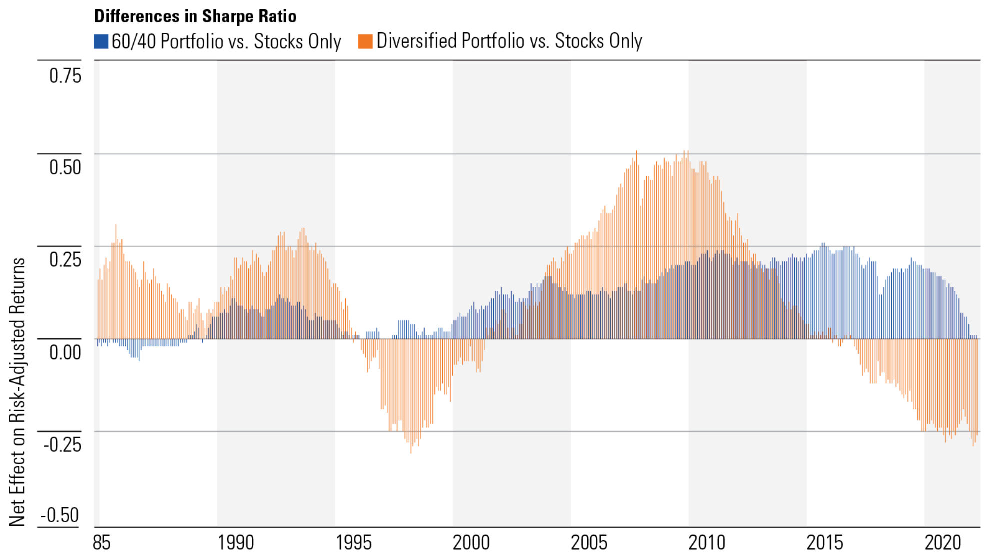
Exhibit 4 Risk-Adjusted Returns



Source: Morningstar Direct. Data as of Dec. 31, 2022. Graph shows rolling 10-year Sharpe ratios for stocks only, a 60/40 portfolio, and a fully diversified portfolio. Both portfolios assume annual rebalancing.

Although a broadly diversified portfolio improved risk-adjusted returns (as measured by the Sharpe ratio) versus an all-stock portfolio during most rolling 10-year periods between May 1993 and December 2016, our test portfolio posted weaker risk-adjusted returns over most periods since then. The basic 60/40 portfolio, on the other hand, fared better than the stocks-only benchmark about 88% of the time going back to 1976 and came out ahead of the more broadly diversified version in every rolling 10-year period since the period starting in late 2004.

Exhibit 5 Net Effect on Risk-Adjusted Returns



Source: Morningstar Direct. Data as of Dec. 31, 2022. Graph shows difference in rolling 10-year Sharpe ratios for a 60/40 portfolio and a fully diversified portfolio versus a stocks-only benchmark. Both portfolios assume annual rebalancing.

Diversification's previous failure to add value mainly reflects the confluence of strong returns for plain-vanilla stocks and bonds and weaker results for international stocks and more specialized assets during most of the period from 2000 through 2021. In addition, market correlations often converge during periods of market crisis, which happened across most major asset classes (with Treasuries and cash the notable exceptions) in early 2020.

Correlations have also trended up over longer periods for some major asset classes, which reduces the value of diversification. Correlations between U.S. and non-U.S. stocks, for example, have significantly increased over the past 10 years. Even areas often touted for their diversification benefits—including REITs and high-yield bonds—have moved in tandem with the broad U.S. equity market more often than investors might expect. In aggregate, the correlation coefficient for the diversified portfolio versus the Morningstar US Market Index rose to 0.96 for the most recent three-year period, compared with 0.87 for the three-year period ended in December 2004.

Exhibit 6 Rolling Three-Year Correlation Trend for Diversified Portfolio vs. Morningstar US Market Index

Source: Morningstar Direct. Data as of Dec. 31, 2022.

The key question now: Will diversification continue to add value as it did in 2022, or will a plain-vanilla stock and bond blend once again dominate? The answer depends to a large extent on the macro environment, which went through a significant shift starting in late 2021. In contrast to the low inflation and generally declining interest rates that defined most of the previous three decades, both inflation and interest rates have reversed course. As a result, correlations between stocks and bonds have flipped to positive from negative, reducing the benefit of basic portfolio diversification.

As we discuss in the sections devoted to historical contexts, stock/bond correlations would probably remain positive during an extended period of rising interest rates and/or rising inflation. A rising interest rate and/or rising inflation environment would provide headwinds for the basic 60/40 portfolio and a potential tailwind for broader portfolio diversification. Even so, investors looking to build diversified portfolios must choose asset classes and allocation percentages carefully and recognize the challenges of shifting correlations over time.

In this paper, we take a deep dive into how different asset classes performed in the past couple of years, how correlations have changed, and what those changes mean for investors and financial advisors trying to build well-diversified portfolios.

Key Portfolio Implications

- Cash has recently looked significantly better than Treasuries from the standpoint of diversification, especially as interest rates have trended up. While cash is likely to underperform bond returns over longer time frames, the improving diversification benefit from cash underscores the merit of cash as a store of value for investors with short-term liquidity needs.

- Lower-quality bonds have generally been poor diversifiers for stocks, demonstrating that they are best used as supplemental holdings or equity alternatives.
- International stocks held up slightly better than U.S. stocks during 2022, but rising correlations and relatively weak returns for international stocks over the previous 10 years might have some investors questioning whether international diversification is still worthwhile. Over longer periods, though, non-U.S. stocks don't always move in lockstep with the U.S. market and have still provided diversification benefits.
- Although correlations for most commodities have increased, they proved their value as portfolio diversifiers in 2022. Gold has generated weaker returns but has continued to fill a valuable role as a haven against equity market volatility.
- Performance for most equity investment styles, sectors, and factor indexes has been closely aligned with the overall market, limiting their usefulness as portfolio diversifiers.

Learning From History

Interest-Rate Pivots

Until recently, investors had grown used to a steady decline in interest rates, punctuated by modest Federal Reserve efforts at recalibrating them to levels last seen before 2008's financial crisis. It wasn't until 2022 that the central bank's 2% inflation target met with economic necessity and resulted in a series of seven substantial hikes to the federal-funds rate, accompanied by expectations for more. Inflation was certainly a contributor to the hiking decision, but another subtle backdrop was a need to strengthen the central bank's monetary policy tools. With rates near zero, there was little room to use them as a tool for easing monetary conditions in response to the market crises that periodically crop up. The goal of an upward interest-rate pivot is to accept short-term pain for the long-term benefit of more effectively moderating the economy.

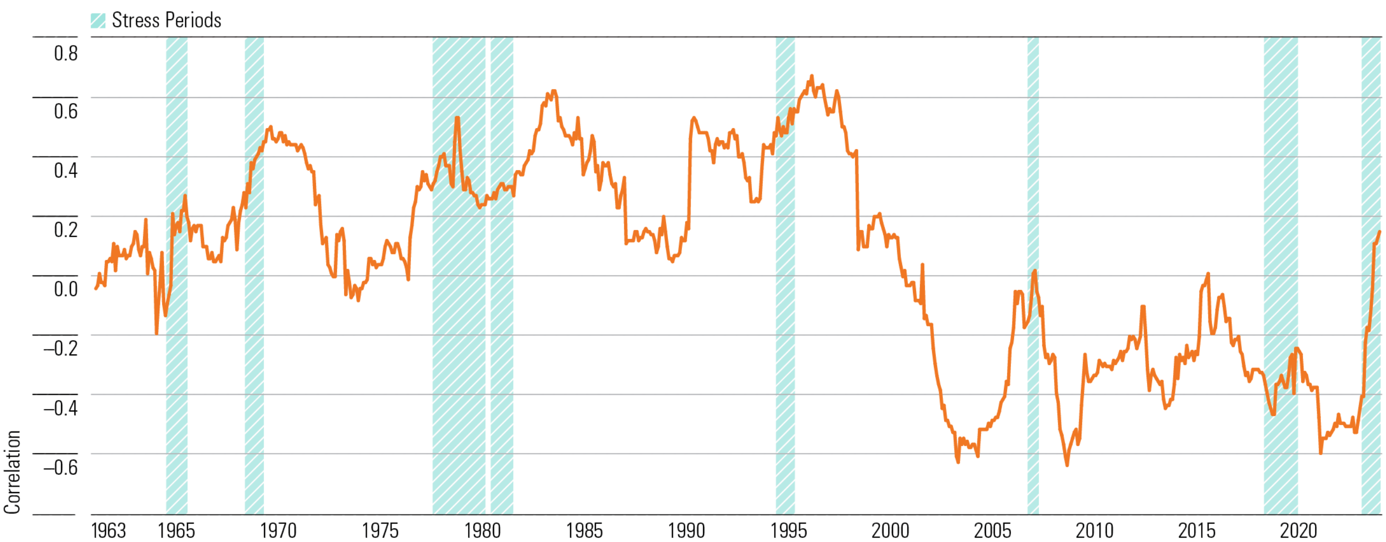
This trade-off was at work in 2022. When the market expects borrowing costs to climb, correlations between stocks and bonds typically increase. From a mechanical perspective, cash flows are discounted by investors at higher rates, thereby decreasing the current value of both stocks and bonds, but bond values are sometimes under more immediate stress in these situations. This is because the value of future income payments makes up a larger portion of a bond's current estimated value. And while all fixed-rate bonds are usually stressed in this situation, longer-maturity bonds that carry significant duration (a measure of interest-rate risk) are at the greatest disadvantage when rates climb. Investor worries over persistent inflation and the risk of a recession only made things worse for bonds as interest rates rose in 2022.

During periods of stable or falling rates (which has been the typical situation over the last six decades), a bond's duration is an advantage rather than a liability. For U.S. Treasury bonds—highly liquid and with minimal credit risk—duration heavily and positively influences prices. Investors accept the lower returns of a U.S. Treasury bond for the ballast that it usually provides when riskier assets sell off. But during periods of rapid rate increases, the very structure of a U.S. Treasury bond negatively affects its price, and its correlation with riskier assets, such as U.S. stocks, can increase precisely at a point when both asset classes are experiencing losses. That is one reason U.S. Treasuries provided little reprieve to diversified portfolios in 2022.

But correlations are dynamic, and the relationship between stocks and bonds varies depending on context. Consider 60 years of interest rates. Policymakers sought to keep the economy stable during four widely acknowledged monetary policy regimes—the Great Inflation, Volcker Reform, the Great

Moderation, and Zero Interest Rate Policy, or ZIRP—but each did so in different ways[3]. During the Great Inflation, targeted interest-rate hikes helped stabilize the business cycle but led to double-digit inflation. Federal Reserve Chair Paul Volcker inherited this situation and aggressively targeted the money supply to moderate inflation and instill trust in prices; his dramatic action unapologetically slowed the economy and is referred to as the period of Volcker Reform.

Exhibit 7 Historical Fixed-Income Correlations and Interest-Rate Pivots



Source: Morningstar Direct. Data as of Dec. 31, 2022. Graph shows rolling three-year correlation between the IA SBBI US IT Government Index and the IA SBBI US Large Stock Index.

The next 25 or so years saw the Federal Reserve move to simultaneously stabilize prices and maintain lower inflation levels, but this Great Moderation coincided with significant financial deregulation. Ultimately, it culminated in the proliferation of complex derivative investments that magnified debts, stoked mistrust in banks, and led to a liquidity crunch. To stabilize the economy and slow the crisis, the Federal Reserve aggressively dropped short-term rates to essentially zero and purchased U.S. Treasuries and (unprecedented up until that point) agency mortgages in order to keep bond market yields low as well. ZIRP and successive rounds of quantitative easing set a nearly 15-year expectation of low borrowing costs. Outside of the U.S., some central banks even experimented with negative interest rates.

What do correlations look like across these monetary policy regimes? As shown in Exhibit 8, no two are the same. In three of the four described, the correlation coefficient is positive, though noticeably more modest (0.02) during the Great Moderation than during the Volcker Reform (0.35). As expected, the correlation was negative during ZIRP, given the precipitous decline in rates. Over the single six-decade period, the correlation coefficient between stocks and bonds registered at a modest but positive 0.10.

3 These periods are based on William T. Gavin's "Monetary Policy Regimens and the Real Interest Rate" published in the Federal Reserve Bank of St. Louis Review, Second-Quarter 2018.

But during a more concentrated period, such as 2022, these reassuring diversification benefits seem misplaced. Why? Within each of these schemes are concentrated periods of interest-rate pivots. They are short, intentional, and reflect a realized increase in borrowing costs. Essentially, the rate regime resets. Here, we've defined these moments as months when both the 10-year U.S. Treasury yield and the effective Federal Open Market Committee rate increased by 10% or more, year over year. There are eight of these pivots in the six decades mentioned above. And with the exception of the ZIRP era, in each of the four established monetary policy periods, a pivot correlation between stocks and bonds reaches a point where it noticeably exceeds that of its regime. These are moments when rates move higher, bond prices move lower, and correlations rearrange.

When the Federal Reserve began aggressively raising rates in 2022 (spanning a period from March to December), the correlation coefficient between stock and bonds registered at 0.6. Rather than maintain a period of low rates indefinitely, the Federal Reserve has been in the process of resetting rates, faster and higher than it has in decades, as it tackles unwieldy inflation and recalibrates the yield potential of U.S. Treasury bonds. We refer to this proposed distinct monetary policy regime as the Great Unknown, and it begins with the most recent interest-rate pivot in our dataset. Similar to the four monetary policy regimes previously described, the contours of this one reflect the unique challenges of its era: excessive inflation and asset bubbles fueled by excessively low borrowing costs.

Exhibit 8 Risk, Returns, and Correlations: Interest-Rate Pivots

	Great Inflation			**Volcker Reform**			**Great Moderation**			**ZIRP**		**Great Unknown**
		Pivot 1	Pivot 2		Pivot 3	Pivot 4		Pivot 5	Pivot 6		Pivot 7	and Pivot 8
	Jan 1965 to Oct 1979	Jun 1966 to Jan 1967	Aug 1969 to Jul 1970	Nov 1979 to Oct 1982	Aug 1978 to Jan 1981	May 1981 to Mar 1982	Nov 1982 to Dec 2008	Sep 1994 to Jun 1995	Jun 2006 to Jan 2007	Jan 2009 to Feb 2022	Jun 2017 to Mar 2019	Mar 2022 to Dec 2022
Correlation Coefficient												
Stocks	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Bonds	0.24	0.51	0.57	0.35	0.24	0.67	0.02	0.8	0.2	-0.24	-0.29	0.6
60/40 Portfolio	0.98	0.99	0.98	0.94	0.94	0.96	0.97	0.99	0.93	0.99	0.99	0.99
Diversified Portfolio	n/a	n/a	n/a	0.85	0.8	0.88	0.86	0.94	0.57	0.94	0.95	0.96
Total Return % (Annualized)												
Stocks	5.15	4.14	-19.6	15.6	16.63	-12.32	10.41	21.15	22.53	15.04	11.38	-10.98
Bonds	5.07	7.41	2.99	14.34	4.05	15.32	8.00	10.89	6.32	2.40	1.44	-7.98
60/40 Portfolio	5.44	5.87	-10.47	15.52	11.81	-1.78	10.02	17.03	16.02	10.18	7.60	-9.73
Diversified Portfolio	n/a	n/a	n/a	13.05	14.21	-4.10	9.85	10.28	14.46	8.54	5.33	-8.47
Standard Deviation												
Stocks	14.73	15.71	18.87	17.00	16.04	12.61	15.04	8.98	3.57	14.64	13.07	24.92
Bonds	4.50	4.22	7.44	11.88	10.78	10.02	4.82	5.32	2.44	3.31	2.87	6.81
60/40 Portfolio	9.23	10.20	12.86	12.56	11.66	10.65	9.30	7.27	2.55	8.48	7.77	16.25
Diversified Portfolio	n/a	n/a	n/a	12.2	11.77	10.41	8.02	5.89	3.25	8.88	6.99	14.91
Sharpe Ratio												
Stocks	0.01	0.00	-0.96	0.18	0.36	-2.08	0.40	1.58	4.35	1.00	0.75	-0.55
Bonds	-0.20	0.51	-0.37	0.11	-0.59	0.06	0.63	0.93	0.44	0.58	-0.12	-1.83
60/40 Portfolio	-0.02	0.11	-0.92	0.19	0.09	-1.43	0.53	1.45	3.91	1.13	0.75	-0.84
Diversified Portfolio	n/a	n/a	n/a	0.02	0.27	-1.68	0.59	0.75	2.65	0.91	0.52	-0.81

Source: Morningstar Direct. Data as of Dec. 31, 2022. Stock performance is based on the IA SBBI US SBBI Large Stock Index. Bond performance is based on the IA SBBI IT Government Index. 60/40 portfolio consists of a 60% weighting in stocks and 40% in bonds. Diversified portfolio includes a 20% weighting each in larger-cap domestic stocks, non-U.S. stocks, and U.S. core bonds, 10% each in intermediate-term Treasuries and high-yield bonds; and 5% each in small-cap stocks, commodities, gold, and REITs. Both portfolios assume annual rebalancing. Returns for periods greater than one year are annualized.

Paradoxically, investors should find interest-rate pivots encouraging. Although painful, without these, bonds would lose their long-term diversification benefits. Inflation combined with persistently low rates detracts from a U.S. Treasury bond's income-generating ability. And when rates sit at or near zero, the expectation that they must rise to restore elements of economic equilibrium fuels volatility in bond prices, too. Nobody wants to hold a bond knowing that aggressive rate increases are on the horizon. A higher rate reset now creates better opportunities for bonds later.

Plus, the likelihood of experiencing diversification benefits from bonds increases over longer periods because painful interest-rate pivots are typically short. Indeed, the rolling three-year correlation between stocks and bonds equaled or exceeded 0.30 in only 30% of the 720 periods (spanning 60 years) analyzed here. That's attractive relative to other asset classes often used as portfolio diversifiers, such as REITs, high-yield bonds, and international equities. And between the interest-rate pivots identified in the exhibit above, it took rolling three-year correlations anywhere from one to eight years to fall to a reset low, but they do eventually fall. Well-diversified portfolios with long time horizons benefit from patience.

Portfolio Implications

Although rising interest rates lead to closer links between stocks and bonds, anticipating the magnitude of a rate rise and the length of time for the climb is difficult. In fact, many professional investors manage strategies as duration-neutral to a chosen benchmark given the difficulty in calling interest-rate changes. But that doesn't mean there is nothing to do. Nimble investors may mitigate pain from rising rates with some thoughtful planning. For example, reducing duration by rotating out of longer-duration bonds or funds and into intermediate- or short-duration alternatives will reduce potential volatility during interest-rate spikes.

It's also useful to consider diversifying within the bond portfolio. Floating-rate bonds offer a reprieve from worrying about the direction of rates, but these may also introduce more credit risk than would a government bond. Instead, a thoughtfully sized exposure to asset classes with a generally low correlation to equities, such as gold or an equity market-neutral strategy, can cushion losses from a bond portfolio during periods of aggressively rising rates. And one of the easiest ways to combine the prior two recommendations is to consider an actively managed bond strategy with a shrewd, well-resourced manager and a disciplined process. A portfolio manager with the right tools can swiftly adjust her bond portfolio in small but meaningful ways (such as adding broader diversification across sectors or geographies), while an index fund has far less flexibility to sidestep the inevitable.

And what can be done with a portfolio following the end of an interest-rate pivot? Investors shouldn't ignore that the opportunity set changes. Cashlike investments, such as money market funds and ultrashort bond offerings, offer better yields when interest rates rise. Following this particular pivot, the move away from interest rates of zero gives investors an opportunity to exchange volatile income-generating holdings for more moderate versions, maintaining return expectations but improving their portfolios' risk profiles. And most importantly, investors should remain focused on the long term. Diversification benefits accrue, slowly and steadily, over decades and through interest-rate pivots. That is the secret sauce behind the enduring strength of the basic 60/40 portfolio, which has typically generated more attractive risk-adjusted returns than a portfolio of only stocks or bonds over the past six decades.

Recessionary Periods

The Federal Reserve's campaign to stamp out inflation by lifting interest rates caused pain for both stocks and bonds last year, prompting correlations between the two assets to increase sharply.
But surging interest rates have given rise to another worry: Could the Fed overshoot on interest rates, pushing the economy into a recession along the way?

The bond market has been flashing warning signals on that front since July 2022, as yields on longer-term bonds dropped below those of shorter-term bonds. That pattern of long-term bonds paying lower rates than shorter-term bonds, called a yield-curve "inversion," has historically been a harbinger of recession. Investors are betting that yields will go lower because of economic weakness.

Not every economist is convinced that the U.S. economy will sink into a recession imminently, and even some of the economists who do expect a recession aren't convinced it will be especially severe, thanks to a still-robust job market. It is also worth noting that the definition of a recession varies. While "recession" is often defined as two successive quarters of negative gross domestic product growth, the National Bureau of Economic Research defines a recession as "a significant decline in economic activity that is spread across the economy and that lasts more than a few months."

Examining Risk/Return During Recessionary Periods

Nonetheless, with recessionary storm clouds on the horizon, it is worth looking into history to examine how various asset types have behaved in periods of economic weakness and which assets have helped diversify U.S. equity exposure.

To do so, we examined eight recessionary periods in U.S. history. Some of those economic downturns were abbreviated, such as the start of the pandemic in February/March 2020, and some were more prolonged, such as the Great Depression in the late 1920s and early 1930s. For each period, we examined the returns, volatility, and correlations of U.S. large-cap stocks, U.S. Treasury bonds, a 60/40 mix of the two assets, and a diversified portfolio encompassing U.S. and non-U.S. stocks, bonds of varying types, and small stakes in commodities, precious metals, and real estate. (The specific allocations are included in Exhibit 9.)

Exhibit 9 Risk, Returns, and Correlations: Recessionary Periods

	Aug 1929 to Mar 1933	Nov 1973 to Mar 1975	Jan 1980 to Jul 1980	Jul 1981 to Nov 1982	Jul 1990 to Mar 1991	Mar 2001 to Nov 2001	Dec 2007 to Jun 2009	Feb 2020 to Apr 2020
Correlation Coefficient								
Stocks	n/a	1.00	1.00	1.00	1.00	1.00	1.00	n/a
Bonds	n/a	-0.02	0.16	0.65	0.55	-0.70	-0.33	n/a
60/40 Portfolio	n/a	0.99	0.88	0.97	1.00	0.98	0.97	n/a
Diversified Portfolio	n/a	n/a	0.87	0.90	0.92	0.94	0.95	n/a
Total Return % (Annualized)								
Stocks	-31.13	-13.12	16.39	10.00	7.64	-7.18	-24.17	-9.26
Bonds	4.94	5.80	8.01	24.76	9.10	6.34	5.46	5.26
60/40 Portfolio	-17.21	-4.36	13.04	15.90	8.60	-1.51	-11.10	-3.40
Diversified Portfolio	n/a	n/a	12.21	12.07	6.53	-2.53	-11.42	-8.17
Standard Deviation								
Stocks	46.27	26.28	20.06	18.66	18.29	20.15	24.02	n/a
Bonds	3.13	4.68	20.17	9.81	3.20	5.13	6.13	n/a
60/40 Portfolio	25.52	14.61	15.65	13.71	11.51	9.68	12.90	n/a
Diversified Portfolio	n/a	n/a	19.19	12.30	9.95	8.53	16.91	n/a
Sharpe Ratio								
Stocks	n/a	-0.70	0.80	-0.06	0.24	-0.57	-1.07	n/a
Bonds	n/a	-0.40	0.17	1.04	1.48	0.96	0.71	n/a
60/40 Portfolio	n/a	-0.75	0.66	0.25	0.40	-0.51	-0.93	n/a
Diversified Portfolio	n/a	n/a	0.50	-0.01	0.19	-0.76	-0.70	n/a

Source: Morningstar Direct. Data as of Dec. 31, 2022. Stock performance is based on the IA SBBI Large Stock Index. Bond performance is based on the IA SBBI IT Government Index. 60/40 portfolio consists of a 60% weighting in stocks and 40% in bonds. Diversified portfolio includes a 20% weighting each in larger-cap domestic stocks, non-U.S. stocks, and U.S. core bonds, 10% each in intermediate-term Treasuries and high-yield bonds; and 5% each in small-cap stocks, commodities, gold, and REITs. Both portfolios assume annual rebalancing. Returns for periods greater than one year are annualized.

Not surprisingly, stocks frequently contracted during past recessions, losing value in five of the eight time periods we examined. Some of those losses were severe, such as the 24% annualized loss for stocks during the global financial crisis of 2007-09. Stocks' poor performance during such periods makes intuitive sense: Weakening economic growth translates into slackening demand and declining earnings growth for many businesses, especially those that sell discretionary goods and services.

In that same vein, bonds logged positive gains in all eight of those same periods of economic weakness. The explanation for bonds' strength during recessionary periods is twofold. The Federal Reserve often cuts interest rates during such periods, which boosts bond prices. Moreover, investors often retreat to safety, stability, and liquidity in periods of economic insecurity (high-quality bonds and cash) and away from assets they perceive to be higher risk (equities).

The 60/40 and diversified portfolios' returns and volatility levels, as measured by standard deviation, tended to fall between those two extremes during economic downturns. In other words, the balanced and diversified portfolios didn't lose as much as the equity-only portfolio, nor did they fare as well as an all-government-bond portfolio would have done during those periods of economic distress. And the plain-vanilla 60% U.S. large-cap equity/40% intermediate-term government-bond portfolio tended to outperform the diversified portfolio that included exposure to high-yield bonds, smaller-cap stocks, commodities, and other asset classes.

In other words, in an economic shock, plain-vanilla government bonds often serve as effective ballast for equity portfolios. That's borne out by correlation data as well. Bonds' correlation coefficient with equities during recessionary environments ranged from strongly negative (negative 0.7 in the period from March 2001 to November 2001) to more positive (0.65 in the period from July 1981 to November 1982). Bonds therefore provide a significant diversification benefit, even during periods when stock/bond correlations are relatively high.

Examining the Outliers

Yet as much as the data underscores the weakness of stocks and the benefits of holding a plain-vanilla government-bond portfolio during recessionary environments, a few time periods stand out as outliers and are worthy of further examination. In three recessionary periods—January 1980-July 1980, July 1981-November 1982, and July 1990-March 1991—stocks actually gained ground, and high-quality bonds did, too. In other words, stock market losses and bond market gains aren't a fait accompli in every recession.

It is worth homing in on the two recessions in the early 1980s—the so-called "double-dip" recession—because they have some of the closest parallels with the current time frame. The Iran-Iraq war in 1980 caused energy prices to surge and led to broad-based inflation: In 1980, the inflation rate surged to nearly 14%. The Federal Reserve, led by Volcker, aggressively increased interest rates to combat soaring prices. That caused high unemployment and two economic contractions—a mild recession from January 1980 to July 1980 and a deeper one from mid-1981 through 1982.

Despite those headwinds, stocks managed to post robust gains in 1980 and 1982, contributing to positive returns in both early 1980s recessions. (Stocks did post a loss in 1981, however.) Stock market participants appeared to be looking through the bad news to better times ahead, including an end to rising inflation and interest rates, as well as a recovery in economic growth. They were also cheered by President Ronald Reagan's tax cuts and regulatory rollbacks, among other factors.

Portfolio Implications

Of course, each time period is different, and the current economic environment is almost certainly different from that of the early 1980s. For one thing, the 2023 economy appears to be pretty resilient, even in the face of inflation and dramatic interest-rate increases, thanks largely to the health of the labor market.

Yet even as equity returns during recessions are scattershot, the data suggest that high-quality fixed-income assets are a boon to portfolios in most recessionary environments. That is largely due to lower yields and investors' desire for the stability and safety of fixed income and cash assets during periods of economic turbulence, both of which boost bond prices. While high-quality bonds won't diversify equities in every market environment (see: 2022), they have historically been reliable in periods of economic weakness.

Inflationary Periods

The resurgence in inflation that started in May 2021 made market conditions much more challenging. Supply-chain disruptions, a tight labor market, the war in Ukraine, and strong economic growth all conspired to push up inflation from its previously benign levels. The year-over-year change in consumer prices rose to more than 7% by the end of 2021 and reached as high as 9% by mid-2022. Inflationary pressures have been easing a bit in early 2023, but inflation was still running well above average at the end of 2022.

Higher inflation marked a sharp reversal from the previous regime. For most of the previous 30 years, conditions were unusually benign from an inflation perspective. Aside from a brief increase in the mid-2000s, inflation had generally been running well below its long-term historical average of about 2.7%. Cooler-than-average inflation, in turn, created close to ideal conditions for stock/bond correlations. With inflation mostly a nonissue, stocks and bonds moved largely independently; in fact, rolling three-year correlations between stocks and bonds were consistently negative (or barely above zero) from November 2000 through 2020.

With those conditions now a distant memory, it shouldn’t come as a surprise that correlations between stocks and bonds have sharply increased. In fact, correlations between stocks and bonds edged into positive territory in 2021, with a correlation coefficient of 0.09 between the two asset classes for the full year. Stock/bond correlations trended up to 0.58 for the full year in 2022, and 0.15 for the trailing three-year period.

The recent uptrend in correlations has been unusually dramatic but not unprecedented. As shown in Exhibit 7, the stock/bond correlation has often been positive over multiyear periods. For example, the trailing three-year correlation coefficients between the two asset classes were consistently above zero from August 1966 through August 1974. Stock/bond correlations were also consistently positive from October 1974 until late 2000.

We also looked at correlations over specific periods of higher inflation, generally defined as periods when year-over-year inflation increased by at least 5% and remained high for at least six months.[4]
As shown in next exhibit, correlations between stocks and bonds increased during some but not all periods. In general, correlations increased the most during periods when inflation was both high (in the double digits) and protracted (lasting at least three years). The post-World War II era saw an unusually high spike in inflation (driven by the removal of wartime wage and price controls, combined with large numbers of troops coming home), but the increase in consumer prices lasted only about a year. More recently, surging economic growth in China fueled rising consumer prices in 2007 and 2008, but inflation remained below 6% and lasted less than a year.

4 Inflationary periods are based on the parameters described in Neville, H., Draaisma, T., Funnell, B., Harvey, C.R., & van Hemert, O. 2021. "The Best Strategies for Inflationary Times." https://ssrn.com/abstract=3813202.

Exhibit 10 Risk, Returns, and Correlations: Inflationary Periods

	April 1941 to May 1942	Mar 1946 to Mar 1947	August 1950 to Feb 1951	Feb 1966 to Jan 1970	July 1972 to Dec 1974	Feb 1977 to Mar 1980	Feb 1987 to Nov 1990	Sept 2007 to July 2008	May 202 to Dec 202
Cumulative Inflation Rate %	**14.79**	**20.99**	**6.64**	**18.87**	**24.46**	**36.92**	**20.32**	**5.79**	**11.1**
Correlation Coefficient									
Stocks	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
Bonds	0.18	-0.06	0.02	0.26	-0.08	0.28	0.17	-0.72	0.5
60/40 Portfolio	1.00	1.00	1.00	0.98	0.98	0.97	0.99	0.96	0.9
Diversified Portfolio	n/a	n/a	n/a	n/a	n/a	0.81	0.89	0.92	0.9
Total Return % (Annualized)									
Stocks	-8.88	-7.50	28.93	1.04	-13.24	5.40	7.99	-12.41	-3.5
Bonds	1.53	0.61	0.45	2.42	5.33	1.33	7.55	8.25	-6.4
60/40 Portfolio	-4.69	-4.25	17.63	1.84	-5.38	3.85	7.94	-4.32	-4.1
Diversified Portfolio	n/a	n/a	n/a	n/a	n/a	10.56	6.75	0.32	-3.1
Standard Deviation									
Stocks	16.55	15.41	7.86	13.11	18.34	14.37	18.50	14.05	19.8
Bonds	1.31	0.76	0.38	4.16	4.57	5.67	4.87	6.58	4.9
60/40 Portfolio	9.79	9.24	4.87	8.39	9.98	9.55	12.20	6.67	12.9
Diversified Portfolio	n/a	n/a	n/a	n/a	n/a	9.49	8.73	7.95	11.6
Sharpe Ratio									
Stocks	-0.49	-0.46	5.50	-0.28	-1.06	-0.14	0.12	-1.14	-0.1
Bonds	1.03	0.29	-1.65	-0.72	-0.38	-1.16	0.03	0.97	-1.5
60/40 Portfolio	-0.46	-0.47	5.52	-0.39	-1.19	-0.42	0.10	-1.09	-0.3
Diversified Portfolio	n/a	n/a	n/a	n/a	n/a	0.23	-0.04	-0.25	-0.3

Source: Morningstar Direct. Data as of Dec. 31, 2022. Stock performance is based on the IA SBBI Large Stock Index. Bond performance is based on the IA SBBI IT Government Index. 60/40 portfolio consists of a 60% weighting in stocks and 40% in bonds. Diversified portfolio includes a 20% weighting each in larger-cap domestic stocks, non-U.S. stocks, and core bonds, 10% each in intermediate-term Treasuries and high-yield bonds; and 5% each in small-cap stocks, commodities, gold, and REITs. Both portfolios assume annual rebalancing. Returns for periods greater than one year are annualized.

The most dramatic correlation upturns took place in the periods from February 1966 through January 1970 (driven by low unemployment and surging economic growth) and February 1977 through March 1980 (driven by soaring oil prices, the oil embargo and related price shocks, and expansionary monetary policies). Correlations ended up in a similar range (0.26 and 0.28, respectively) in both periods.

Portfolio Implications

There are a couple of key lessons to draw from these patterns. For one, the environment for both inflation and interest rates has fundamentally changed. Thus, while adding bonds was previously an easy way to reduce risk and improve portfolio diversification, that is no longer the case. As long as the outlook for inflation and interest rates remains uncertain, the diversification benefit from bonds will probably remain muted.

That doesn’t necessarily mean investors should shift assets to stocks from bonds, however. Stocks and bonds tend to move more in tandem during inflationary periods, but bonds can still provide significant diversification benefits, as well as play a critical role in providing ballast and reducing risk at the portfolio level.

Exploring the Diversification Benefits by Asset Class

Taxable Bonds

Taxable bonds are a broad basket, encompassing high-quality bonds (U.S. government and government-related bonds, asset-backed securities, and high-quality corporates) as well as higher-yielding credits from lower-quality issuers (high yield, bank loans, and emerging markets). These investments have provided varying degrees of effectiveness from a diversification standpoint.

High-quality bonds, especially U.S. Treasury and agency mortgage bonds, have proved the best diversifiers for equity exposure over the past several decades. The reason is intuitive: Demand for Treasuries often spikes when investors are seeking safety. Moreover, interest rates often decline during such periods, which has provided another tailwind for government-bond prices. Cash investments, while not technically under the bond umbrella, have also helped diversify equity exposure.

In contrast, lower-quality bonds have been much less-effective diversifiers, often losing less than stocks in market downdrafts but moving more in sympathy with stocks than government bonds. The economic conditions that precipitate stock market downturns (namely, weaker economic growth) often crimp the outlook for the debt-laden issuers of lower-quality credits.

Recent Performance Trends

The distinct and wildly divergent markets of the last three years tested the expectations an investor might have from a fixed-income portfolio. A global pandemic at the start of 2020 resulted in sharp losses for stocks and other risky assets; higher demand for perceived safe havens, such as U.S. Treasury bonds and other high-quality government-backed debt, followed. The U.S. government's efforts at economic triage included two rate cuts in March of that year—first 50 basis points and then a full percentage point—which returned rates to the near-zero levels experienced after the global financial crisis of 2007-09. U.S. Treasury bonds and GNMA securities (high-quality U.S. mortgages) provided the greatest diversification benefit to a U.S. stock portfolio, aided not only by aggressive demand from investors but also a tailwind in plummeting interest rates.

Exhibit 11 Three-Year Correlation Matrix: Taxable Bonds

	1	2	3	4	5	6	7	8	9	10	11	12
1 Morningstar US Market	1.00											
2 Morningstar EM Bond GR Hedged	0.73	1.00										
3 Morningstar Global Core Bond GR	0.60	0.75	1.00									
4 Morningstar US 1-5 Yr Treasury Bd	0.08	0.24	0.70	1.00								
5 Morningstar US 10+ Yr Treasury Bd	0.13	0.30	0.71	0.77	1.00							
6 Morningstar US 5-10 Yr Treasury Bd	0.18	0.32	0.78	0.94	0.91	1.00						
7 Morningstar US Cash T-bill	−0.30	−0.06	0.03	0.19	0.13	0.12	1.00					
8 Morningstar US Core Bond	0.49	0.68	0.94	0.80	0.84	0.89	0.02	1.00				
9 Morningstar US Corporate Bond	0.72	0.91	0.87	0.43	0.56	0.56	−0.09	0.86	1.00			
10 Morningstar US High-Yield Bond	0.86	0.86	0.64	0.09	0.08	0.16	−0.25	0.52	0.81	1.00		
11 Morningstar US TIPS	0.68	0.64	0.83	0.58	0.62	0.69	−0.22	0.82	0.78	0.66	1.00	
12 US Fund Intermediate Core-Plus Bd	0.68	0.89	0.92	0.56	0.62	0.67	−0.11	0.92	0.98	0.77	0.83	1.00

- 0.76 to 1.00
- 0.51 to 0.75
- 0.26 to 0.50
- 0.01 to 0.25
- 0.00 to −0.24
- −0.25 to −0.49
- −0.50 to −0.74
- −0.75 to −1.00

Source: Morningstar Direct. Data as of Dec. 31, 2022.

If the prior year was defined by both a shock and then stabilization, 2021 was fueled by enthusiasm. Consumers and companies, eager to make up for a challenging period of uncertainty, took advantage of low interest rates to borrow and spend, creating an economic boom. High yield bonds—corporate and municipal—and leveraged loans provided positive returns, but these subasset classes moved in sympathy with equities and provided portfolios with only modest diversification. U.S. Treasury bonds and agency mortgages exhibited low correlations to equities, but their negative returns over the period reflected growing market anxiety over rising inflation and the dawning realization that tighter monetary policies were on the horizon as the government pared back balance sheet purchases and the Federal Reserve hinted at imminent interest-rate increases.

The year 2022 was one of recalibration. The market exuberance of the postpandemic recovery, coupled with low interest rates, sparked a sudden uptick in inflation (which had remained stubbornly low following the market interventions in the wake of the financial crisis). The war in Ukraine placed pressure on global energy and food resources, and several punishing coronavirus lockdowns in China further stoked anxieties around global economic growth.

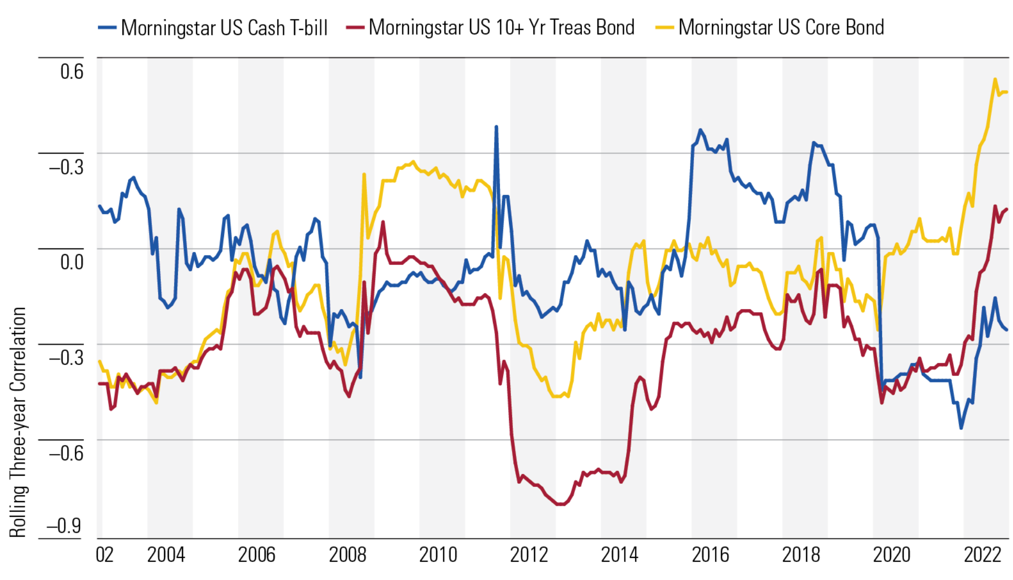
The Federal Reserve took action, with seven interest-rate increases over the course of the year that were not only swift but also substantial. The benchmark Federal Open Market Committee rate began the year at a historic low and climbed to 4.50%, with several hikes of 75 basis points at a time. These rate hikes roiled equity markets, particularly the growth stocks that rode a wave of enthusiasm in 2021. Bonds were at a disadvantage—particularly the high-quality U.S. Treasury bonds that typically serve as ballast in aggressive equity market downturns. Prices for U.S. Treasuries, which are highly liquid and carry minimal credit risk, primarily reflect interest-rate risk. As a result, an environment marked by stable or falling interest rates (which had been the typical experience of the last few decades) creates a tailwind for these securities and strengthens their value as a diversifier against equity-related risk.

For many investors accustomed to Treasuries providing a cushion against equity market volatility, there was no such reprieve given the interest-rate hikes in 2022. The three-year rolling correlations between equity and fixed-income securities sharply increased, and those of U.S. Treasuries, in particular, flipped from negative to positive that year. Cash, which is not fixed income per se but exhibits many similar characteristics, provided a competitive yield for the first time (given increased rates) and exhibited a negative correlation with equities.

Longer-Term Trends

Recency bias might cause an investor to balk at the usefulness of U.S. Treasuries in a portfolio, but over the long term, U.S. Treasuries and other high-quality government-backed fare, such as agency mortgages, remain some of the most compelling diversifiers for a portfolio over the long term. When interest rates are stable or falling, these offerings provide a modest but reliable return that balances the volatile swings inherent in stocks. Riskier allocations such as high yield and emerging-markets debt, on the other hand, serve as poor diversifiers relative to equity. Swiftly rising interest rates may place U.S. Treasuries at a structural disadvantage, but the recalibration period is typically relatively short, and following that reset is when these allocations provide low and, at times, negative correlations to equities.

Exhibit 12 Rolling Three-Year Correlations vs. Morningstar US Market Index: Taxable Bonds



Source: Morningstar Direct. Data as of Dec. 31, 2022.

Portfolio Implications

A portfolio constructed for long-term resilience will be well served by a high-quality government allocation, in particular one with U.S. Treasuries and agency mortgages. During periods of stable or falling interest rates, these fixed-income building blocks may generate only modest yields but provide enough protection during volatile equity markets to result in more-attractive risk-adjusted returns.

As we discuss further in the Learning From History: Interest-Rate Pivots section, patience rewards diversification choices. Although bonds served as a source of portfolio pain in 2022, over longer periods and more typical interest-rate backdrops, a high-quality U.S. government-bond sleeve positively improved diversification more often than it detracted from it. And U.S. Treasuries aren't exclusive in providing this counterbalance. Intermediate-term and short-term maturities of diversified high-quality bonds also provide some refuge when the U.S. equity portion of a portfolio is under duress. Riskier fixed-income subsectors, such as high yield, nonagency mortgages, and emerging-markets debt, are highly correlated with stocks and should be seen as equitylike complements to a portfolio.

Municipal Bonds

Municipal bonds are issued by state and local municipalities to pay for infrastructure and fund other projects such as building hospitals, schools, retirement communities, and airports. Individual taxpayers who purchase municipal bonds can typically exclude the income (though not the capital gains) from their federal taxes. If investors buy bonds issued by their home states and/or municipalities, the income from the bonds may be tax-free at the state and local level, as well. Those tax-saving features are most beneficial to investors in higher tax brackets.

Because the states and municipalities that issue these bonds have taxing authority (and can raise taxes to pay their bills), the creditworthiness of high-quality muni-bond issuers is typically considered second only to that of the U.S. government. Unlike the U.S. government, though, state and local governments cannot run deficits. As a result, there have been a handful of municipal bankruptcies—notably Detroit's in 2013 and the Commonwealth of Puerto Rico's in 2017—but they have been relatively rare.

Because of their yields and general price stability, muni bonds have historically done a decent job of diversifying U.S. equity exposure. Their long-term correlations with stocks have tended to be on par with high-quality taxable-bond indexes but not as low as those of Treasuries or cash.

Recent Performance Trends

Municipal bonds' rolling three-year correlations are often negative with U.S. equities, as they were from January 2016 through February 2020, but the pandemic introduced anxieties around how the economies of state and city municipalities would open and what their revenues would look like in a world reshaped by lockdowns. As a result, correlations relative to equities turned positive and for the remainder of 2020 and 2021 were modestly higher than those of a diversified basket of investment-grade taxable bonds (U.S. Treasuries, agency mortgages, and corporate credit) but much lower than the intermediate core bond Morningstar Category. U.S. Treasuries and cash were far more effective diversifiers over those two calendar years.

Exhibit 13 Three-Year Correlation Matrix: Municipal Bonds

	1	2	3	4	5	6	7	8	9	10	11	12
1 Morningstar US Market	1.00											
2 Morningstar US Core Bond	0.49	1.00										
3 Morningstar US Treasury & Govt Bond	0.20	0.91	1.00									
4 US Fund High-Yield Muni	0.54	0.72	0.48	1.00								
5 US Fund Muni National Interm	0.52	0.80	0.61	0.97	1.00							
6 US Fund Muni National Long	0.53	0.81	0.62	0.97	1.00	1.00						
7 US Fund Muni National Short	0.54	0.79	0.59	0.92	0.98	0.97	1.00					

0.76 to 1.00
0.51 to 0.75
0.26 to 0.50
0.01 to 0.25
0.00 to −0.24
−0.25 to −0.49
−0.50 to −0.74
−0.75 to −1.00

Source: Morningstar Direct. Data as of Dec. 31, 2022.

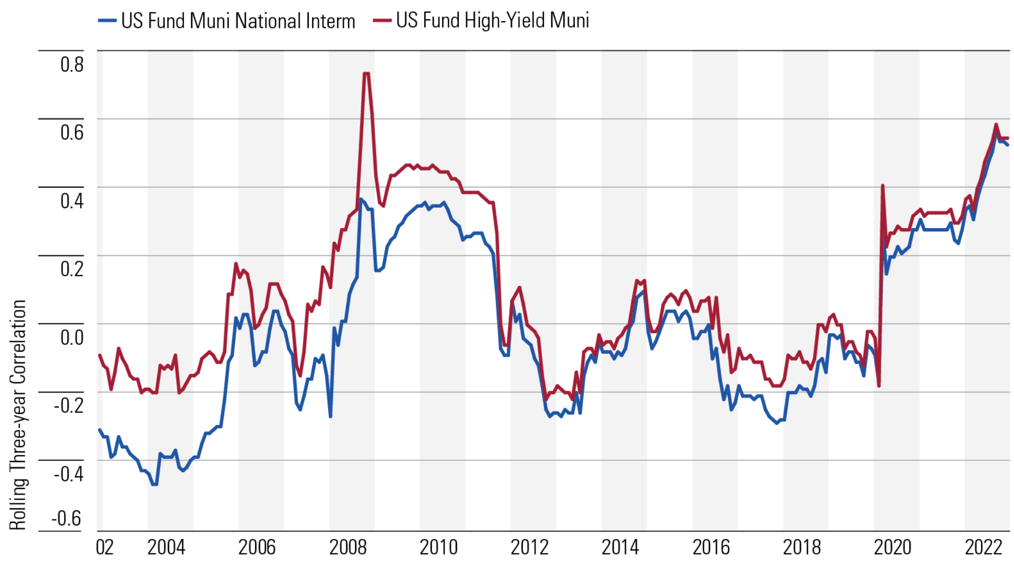
During 2022, as rising interest rates fueled losses across nearly all bond varieties, muni correlations continued to increase modestly, while those of investment-grade corporate credit, agency mortgages, and U.S. Treasuries increased significantly. By the end of 2022, the rolling three-year correlation of a diversified basket of investment-grade taxable bonds matched that of munis; both registered at roughly 0.50. Short-, intermediate-, and long-term munis showed similar correlation levels versus stocks over the period, but notably, while high-yield munis also exhibited positive correlations with equities, these were in line with the correlations of investment-grade munis and lower than those of high-yield corporate credits.

With rock-bottom interest rates a tailwind, municipal bonds generated a positive return in calendar-year 2020 but lagged investment-grade corporates or U.S. Treasuries. As broad markets roared back the following year, equities soared, but signals of alarming inflation and impending interest-rate increases punished many of the taxable-bond markets more heavily than their municipal counterparts. Low interest rates for much of 2021 fueled refinancings, and municipal bonds posted a modest positive return when other taxable-bond sectors registered losses. As with most fixed-income securities, 2022 changed the context, with aggressive rate rises altering economic expectations. Munis lost less than U.S. Treasuries, agency mortgages, and investment-grade corporate credit that year.

Longer-Term Trends

Since 2000, most muni-bond indexes exhibited a correlation with equities that was higher than that of U.S. Treasuries and other government-backed fare but lower than investment-grade corporate credits. In periods of equity market volatility driven by a weakening economy, municipal bonds have decoupled from Treasuries and other U.S. government bonds, likely on concerns that higher unemployment and weak business conditions would hurt tax receipts. For example, the correlation between muni yields and U.S. Treasury yields broke violently in 2020’s turbulent first half of the year.

Exhibit 14 Rolling Three-Year Correlations vs. Morningstar US Market Index: Municipal Bonds



Source: Morningstar Direct. Data as of Dec. 31, 2022.

Munis' correlation with stocks has also risen a bit over the past decade. That is likely because the muni market is less liquid than that of the U.S. Treasury market, and it has often seized up in periods of economic and equity market stress. Across all longer-term time frames, high-yield muni funds were the least-effective diversifiers for equities of any muni fund group. That is similar to the trend for high-yield taxable bonds; they are much less defensive and more sensitive to economic stress than high-quality bonds.

Portfolio Implications

As with taxable bonds, it's valuable to keep an eye on the big picture: High-quality munis have typically held up much better than stocks during equity market swoons.

That said, over longer periods, munis have exhibited a higher correlation with equities than high-quality taxable-bond indexes, especially U.S. Treasury bonds. That suggests that even investors who value the tax-saving features of muni bonds should consider augmenting them with U.S. government bonds for diversification and ballast during equity market shocks. It also underscores the importance of not using a muni fund as a source of liquid reserves; any bout of illiquidity in the muni market would be an inopportune time to sell. (Investors in high tax brackets can use municipal money market funds in that role.) High-yield munis' higher correlation with equities, meanwhile, indicates that such bonds are best used alongside higher-quality muni bonds (or high-quality taxable bonds) for investors aiming to diversify equity risk.

International Equities

Adding international exposure is one of the first steps toward a diversified portfolio. Even minimalist investors usually carve out a portion of their portfolios for non-U.S. stocks as a supplement to domestic stocks and bonds.

International stocks are subject to many factors that can lead to divergent performance, including local market conditions, currency movements, exposure to different sectors and industries, and political and economic factors. These traits mean they might show different performance patterns, both relative to the U.S. market and versus other international markets.

Recent Performance Trends

Even though diversifying into non-U.S. stocks makes intuitive sense and modestly reduced the standard deviation of a U.S.-only portfolio over the past three-, five-, and 10-year periods, doing so has detracted from returns for U.S. equity investors, at least until very recently. In eight of the 10 calendar years from 2013 through 2022, the Morningstar Global Markets ex-US Index lagged the Morningstar US Market Index. That pattern of underperformance showed signs of reversing in 2022, as non-U.S. stocks held up better than U.S. stocks amid a bear market induced by the Federal Reserve's aggressive campaign of interest-rate hikes. But that was a modest victory, in that most non-U.S. equity indexes endured sharp losses, albeit smaller than what U.S. stocks posted last year. The Morningstar Global Markets ex-US Index lost about 15% last year, compared with a 20% loss for its U.S. counterpart.

Emerging-markets stocks lost more than non-U.S. stocks from developed markets last year: The Morningstar Emerging Markets Index shed 18% in 2022 versus a 15% decline for the Morningstar Developed Markets ex-US Index. Although stocks in Latin America and the Middle East performed relatively well thanks to their heavy tilts toward the rallying energy sector, the broad universe of emerging-markets equities sagged in last year's risk-off environment.

From a diversification perspective, most international stock benchmarks, especially those in developed markets, have been closely tied to the U.S. market over the past three years, as shown in the exhibit below. Not surprisingly, developed-markets European and U.K. equities have had the tightest correlation with U.S. equities. Meanwhile, emerging-markets stocks have tended to have lower correlations with U.S. stocks.

Exhibit 15 Three-Year Correlation Matrix: International Equity

	1	2	3	4	5	6	7	8	9	10	11	12
1 Morningstar US Market	1.00											
2 Morningstar APAC xJapan GR	0.74	1.00										
3 Morningstar DM Europe xUK GR	0.90	0.78	1.00									
4 Morningstar DM xUS GR	0.92	0.83	0.98	1.00								
5 Morningstar EM Americas GR	0.68	0.60	0.70	0.73	1.00							
6 Morningstar EM Europe GR	0.41	0.43	0.55	0.52	0.24	1.00						
7 Morningstar EM GR	0.75	0.99	0.79	0.83	0.68	0.49	1.00					
8 Morningstar Global xUS GR	0.90	0.90	0.96	0.99	0.74	0.53	0.91	1.00				
9 Morningstar Japan GR	0.77	0.71	0.82	0.88	0.54	0.47	0.71	0.86	1.00			
10 Morningstar MEA GR	0.76	0.72	0.73	0.79	0.82	0.28	0.77	0.81	0.62	1.00		
11 Morningstar UK GR	0.86	0.78	0.95	0.97	0.74	0.53	0.80	0.95	0.81	0.82	1.00	

0.76 to 1.00
0.51 to 0.75
0.26 to 0.50
0.01 to 0.25
0.00 to −0.24
−0.25 to −0.49
−0.50 to −0.74
−0.75 to −1.00

Source: Morningstar Direct. Data as of Dec. 31, 2022.

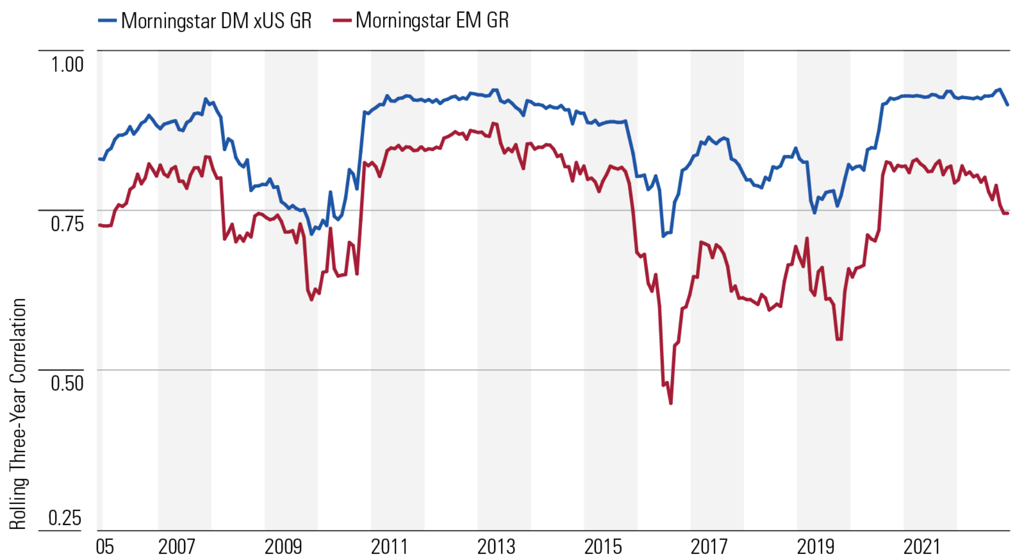
The small subset of European stocks from markets classified as emerging have had the lowest correlation with the U.S. market over the past three years, with correlations declining significantly in 2022. (At the end of 2021, the three-year correlation of the Morningstar Emerging Markets Europe Index with the U.S. market was 0.82; by the end of 2022, it was just 0.41.) That steep drop in correlations owed largely to eastern European equities' sharp losses following Russia's invasion of Ukraine in early 2022.

The Morningstar Emerging Markets Europe Index lost nearly two thirds of its value last year, a catastrophic loss by any measure and an indication that investors have grave uncertainties about eastern European markets going forward. Such stocks are just 1.3% of the broader Morningstar Emerging Markets Index, however, and are a negligible slice of the Morningstar Global Markets ex-US Index.

Longer-Term Trends

While non-U.S. stocks, especially those from developed markets, have exhibited a high correlation with the U.S. market in recent years, that hasn't always been the case. As shown in the next exhibit, correlations between the U.S. and international markets have been lower in some previous periods, such as the period from 2004 through 2008, when the U.S. dollar was generally on the decline. If the greenback goes into another longer-term slump or if the U.S. sinks into recession but other major non-U.S. markets manage to avoid one, it is conceivable that correlations between U.S. and international markets could again drift lower.

Exhibit 16 Rolling Three-Year Correlations vs. Morningstar US Market Index: International Equity



Source: Morningstar Direct. Data as of Dec. 31, 2022.

Longer-term correlations also demonstrate that emerging markets generally have a lower correlation with U.S. stocks than developed markets do. That's because the types of industries that are especially prominent in emerging markets, particularly energy and basic materials, have declined as a percentage of the U.S. market.

Portfolio Implications

While investors who have diversified internationally haven't much benefited over the past decade, they have picked up a modest reduction in volatility relative to a U.S.-only portfolio. The 10-year standard deviation of the Morningstar US Market Index is 15.2, whereas the standard deviation of the Morningstar Global Markets Index, which includes both U.S. and non-U.S. names, is 14.4.

Moreover, the U.S. market has become increasingly growth-tilted: 24% of the Morningstar US Market Index lands in the technology sector, for example, whereas just 11% of the Morningstar Global Markets ex-US index does. The outperformance of technology stocks has redounded to the benefit of U.S.-only investors, as technology names soared for most of the past decade. But in a period in which value-type sectors lead the way, non-U.S. stocks could outperform and help diversify U.S. exposure. Indeed, non-U.S. markets' slightly higher weighting in energy and lower weighting in technology stocks contributed to smaller losses in 2022 than the U.S. market experienced.

Because emerging markets have generally had a lower correlation with the U.S. equity market than developed, investors seeking diversification may want to make sure their foreign-stock allocation includes at least some exposure to less-developed markets. And while some specific regions have been better portfolio diversifiers than others, most investors will probably want to shy away from investment vehicles that focus solely on a particular geographic region.

U.S. Equity Style Box

U.S. equity exposure can be broadly segmented by market capitalization (small, mid, and large) and style (value versus growth), as represented by the Morningstar Style Box. Correlations among U.S. equity groups tend to be high, although small-cap and value stocks tend to be somewhat less tightly linked with the overall market.

The resulting nine boxes go from the relative extremes of large growth to small value. The divergence between these two portions of the style box shows the long-running gap in returns between value and growth stocks on the one hand and large- and small-cap stocks on the other. For many years, the dominant story line was simple: The larger and growthier the style, the better. That narrative held true nearly every year starting in 2009, as the market recovered in the wake of the 2008 bear market\.

Recent Performance Trends

Some of these long-running performance trends have shown signs of reversal, though. Amid surging inflation, the Federal Reserve repeatedly hiked interest rates during 2022, sending stocks into a bear market that continued throughout most of the year. The Morningstar US Market Index finished the year with a 19.4% decline. As higher interest rates prompted investors to mark down previously high-flying technology stocks and other growth-oriented issues, the Morningstar US Growth Index suffered a 36.4% loss. Value stocks, meanwhile, survived the year relatively unscathed. The Morningstar US Value Index finished the year just barely in the red, losing 0.7%.

This relatively resilient showing followed on the heels of a strong value rebound in 2021. Value stocks—particularly in sectors such as energy, financials, and real estate—benefited from the strong economic recovery after falling behind their growth counterparts in 2020 and previous years.

Exhibit 17 Three-Year Correlation Matrix: U.S. Equity Style Box

	1	2	3	4	5	6	7	8	9	10	11	12
1 Morningstar US Market	1.00											
2 Morningstar US Large Core	0.98	1.00										
3 Morningstar US Large Growth	0.92	0.89	1.00									
4 Morningstar US Large Value	0.89	0.88	0.67	1.00								
5 Morningstar US Mid Core	0.97	0.96	0.83	0.93	1.00							
6 Morningstar US Mid Growth	0.92	0.87	0.94	0.70	0.88	1.00						
7 Morningstar US Mid Value	0.88	0.85	0.64	0.94	0.94	0.71	1.00					
8 Morningstar US Small Core	0.93	0.89	0.76	0.91	0.97	0.84	0.95	1.00				
9 Morningstar US Small Growth	0.88	0.82	0.89	0.69	0.84	0.96	0.72	0.86	1.00			
10 Morningstar US Small Value	0.87	0.83	0.66	0.93	0.93	0.73	0.98	0.97	0.76	1.00		

- 0.76 to 1.00
- 0.51 to 0.75
- 0.26 to 0.50
- 0.01 to 0.25
- 0.00 to −0.24
- −0.25 to −0.49
- −0.50 to −0.74
- −0.75 to −1.00

Source: Morningstar Direct. Data as of Dec. 31, 2022.

The large versus small narrative also shifted a bit during 2022. After dominating the market for several years running, the market's biggest stocks were trading at steep valuations at the beginning of the year, giving them more room to fall as valuations dropped. As a result, the Morningstar US Large Cap Index fell behind the broader Morningstar US Market Index for the first time in six years.

Style box performance in 2022 also marked a dramatic shift from performance trends during the pandemic-driven bear market in 2020. As COVID-19 kicked off a fast and severe bear market in the first quarter of 2020, the Morningstar US Large Growth Index fared best in relative terms, dropping 30.9% during the downturn from Feb. 19 through March 23, 2020. This was about 17 percentage points better than the Morningstar US Small Value Index's 47.7% drop over the same period. Large-growth stocks also bounced back much better than their value counterparts as the market recovered later in the year.

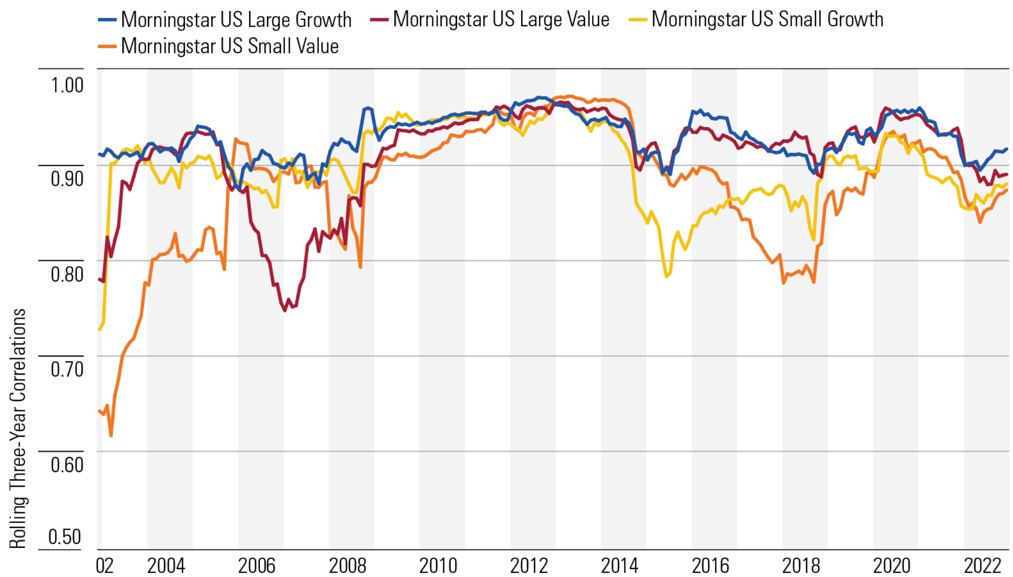
The take-home point is that a high correlation coefficient doesn't translate into similar returns; correlation measures only the direction, not the magnitude, of returns. Indeed, most of the nine boxes have had high correlations with the broader equity market over the past three years, as shown in the following exhibit. The Morningstar US Large Core Index had the highest correlation coefficient (0.98) with the broader equity market, while the Morningstar US Small Value Index was the lowest, at 0.87.

While all nine boxes showed close correlations with the Morningstar US Market Index, correlations between individual style boxes were sometimes much lower. Over the trailing three-year period ended in December 2022, the Morningstar US Mid Value and Small Value indexes had correlation coefficients of just 0.64 and 0.66, respectively, with the Morningstar US Large Growth Index. The Morningstar US Large Value Index also had a relatively low correlation of just 0.67 with its large-growth counterpart over the trailing three-year period.

Longer-Term Trends

Since 2000, correlations for the nine style box indexes have trended higher overall, suggesting that style-based diversification is becoming more difficult. However, there have been some notable divergences over time: For example, small-cap stocks decoupled from the Morningstar US Market Index to the greatest degree between 2015 and 2018. From October 2015 through September 2018, the correlation coefficient for the Morningstar US Small Value Index fell to 0.78, and the same metric decreased to 0.82 for the Morningstar US Small Growth Index.

Exhibit 18 Rolling Three-Year Correlations vs. Morningstar US Market Index: U.S. Style Box Indexes



Source: Morningstar Direct. Data as of Dec. 31, 2022.

Portfolio Implications

These results reinforce the importance of broad diversification. While all nine style boxes have had relatively high correlations with the Morningstar US Market Index, they have often shown marked divergence in returns across the group. Until recently, for example, investors would have paid a high price—during both rallies and down markets—for overweighting value at the expense of growth. But the huge performance differential between value and growth during the 2022 bear market is a testament to the value of style-based diversification. Because it's impossible to predict which style will fare best in any particular market, it's prudent to maintain a diversified portfolio and avoid overweighting either value or growth.

Sector Equity

Sector-specific investments focus on a single economic segment, such as technology, healthcare, or real estate. Because they're often weighted by market capitalization, sector indexes are usually heavily tilted toward the biggest players in that segment. Many investors do not use sector funds at all, relying on broadly diversified equity funds instead. Some investors might employ sector funds to capitalize on industries that they believe are beaten down but due for a recovery or that they think will benefit from secular growth trends, such as healthcare. Alternatively, investors might add sector exposure to provide their portfolios with a higher stream of income (for example, utilities or real estate) or to counterbalance overweightings elsewhere in their portfolios.

Recent Performance Trends

Most sectors suffered double-digit losses in 2022's turbulent environment, and some sectors lost more than the broad U.S. market. While the Morningstar US Market Index dropped 19% for the year, the

Morningstar US Technology, US Communication Services, and US Consumer Cyclical indexes all lost more than 30%. That was a reversal of market performance from 2019 through 2021, when technology and economically sensitive stocks paced the market's strong gains.

A notable exception to widespread equity losses in 2022 was the energy sector: Amid a still-strong economy and Russia's invasion of Ukraine, the Morningstar US Energy Index gained more than 60%. The Morningstar US Utilities Index also managed to hold its ground, and the Morningstar US Consumer Defensive Index posted only a small loss. Other sectors, meanwhile, lost substantially more than the broad market.

Exhibit 19 Three-Year Correlation Matrix: Sector Equity

	1	2	3	4	5	6	7	8	9	10	11	12
1 Morningstar US Market	1.00											
2 Morningstar US Basic Materials	0.90	1.00										
3 Morningstar US Communication Svc	0.92	0.79	1.00									
4 Morningstar US Consumer Cyclical	0.94	0.79	0.86	1.00								
5 Morningstar Consumer Defensive	0.81	0.83	0.66	0.69	1.00							
6 Morningstar US Energy	0.66	0.66	0.53	0.54	0.49	1.00						
7 Morningstar US Financial Services	0.91	0.86	0.84	0.79	0.74	0.80	1.00					
8 Morningstar US Health	0.86	0.82	0.78	0.76	0.79	0.50	0.72	1.00				
9 Morningstar US Industrials	0.94	0.91	0.82	0.83	0.83	0.70	0.94	0.77	1.00			
10 Morningstar US Real Estate	0.91	0.86	0.81	0.82	0.81	0.57	0.82	0.79	0.88	1.00		
11 Morningstar US Technology	0.94	0.77	0.88	0.94	0.71	0.48	0.77	0.79	0.82	0.82	1.00	
12 Morningstar US Utilities	0.65	0.68	0.59	0.53	0.68	0.30	0.55	0.63	0.65	0.74	0.54	1.00

- 0.76 to 1.00
- 0.51 to 0.75
- 0.26 to 0.50
- 0.01 to 0.25
- 0.00 to −0.24
- −0.25 to −0.49
- −0.50 to −0.74
- −0.75 to −1.00

Source: Morningstar Direct. Data as of Dec. 31, 2022.

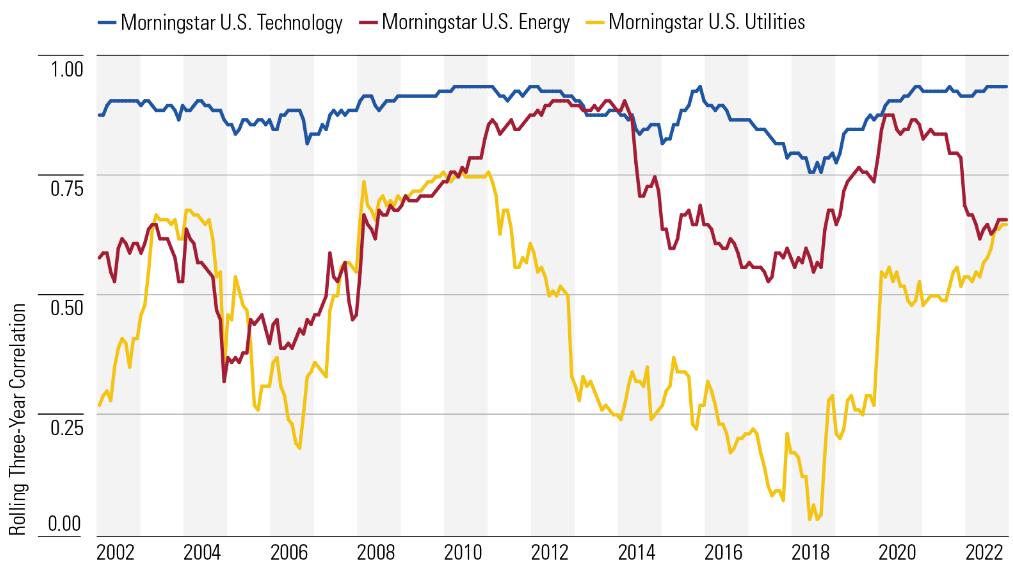
The Morningstar US Energy Index and the Morningstar US Utilities Index have exhibited the lowest correlation with the Morningstar US Market Index over the past three years. Owing to soaring energy prices and stock-price gains amid broad equity weakness in 2022, the Morningstar US Energy Index's correlation with the U.S. market plummeted over the past year. The energy sector had a correlation of 0.79 with the U.S. market at the end of 2021, but it had dropped to 0.65 by the end of 2022. Meanwhile, the utilities sector—the diversification champ among sectors at the end of 2021—saw its correlation with the U.S. market increase in 2022. That's likely because utilities, prized for their dividend yields, are sensitive to interest-rate changes. In a rising-interest-rate environment, investors often swap into the safety of higher-yielding bonds rather than seek yield from equities, which have more risk.

On the flip side, the technology sector has been a notably weak diversifier for investors who already have broad U.S. market exposure. That's not too surprising when you consider that tech stocks consume roughly one fourth of the Morningstar US Market Index. Moreover, technology sector indexes tend to be dominated by a handful of companies. Apple AAPL and Microsoft MSFT, for example, make up more than 35% of the Morningstar US Technology Index. Consumer cyclical stocks have also shown a tight correlation with the broad market.

Longer-Term Trends

Notwithstanding energy stocks' heroic performance in 2022, they haven't been the top diversifier for U.S. equity portfolios historically. Instead, utilities have. While the utilities' correlation with the broad market has been positive, it has been substantially lower than those of other sectors over every longer-term period: three, five, 10, 15, and 20 years. While the 10 other sectors have generally exhibited a higher correlation with the broad market over time, utilities' correlation has remained fairly low. After utilities, the Morningstar US Energy Index has had the lowest correlation with the Morningstar US Market Index over longer time horizons.

Exhibit 20 Rolling Three-Year Correlations vs. Morningstar US Market Index: Sector Equity



Source: Morningstar Direct. Data as of Dec. 31, 2022.

Some advisors recommend that investors carve out a separate allocation to real estate stocks with an eye toward boosting yield and diversification. The anticipated yield on the Morningstar US Real Estate Index is currently double that of the yield on the Morningstar US Market Index, but the Morningstar US Real Estate Index has been an underwhelming diversifier over long-term periods, typically hovering around 0.70 or even higher. What's more, REITs' correlation with the equity market has generally increased over the past few decades. In 2022, for example, the Morningstar US Real Estate Index lost more than the Morningstar US Market Index.

Portfolio Implications

With the exception of utilities, sector-specific indexes have generally exhibited performance that was closely aligned with the broad market. Thus, there doesn't appear to be a strong portfolio construction case for layering on sector-specific exposure in a diversified equity portfolio that also includes exposure to that sector. (Investors may wish to emphasize them for valuation or other factors, but that is a separate issue.)

Utilities have exhibited the most different performance pattern of any of the sectors over longer time frames. The sector also exhibited a diversification benefit relative to the U.S. market in 2022, gaining ground even as the broad market sold off. In addition to sporting higher yields, utilities have also experienced lower volatility, as measured by 15-year standard deviation, than the broad market.

However, the sector likely benefited from the trend toward lower interest rates during that period. It is also worth noting that utilities compose just 3% of the Morningstar US Market Index, so it doesn't take a huge allocation to result in a meaningful overweighting. Moreover, utilities' lower standard deviations and diversification benefit have come at the expense of returns: The Morningstar US Utilities Index has the second-lowest 15-year return of any sector. (The Morningstar US Energy Index's 15-year return is the lowest of all sectors.)

Factor Indexes

Equity factors are another way of examining the drivers of equity market returns. Since the 1990s, asset managers and other researchers have focused considerable effort on trying to identify additional characteristics (beyond traditional metrics such as sector, market cap, and value/growth) that help to explain investment management styles and resulting performance differences. Theoretically, each factor should have its own set of performance characteristics and succeed or fail in different types of market environments.

Recent Performance Trends

The 2022 bear market offered a test case for this hypothesis. As it turned out, there was a sharp divergence in performance based on equity factor during the year. As valuations on previously high-flying stocks dropped down to earth, two equity factors emerged mostly unscathed: yield and value. The Morningstar US Target Dividend Index was the only factor index to finish the year with a slight gain, while the Morningstar US Value Index lost less than 1% for the year. As investors sold off high-risk assets, lower-volatility stocks also provided some shelter from the storm. The Morningstar US Minimum Volatility Index (USD) was down about 12% for the year, compared with a 19.4% loss for the Morningstar US Market Index. But the MSCI USA Sector Neutral Quality Index lost slightly more than the benchmark, mainly thanks to moderately heavier weightings in hard-hit areas such as communications and technology.

Factor performance in 2021's bullish market followed a different pattern. As in 2022, yield was the best-performing factor, partly because many dividend-paying stocks are in the strong-performing energy and industrials sectors. Unlike in 2022, though, quality stocks also fared well thanks to the market's increasing interest in reliable stocks with high profitability, low leverage, and consistent earnings, as well as solid earnings results for these firms. On the negative side, small-cap stocks ended up at the bottom of the heap with a 16.5% return for the year. These stocks benefited from the strong economic rebound in late 2020 and early 2021 but later suffered owing to investor fears about new coronavirus variants and rising inflation. Similarly, momentum stocks suffered a sharp reversal after leading the market in 2020, as investors sold off previously hyped stocks with high valuations.

In early 2020, all six of the major factors—value, yield, small-cap, momentum, quality, and low volatility—were down at least 30%. At the margins, quality and momentum-driven stocks held up slightly better, while small-cap, yield, and value-oriented stocks suffered the deepest losses. Many of the stocks in the three latter categories have heavier weights in economically sensitive sectors, which suffered deeper losses during the downturn.

Exhibit 21 Three-Year Correlation Matrix: Factor Indexes

	1	2	3	4	5	6	7	8	9	10	11	12
1 Morningstar US Market	1.00											
2 Morningstar US Minimum Volatility	0.96	1.00										
3 Morningstar US Small Cap Extended	0.93	0.87	1.00									
4 Morningstar US Target Dividend	0.92	0.91	0.93	1.00								
5 Morningstar US Value	0.90	0.89	0.91	0.97	1.00							
6 MSCI USA Momentum GR	0.92	0.90	0.84	0.80	0.77	1.00						
7 MSCI USA Sector Neutral Quality GR	0.99	0.96	0.88	0.89	0.88	0.89	1.00					

- 0.76 to 1.00
- 0.51 to 0.75
- 0.26 to 0.50
- 0.01 to 0.25
- 0.00 to −0.24
- −0.25 to −0.49
- −0.50 to −0.74
- −0.75 to −1.00

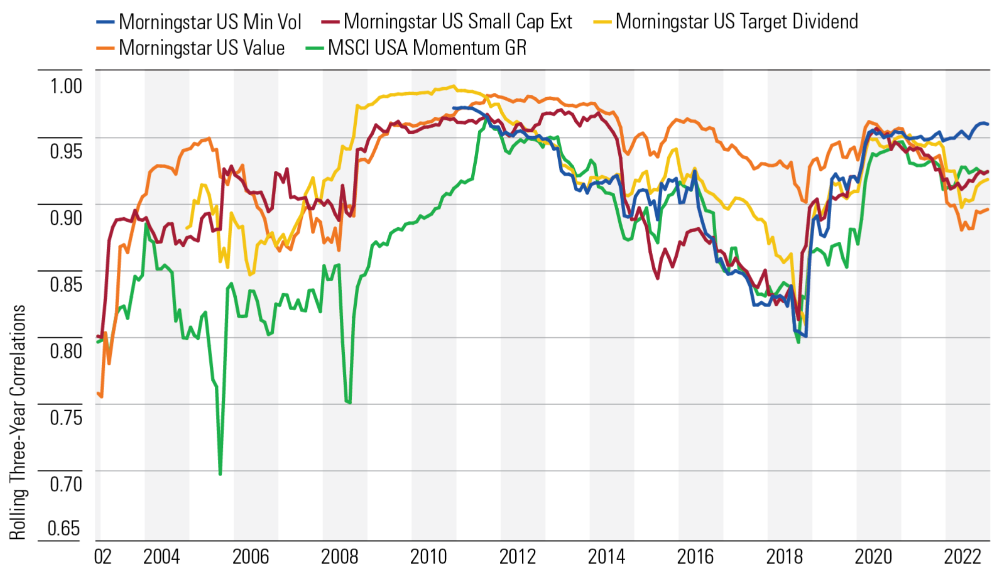
Source: Morningstar Direct. Data as of Dec. 31, 2022.

Over the past three years overall, factor profile correlations have landed in a fairly narrow range. The quality factor has shown the highest correlation with the broader equity market, followed by low volatility. Correlations for the small-cap, momentum, yield, and value factors have been a bit lower. Across factors, the lowest correlation has been between momentum and value.

Longer-Term Trends

Over time, correlations for all six factor indexes have generally trended up, as shown in the graph below. Both smaller-cap stocks and momentum issues decoupled from the Morningstar US Market Index to some extent between 2015 and 2018, but correlations have generally increased since then.

Exhibit 22 Rolling Three-Year Correlations vs. Morningstar US Market Index: Factor Indexes



Source: Morningstar Direct. Data as of Dec 31, 2022.

With performance moving more in line with the overall market, correlations between factor profile benchmarks have also converged. Now that factors are so widely studied and embraced by asset managers, one possible cause for this convergence could be that so many investors are following the same factors that their performance has become less and less discrete.

Portfolio Implications

A general upward trend in correlations has reduced the diversification value of factor profiles. There may be some benefits from diversifying a portfolio by factor, but they have generally been modest. The value factor is a partial exception but still sports a relatively high correlation with the overall market. While some investors might attempt to enhance returns by focusing on factors, a factor-based approach to portfolio construction looks less compelling from a diversification standpoint.

Commodities

Commodities are traditionally defined as raw materials or other basic ingredients used in manufacturing and industrial processes. As basic materials, they are essentially interchangeable with other commodities of the same type. And because their prices mostly depend on the balance of supply and demand, they often show very low correlations with other classes. They can also be a useful hedge against inflation. Commodities themselves are a major part of most inflation indexes, so it makes sense that their prices tend to rise when inflation is increasing. Some commodities also show seasonal price movement, which can affect returns over shorter periods.

Recent Performance Trends

Following an exceptional year for various commodities generated by rising inflation concerns in 2021, 2022 proved to be more of a challenge as war, spiking interest rates, reinstated lockdowns, and fears of an impending recession complicated matters. Still, the Bloomberg Commodity Index posted a positive return of more than 16% in 2022 while the Morningstar US Market Index dropped more than 19%. The price of WTI Crude Oil soared from roughly $48 per barrel to $75 per barrel in 2021 as increased travel capacity stoked demand while supply remained limited following production caps during the global pandemic. In 2022, the price of WTI Crude Oil experienced a $5 net gain, but market volatility got it there via a circuitous route. The price rose through the beginning of 2022 and peaked around $124 in early March, after which it rocked up and down until June, finally trending downward and landing at around $80 by year's end. Ultimately, this delivered a 25% return in the Bloomberg Sub WTI Crude Oil Index for 2022.

Exhibit 23 Three-Year Correlation Matrix: Commodities

	1	2	3	4	5	6	7	8	9	10	11	12
1 Morningstar US Market	1.00											
2 Bloomberg Commodity	0.51	1.00										
3 Bloomberg Sub Copper	0.59	0.58	1.00									
4 Bloomberg Sub Energy	0.42	0.91	0.35	1.00								
5 Bloomberg Sub WTI Crude Oil	0.40	0.71	0.43	0.75	1.00							
6 LBMA Gold Price PM	0.13	0.08	0.27	-0.20	-0.16	1.00						

- 0.76 to 1.00
- 0.51 to 0.75
- 0.26 to 0.50
- 0.01 to 0.25
- 0.00 to −0.24
- −0.25 to −0.49
- −0.50 to −0.74
- −0.75 to −1.00

Source: Morningstar Direct. Data as of Dec. 31, 2022.

The Bloomberg Sub Copper Index lost nearly 14% in 2022, a far cry from 2021's 27% gain. Early 2022 painted a promising picture for copper prices as demand remained high owing to the shift to electric energy sources and easing restrictions in China (a substantial consumer of global copper output). The war in Ukraine also nudged prices up a bit because consumers stockpiled the commodity. However, even as near- and future-term appetites became increasingly palpable, a complex backdrop, including recession fears across the globe and reinstated lockdowns in China, hindered consumers' ability to utilize the resource, which is a key element for electrical circuits used in infrastructure and electric vehicles.

The LBMA Gold Price PM Index returned 0.44% in 2022. In 2021, the index lost 4.33% owing to investors' greater appetite for higher-risk assets, but 2022's volatility spikes, spurred in part by the war in Ukraine and concerns over energy supplies, sent investors seeking gold for its traditional role as a safe haven. Prices dipped midyear when investors turned to higher-yielding fixed-income offerings amid rising interest rates, but the index recovered and posted positive returns in November and December of 2022 and ultimately nearly broke even over 2022. Overall, though, this showing likely disappointed investors who expected gold to provide a safer haven and better hedge against inflation.

Energy had another strong year as supply constraints spilled into 2022. Greater-than-anticipated acceleration of demand and limited supply, both factors that were amplified by Russia's invasion of Ukraine, contributed to Bloomberg Sub Energy Index's 36% return for 2022.

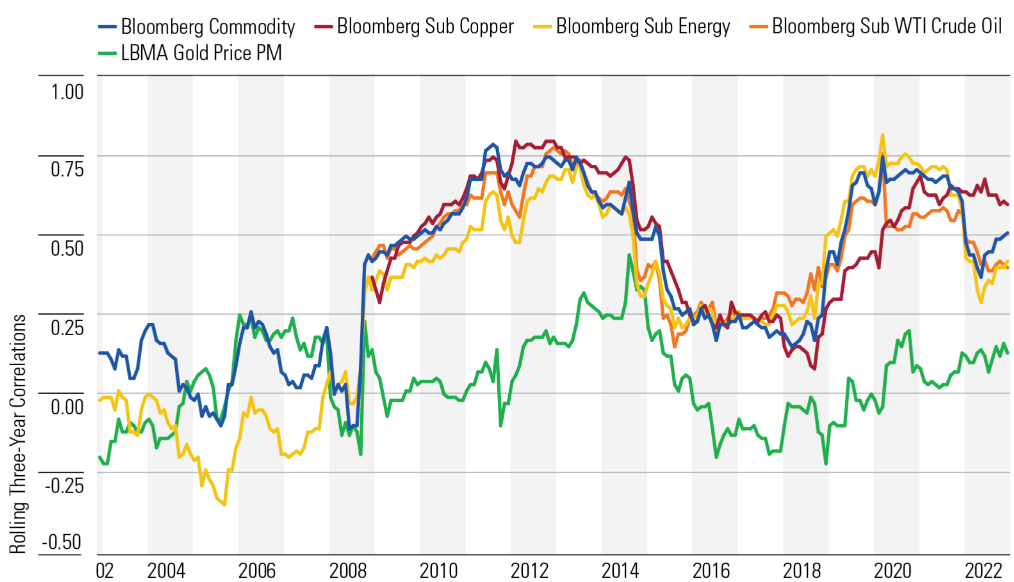
Longer-Term Trends

The Bloomberg Commodity Index's average rolling three-year correlation to the Morningstar US Market Index was 0.46 in 2022, which was roughly in line with the average rolling three-year correlation over the previous decade. During 2021, the index's average rolling three-year correlation was markedly higher, at 0.67, mainly reflecting the impact of the 2020 pandemic panic, when commodity correlations spiked. As inflation picked up in 2021 and soared in 2022, correlations began to fall to more historically typical levels.

The average rolling three-year correlations for energy and oil are also sitting lower in 2022 than in 2021: Those figures dropped from 0.68 and 0.57 to 0.38 and 0.43 for energy and oil, respectively. For both indexes, the 2021 average was well above the decade-long average, whereas 2022's numbers were lower. Copper's average three-year rolling correlation over the last decade was 0.47, whereas the 2022 average remains elevated, clocking in at 0.63.

Although the average rolling three-year correlation for gold was 0.12 in 2022, which is more than twice than the average over 2021 and the last decade (both of which were roughly 0.05), gold remains the mostly weakly correlated of the five commodities indexes studied here. In fact, gold has the lowest correlation of any major asset class—excluding cash and 10+ year Treasuries—over the trailing periods depicted in the Appendix (see Exhibits A2 through A7).

Exhibit 24 Rolling Three-Year Correlations vs. Morningstar US Market Index: Commodities



Source: Morningstar Direct. Data as of Dec. 31, 2022.

Commodities have served as a strong hedge versus inflation, but the degree to which this may remain the case is uncertain. Several factors—such as complex market dynamics, ongoing postpandemic disruptions, political and regulatory factors (negative sentiment toward mining is on the rise, for example), and environmental concerns (mining sites are increasingly more difficult to access)—have undermined return expectations. It seems likely that such compromising factors will persist. And commodities continue to exhibit negative correlations versus market volatility (as measured by the CBOE VIX Index), except for gold, which hovered around zero.

Portfolio Implications

Although investors increasingly treat commodities as a financial asset, their value as portfolio diversifiers, particularly during bouts of extreme market stress, has only slightly diminished relative to historical expectations: Correlations are still low compared with other asset classes. And while long-term returns relative to other broad asset classes haven't been that compelling, commodities can excel during certain market environments. Notably, gold should continue to fill a valuable role as a buffer against equity market volatility despite 2022's lackluster showing. It is also worth noting that the way investors gain access to commodities (for example, via mutual funds, exchange-traded funds, or futures contracts; and the kind of commodity/commodities held) plays a major role in the potential outcomes. Roll yield and implementation decisions can all have a significant impact on results.

Alternatives

Alternative strategies, as the name suggests, offer something fundamentally different from mainstream asset classes. Morningstar defines these strategies based on their ability to modify, diversify, or eliminate traditional market risks. There is considerable variation between strategies, though, and identifying appropriate benchmarks is tough. For that reason, we used Morningstar's fund categories as proxies for the most common strategies rather than market indexes. (Note: The categories referenced in this report reflect the classifications Morningstar introduced in early 2021.)

Alternatives classified as diversifiers include the equity market-neutral, event-driven, options trading, relative value arbitrage, and multistrategy categories. These incorporate various traditional market risk factors found in equities, alongside nontraditional or alternative risk factors or betas, to offer a more diversified source of long-term returns. Nontraditional betas include factors such as carry, momentum, and trend, but because these are combined with residual traditional risk factors, they are still exposed to losses during market crashes. The most common strategies in this group—equity market-neutral, event driven, and relative value arbitrage—typically have little to no sensitivity to moves in equities markets. In all three cases, they tend to trade securities both long and short against each other rather than trading against the overall market.

Strategies defined as opportunistic (macro trading and systematic trading) generally focus on absolute returns, meaning they aim for positive returns in all markets and focus more on capital preservation. Managers of these strategies move in and out of long and short positions as opportunities arise. Opportunistic funds tend to lose less in drawdowns but also come with more complexity. Sometimes these managers bet the market will continue moving in the same direction, sometimes they wager it won't, and they often switch or hedge their bets. Market expectations can often get caught out of step, so they often use sophisticated risk-management systems to manage their myriad exposures.

Recent Performance Trends

As equity markets sank more than 19% in 2022, Morningstar's alternative strategies categories delivered returns ranging between positive 16.9% and negative 9.2%. Trailing three-year correlations varied between 0.98 and negative 0.11, with five categories above 0.77. Unsurprisingly, categories with the weakest links to stocks fared the best with respect to returns. The systematic trend (negatively correlated) and equity market-neutral (very weakly positively correlated) categories posted positive returns of 16.9% and 5.9%, respectively. What might evoke a little more surprise is that the macro trading category nearly broke even in 2022 despite a 0.88 correlation to equities. This was due to its low equity and bond beta, which is an important consideration when assessing alternative categories' performance.

Exhibit 25 Three-Year Correlation Matrix: Alternatives

	1	2	3	4	5	6	7	8	9	10	11	12
1 Morningstar US Market	1.00											
2 US Fund Equity Market Neutral	0.12	1.00										
3 US Fund Event Driven	0.80	0.06	1.00									
4 US Fund Macro Trading	0.88	0.18	0.78	1.00								
5 US Fund Multistrategy	0.89	0.30	0.91	0.90	1.00							
6 US Fund Options Trading	0.98	0.15	0.76	0.83	0.86	1.00						
7 US Fund Relative Value Arbitrage	0.77	−0.05	0.92	0.75	0.85	0.72	1.00					
8 US Fund Systematic Trend	−0.11	0.09	0.01	0.28	0.06	−0.19	−0.07	1.00				

- 0.76 to 1.00
- 0.51 to 0.75
- 0.26 to 0.50
- 0.01 to 0.25
- 0.00 to −0.24
- −0.25 to −0.49
- −0.50 to −0.74
- −0.75 to −1.00

Source: Morningstar Direct. Data as of Dec. 31, 2022.

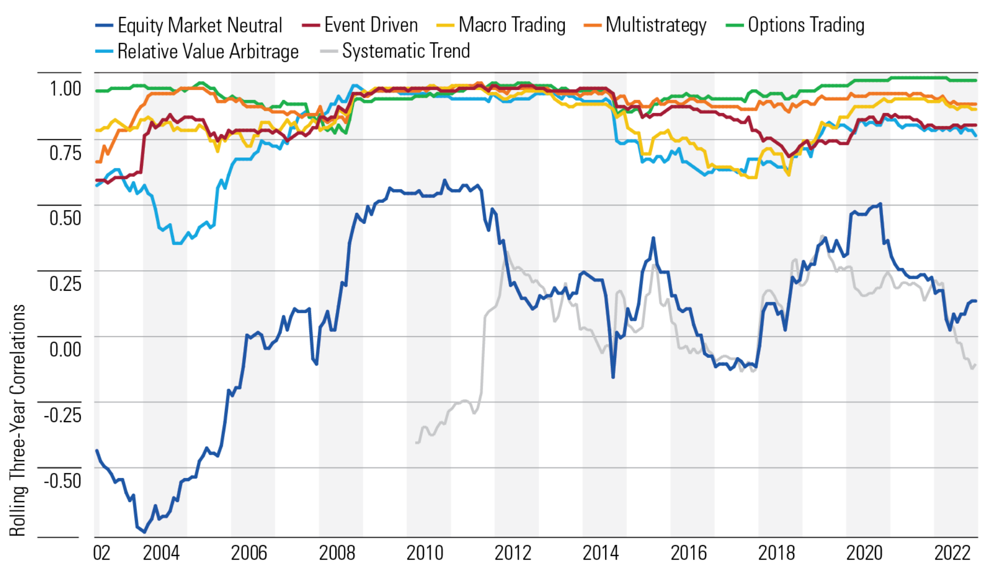
Correlation figures tell us how directionally aligned these alternative categories' returns are with the equity market's returns but do not convey the magnitude of that alignment (or nonalignment). Thus, it's also helpful to consider their respective betas (computed versus the Morningstar US Market Index), which provide insight into alternatives' degree of sensitivity to equity movements. Alternatives exhibited three-year trailing equity betas between positive 0.47 and negative 0.04, with six of seven categories measuring below 0.26—meaning only 26% of their returns could be attributed to moves in the equity markets.

For example, the event-driven category lost only 1.75% in 2022, faring significantly better than a 60/40 portfolio. This was due to an equity beta of only 0.23. Based on correlations alone, investors might have expected the category to move in the same direction as equity markets but not the (small) degree to which that was the case. By factoring in the equity beta, one might estimate something around a 4% loss (computed by multiplying the category's beta of 0.23 by the equity market's 19% loss), which is close to observed category performance. The remaining categories all posted negative returns. Options trading, a 50% hedged equity category, lost the most (9.2%), which is unsurprising given it had both the highest correlation (0.98) and equity beta (0.47).

Longer-Term Trends

Over longer periods, correlations have been relatively stable for most categories, but some differences have arisen. Near-term correlations for macro trading have increased over the last decade. On the other hand, correlations for equity market-neutral and systematic trend have decreased in recent years. Equity betas have shifted most noticeably for options trading and systematic trend, whose recent figures have increased and decreased, respectively.

Exhibit 26 Rolling Three-Year Correlations vs. Morningstar US Market Index: Alternatives



Source: Morningstar Direct. Data as of Dec. 31, 2022.

Portfolio Implications

Investors seek out alternative strategies for a multitude of reasons such as reducing drawdowns, seeking a wider range of risk factors or asset classes, or more portfolio stability. In other words, they're not primarily viewed as return generators in bullish markets. Given the asset class' primary purpose to complement and diversify an overall portfolio, it therefore shouldn't come as a surprise that in seven out of the past 10 calendar years, all seven alternative categories underperformed the Morningstar US Market Index, often by substantial margins. The benefit of alternatives becomes more evident when one considers intense market selloffs, such as the fourth quarter of 2018, the first quarter of 2020, and the first half of 2022's market correction. The lower equity sensitivity translates into more modest losses during equity market drawdowns and in some cases even positive returns.

From a portfolio construction perspective, though, investors must remember that exceptionally low betas have a major impact on portfolio performance even when correlations seem high. Despite trailing U.S. equities by a wide margin over the past decade, a 20% allocation to most categories of alternatives would have improved risk-adjusted returns versus an all-equity portfolio or a balanced 60/40 portfolio. The strategies with the lowest equity betas—systematic trend, event-driven, relative value arbitrage, and equity market-neutral—all matched or increased the portfolio's Sharpe ratio.

Private Investments

In contrast to most securities, which are typically traded on an exchange and valued according to rules established by the SEC, private investments involve lending money to an endeavor for a dedicated period of time with a hope of (but no guarantee of) enticing future cash flows. In the case of venture capital, it means providing resources for the incubation and development of an idea into a durable business; the probability of failure is high but so, too, are the potential returns if the investment gains traction. Private equity typically refers to a more developed version of venture capital, where early-stage investment in a company that eventually goes through an initial public offering on a stock exchange may result in attractive upside. Private credit is when investors loan directly to companies that want to avoid the broader capital markets, typically for more favorable covenants than would be available otherwise. Leveraged buyouts, real estate, and real assets—all of these also exist under the umbrella of private investments.

And as varied as these private investments are, they share a number of structural characteristics. The first is illiquidity. Once an investment is made, those assets are committed for a significant period of time (often years) before expectation of a return, in theory giving the management team the space that it needs to make a go of the endeavor. The second is a high barrier to investment entry, given comparatively large commitment minimums and high fees relative to those of marketable public securities. The third is complex reporting. Private investments rely heavily on discretion when valuing assets, particularly in early years when there isn't a market precedent. The industry standard for private company valuation is an internal rate of return that is calculated on a delay and can be easily manipulated, rather than the absolute return easily derived for securities that must transparently mark to market daily.

As a whole, these defining structural characteristics mean that private investments aren't scrutinized publicly and on a periodic schedule. Instead, they take advantage of built-in patience to give the investments the greatest probability of success. As a result, the pace and magnitude of returns differs from marketable public securities, and that contributes to a perception of portfolio diversification, but in practice, many of these private investments are simply leveraged versions of existing equity and fixed-income market dynamics.

Recent Performance Trends

With data beginning in 2016, the quarterly IRRs reported by PitchBook represent the general experience of each of these private investment sectors; other indexes cited represent quarterly total returns.

In the wake of the pandemic panic (first-quarter 2020), when the Morningstar US Market Index lost 20.61%, venture capital, private equity, and secondaries (a type of investment that purchases an existing interest in a company from a private equity company) also suffered losses but much more modest at 1.1%, 8.1%, and 2.5%, respectively. Aided by their illiquid structures and delayed reporting, these results don't as easily reflect of-the-moment market temperament in pricing. Then, as markets roared in 2021, those same investment sectors benefited from the accompanying euphoria and rock-bottom financing rates. The one-year trailing IRRs for all three private sectors exceeded 40% in nearly every quarter that calendar year (secondaries was the exception, with 19.6% in the first quarter); venture capital reached 72% in the second quarter of 2021. Still, private investments remain susceptible to general business sentiment, and as inflation indicators picked up and anxiety over rising rates took hold, results for the first two quarters of 2022 reflected greater valuation caution. First-quarter IRRs for private equity and secondaries were modestly positive, at 1.3% and 2.6%, but venture capital's IRR lost 5.0%. Second-quarter IRRs were lower; secondaries eked out a positive 1.5%, but private equity and venture capital lost 2.4% and 8.2%, respectively.

Exhibit 27 Three-Year Correlation Matrix: Private Investments

	1	2	3	4	5	6	7	8	9	10	11	12
1 Morningstar US Market	1.00											
2 Fund of Funds	0.57	1.00										
3 Private Debt	0.77	0.74	1.00									
4 Private Equity	0.80	0.80	0.89	1.00								
5 Real Assets	0.52	0.47	0.80	0.65	1.00							
6 Real Estate	0.12	0.27	0.51	0.39	0.72	1.00						
7 Secondaries	0.30	0.80	0.68	0.55	0.62	0.65	1.00					
8 Venture Capital	0.71	0.89	0.68	0.83	0.31	0.12	0.57	1.00				

- 0.76 to 1.00
- 0.51 to 0.75
- 0.26 to 0.50
- 0.01 to 0.25
- 0.00 to −0.24
- −0.25 to −0.49
- −0.50 to −0.74
- −0.75 to −1.00

Source: PitchBook and Morningstar Direct. Correlations are based on IRRs for all but the Morningstar US Market Index, which is based on total returns. Quarterly data as of June 30, 2022.

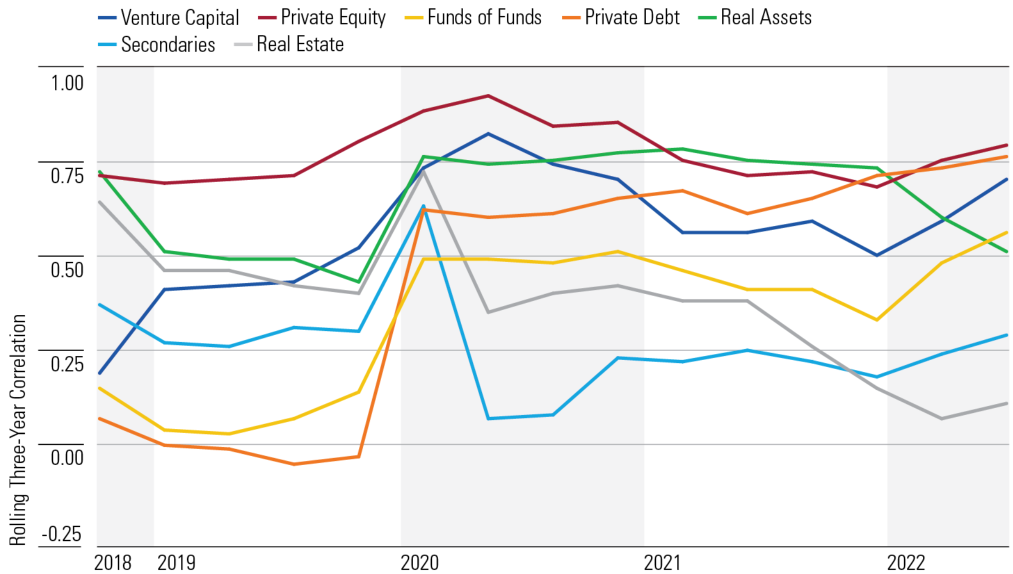
The rolling three-year correlations, reported quarterly, between the private investment sectors and the Morningstar U.S. Market Index vary wildly and reflect volatility potential. By definition, many of these private sectors are early-stage equities. For example, the rolling three-year correlation of private equity ranged from 0.69 (at the end of 2021's bull market) to 0.93 (in the wake of the pandemic panic stress). Only private debt exhibited a negative rolling three-year correlation—in 2019's last two quarters—and that was extremely modest. From the first quarter of 2020 through the second quarter of 2022, the private debt correlations were in far greater sympathy with U.S. equities and ranged from 0.61 to 0.77.

Relative to other asset classes discussed in this paper, the range of correlations across private investments differ dramatically from quarter to quarter, and rather than reflect reality, these are products of the structural characteristics of the asset class outlined above. Still, within private investments, venture capital and private equity are more correlated with marketable equities than private credit, and all three of these typically exhibit higher correlations to U.S. equities than real assets and real estate, which have strong niche underlying market factors that shape those markets.

Long-Term Trends

Over the long term, the structure of private investments means those revenue streams will look different from those of marketable securities, which more swiftly reflect adjustments to market sentiment in their pricing. This enhances diversification in a theoretical way, but investors who seek private options should remain alert to the risks unique to their underlying investment. Venture capital and private equity, for example, are leveraged and concentrated equity investments by their very structure. Through longer periods of time, the potential for those investments is tied to many of the same factors that lift and drag on public equity markets.

Exhibit 28 Rolling Three-Year Correlations vs. Morningstar US Market Index: Private Investments



Source: PitchBook and Morningstar Direct. Correlations are based on IRRs for all but the Morningstar US Market Index, which is based on total returns. Quarterly data as of June 30, 2022.

The quarterly rolling three-year correlations between these private investments and the Morningstar US Market Index have reached high points, unsurprisingly given that the investments are, by definition in many instances, equities. But these correlations can swiftly shift. For example, while private equity exhibited a 0.89 correlation with U.S. equities in the first quarter of 2020, that number declined to 0.69 by the last quarter of 2021. Relative to other asset classes discussed in this paper, the range of correlations across private investments differ dramatically from quarter to quarter, and rather than reflect reality, these are products of the structural characteristics of the asset class outlined above. Still, within private investments, venture capital and private equity are more correlated with marketable equities than private credit, and these are far more correlated than real assets and real estate, which have strong niche underlying market factors that shape those markets.

Portfolio Implications

While private investments remain a potential source for differentiated (though mostly delayed and leveraged) equitylike return streams, their structure merits caution for individual investors. Without access to the highest-quality endeavors with well-resourced teams to manage those projects, the investment can easily fall apart. This is potentially devastating given that the assets are committed for long periods of time with little recourse if something goes wrong. And while large institutional portfolios with unlimited time horizons and the ability to easily replenish funds may find private investments attractive, an individual investor without those benefits can more practically create diversification with other, more liquid and government-regulated asset classes.

Cryptocurrency

After spending its first decade or so of life as more of a fringe asset class, cryptocurrency started gaining more institutional acceptance in 2020 and 2021. Bitcoin, the oldest and most established cryptocurrency, still accounts for most of the investor interest and assets, but numerous digital currencies have also attracted more attention from both retail and institutional investors over the past couple of years. By November 2021, the value of assets invested in cryptocurrency globally totaled about $2.7 trillion.

Interest in crypto was driven by several factors, including spectacular long-term returns since bitcoin was first minted in early 2009. Other key drivers include distrust of national governments and traditional financial institutions, fears that resurgent inflation could be more than transitory, and excitement about the technological potential of digital payments and other innovations related to cryptocurrency, such as blockchain; decentralized finance, or DeFi; and nonfungible tokens, or NFTs. As an asset that exists purely in digital form, cryptocurrency is fundamentally different from other major asset classes.

Recent Performance Trends

However, crypto's potential diversification value has been overshadowed by its extreme downside risk, which was on full display in 2022. As the market sold off risky assets and the high-profile cryptocurrency exchange FTX collapsed, the CMBI Bitcoin Index dropped about 64% for the year and the broader MVIS CryptoCompare 10 Index lost more than 69% of its value. A series of other crises, including the crash of terra, a popular stablecoin that failed to provide any stability, also shook investor confidence in cryptocurrencies during the year.

Exhibit 29 Three-Year Correlation Matrix: Cryptocurrency

	1	2	3	4	5	6	7	8	9	10	11	12
1 Morningstar US Market	1.00											
2 CMBI Bitcoin	0.59	1.00										
3 CMBI Ethereum	0.65	0.75	1.00									
4 MVIS CryptoCompare DA 10 PR	0.63	0.84	0.93	1.00								

0.76 to 1.00
0.51 to 0.75
0.26 to 0.50
0.01 to 0.25
0.00 to −0.24
−0.25 to −0.49
−0.50 to −0.74
−0.75 to −1.00

Source: Morningstar Direct. Data as of Dec. 31, 2022.

Crypto's performance over the previous few years also puts its unusually volatile characteristics in sharp relief. After posting a 104% runup in the first quarter of 2021, the CMBI Bitcoin Index dropped about 40% in the second quarter, followed by a 25.3% gain in the third quarter and then another roller-coaster ride in the fourth quarter, when bitcoin briefly hit an all-time high and then plummeted 20% as high-risk assets sold off in December.

The previous year, 2020, also highlighted crypto's erratic performance trends. As the ultimate risk-on asset, cryptocurrency was hit hard in the early-2020 bear market despite its generally low correlation with major asset classes such as stocks and bonds. The CMBI Bitcoin Index dropped about 38% during the market downdraft from Feb. 19 through March 23, 2020, while the CMBI Ethereum Index was down about 54%. Both assets then bounced back in a spectacular way, with bitcoin posting 305.4% for the full year and ether clocking in with gains of 479.4%.

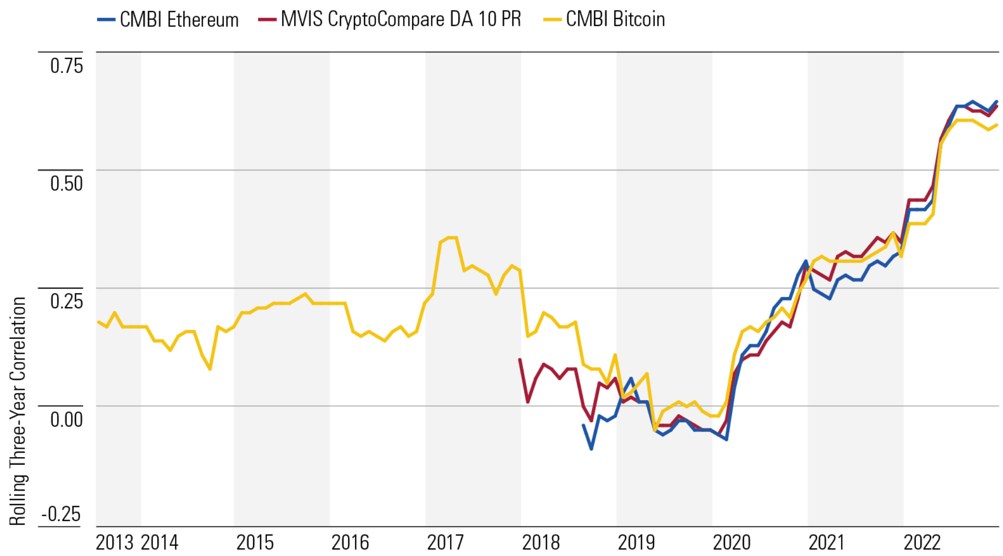
These dramatic performance swings underscore some of the limits of correlation metrics. Correlations often spike during periods of market crisis, and low correlations don't guarantee that a given asset class will hold up better during market drawdowns.

Indeed, while cryptocurrency has continued to show a relatively low correlation with most major asset classes, correlations have been trending significantly higher. For the trailing three-year period ended in 2022, the CMBI Bitcoin Index had a correlation coefficient of just 0.59 with stocks (as measured by the Morningstar US Market Index), but that's up from 0.32 as of the previous year-end. Ethereum and other major cryptocurrencies have shown similar correlation jumps. This can be partly attributed to the bearish market in 2022: With market sentiment switching to a risk-off mindset, riskier assets have moved more in tandem. But while bitcoin remains by far the largest and best-known cryptocurrency, it's also worth noting that the cryptocurrency market isn't monolithic. The cross-correlation between the CMBI Bitcoin and CMBI Ethereum indexes was just 0.75 for the trailing three-year period.

Longer-Term Trends

The recent increase in cryptocurrency correlations continues a longer-term trend. As cryptocurrency has moved more into the mainstream, its correlation with other major asset classes has trended up over time, as shown in the following exhibit. Bitcoin's correlation with the Morningstar US Market Index has been as low as negative 0.05 for some previous periods but has gradually increased over the past few years. Ether and other major cryptocurrencies have shown similar patterns. Although current correlation numbers are still quite low compared with those of other major asset classes, cryptocurrency's low correlation with traditional asset classes may be a bit of a false flag because of its tendency to spike during market corrections.

Exhibit 30 Rolling Three-Year Correlations vs. Morningstar US Market Index: Cryptocurrency



Source: Morningstar Direct. Data as of Dec. 31, 2022.

Portfolio Implications

Diversification value is one potential reason to add cryptocurrency to a portfolio, but investors should also consider other factors, such as their ability to hold on through crypto's periodic downdrafts, which have been unusually swift and severe. The extreme losses in 2022 are a case in point. Even after 2022, crypto aficionados embracing the "hold on for dear life" mindset have been amply rewarded over time, but investors who are more skittish can easily get whipsawed by extreme short-term price movements. It's also worth noting that cryptocurrency's volatility profile means that even small doses can have an outsize impact when added to other portfolio holdings. As a result, most investors will want to keep cryptocurrency exposure to a minimum and carve out any allocations from stocks, not bonds.

Conclusion

The rise in correlations across many major asset classes in recent years illustrates the complexity involved in building a diversified portfolio. Not only are correlations constantly shifting, but they also often rise during periods of market volatility. As a result, while broad portfolio diversification led to slightly lower losses during 2022, this approach has often failed to add value when compared with an equity-only portfolio or a plain-vanilla mix of stocks and bonds.

The shifting landscape for both interest rates and inflation further complicates matters. After decades of relatively low inflation and generally declining interest rates, both measures have shown signs of a fundamental regime change. Thanks to supply-chain issues and resurgent economic growth, inflation surged to a 40-year high during 2022, and the Federal Reserve has repeatedly hiked interest rates in an effort to tamp down inflation. As a result, the previously ideal conditions for stock/bond correlations are no longer in place, and correlations between stocks and investment-grade bonds have flipped to positive territory. That, in turn, reduces the diversification value of bonds from a portfolio perspective.
Even so, the basic arguments in favor of diversification still hold. Even as stock/bond correlations have moved higher, they're still low in absolute terms. And our analysis of previous stress periods for inflation and interest rates suggests that stock/bond correlations have rarely increased above 0.6, and then only during the most acute periods of rising rates and/or inflation. That means the diversification case for adding bonds to a portfolio remains intact, even if some conditions for fixed-income holdings are less favorable than in the past.

In addition, as Exhibit A1 (on the following page) illustrates, asset classes that are winners in one year often sink to the bottom in later years. Holding a variety of asset classes helps guard against being overly exposed to an area that falls out of favor. As discussed above, asset classes with lower correlation coefficients can also reduce a portfolio's risk profile. Finally, holding a diversified portfolio helps investors expand the opportunity set and ensure they do not miss out on areas that can enhance long-term returns, such as international stocks.

Note: One of the authors has ownership positions in the following securities mentioned in this report: AAPL and MSFT.

Appendix

Exhibit A1 Asset-Class Winners and Losers (Annual Total Return %)

2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
5,326.12	28.58	35.98	123.54	1,367.43	1.82	94.28	305.37	58.58	16.09
37.91	27.16	1.73	20.25	35.97	0.13	31.22	24.61	41.06	1.54
33.13	12.85	0.69	17.46	25.54	-0.93	28.53	20.90	27.11	0.44
21.97	6.92	0.62	12.44	21.47	-1.94	25.96	18.77	25.78	-11.09
7.21	5.67	0.02	11.77	15.03	-2.27	23.45	17.78	16.25	-12.96
4.29	2.38	-1.41	11.35	12.66	-3.61	18.56	16.41	12.71	-14.79
0.04	0.12	-1.57	8.30	8.88	-5.05	18.43	8.97	5.24	-17.93
-1.84	0.02	-4.44	8.10	8.06	-11.25	14.97	7.50	0.04	-18.46
-1.95	-0.75	-4.88	3.40	7.30	-12.11	14.33	7.03	-0.02	-19.43
-9.52	-3.91	-12.11	2.55	3.40	-13.16	8.65	0.54	-1.61	-25.21
-13.56	-17.01	-13.26	1.41	1.70	-13.93	7.69	-3.12	-4.33	-29.44
-27.33	-56.70	-24.66	0.22	0.81	-74.00	2.22	-4.69	-4.68	-63.96

U.S. Stock
- Morningstar US Market
- Morningstar US Small Cap
- Morningstar US REIT

International Stock
- Morningstar Developed Markets xUS GR
- Morningstar Emerging Markets GR

Bonds
- Morningstar US 10+ Yr Treasury Bond
- Morningstar US Cash T-bill
- Morningstar US Core Bond
- Morningstar US High-Yield Bond

Commodities
- Bloomberg Commodity
- CMBI Bitcoin PR
- LBMA Gold Price PM

Source: Morningstar Direct. Data as of Dec. 31, 2022. All indexes shown are Morningstar benchmarks based on total returns in U.S. dollars unless otherwise noted.

Exhibit A2 Correlation Matrix: One Year

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Morningstar US Market	1.00												
2 Bloomberg Commodity	0.45	1.00											
3 CMBI Bitcoin PR	0.59	0.48	1.00										
4 LBMA Gold Price PM	0.08	0.25	0.06	1.00									
5 Morningstar DM xUS GR	0.90	0.47	0.46	0.37	1.00								
6 Morningstar EM GR	0.59	0.41	0.04	0.52	0.81	1.00							
7 Morningstar Global Core Bond GR	0.71	0.23	0.26	0.41	0.88	0.79	1.00						
8 Morningstar US 10+ Yr Treasury Bd	0.53	0.07	0.05	0.46	0.68	0.77	0.90	1.00					
9 Morningstar US Cash T-bill	0.10	-0.42	0.01	0.28	0.34	0.34	0.39	0.29	1.00				
10 Morningstar US Core Bond	0.66	0.15	0.15	0.32	0.80	0.79	0.97	0.95	0.30	1.00			
11 Morningstar US High-Yield Bond	0.91	0.47	0.72	0.06	0.88	0.57	0.76	0.52	0.22	0.70	1.00		
12 Morningstar US REIT	0.89	0.51	0.54	0.22	0.84	0.60	0.61	0.53	0.03	0.61	0.77	1.00	
13 Morningstar US Small Cap	0.98	0.41	0.62	0.08	0.86	0.52	0.68	0.48	0.08	0.63	0.91	0.83	1.00

- 0.76 to 1.00
- 0.51 to 0.75
- 0.26 to 0.50
- 0.01 to 0.25
- 0.00 to −0.24
- −0.25 to −0.49
- −0.50 to −0.74
- −0.75 to −1.00

Source: Morningstar Direct. Data as of Dec. 31, 2022.

Exhibit A3 Correlation Matrix: Three Years

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Morningstar US Market	1.00												
2 Bloomberg Commodity	0.51	1.00											
3 CMBI Bitcoin PR	0.59	0.25	1.00										
4 LBMA Gold Price PM	0.13	0.08	0.06	1.00									
5 Morningstar DM xUS GR	0.92	0.58	0.47	0.15	1.00								
6 Morningstar EM GR	0.75	0.56	0.37	0.29	0.83	1.00							
7 Morningstar Global Core Bond GR	0.60	0.17	0.32	0.49	0.63	0.62	1.00						
8 Morningstar US 10+ Yr Treasury Bd	0.13	-0.31	0.02	0.39	0.07	0.10	0.71	1.00					
9 Morningstar US Cash T-bill	-0.30	-0.42	-0.26	0.09	-0.17	-0.19	0.03	0.13	1.00				
10 Morningstar US Core Bond	0.49	-0.01	0.22	0.37	0.48	0.48	0.94	0.84	0.02	1.00			
11 Morningstar US High-Yield Bond	0.86	0.57	0.54	0.16	0.84	0.76	0.64	0.08	-0.25	0.52	1.00		
12 Morningstar US REIT	0.90	0.51	0.51	0.18	0.84	0.69	0.54	0.16	-0.35	0.47	0.80	1.00	
13 Morningstar US Small Cap	0.94	0.56	0.62	0.04	0.90	0.79	0.51	-0.06	-0.32	0.37	0.89	0.83	1.00

- 0.76 to 1.00
- 0.51 to 0.75
- 0.26 to 0.50
- 0.01 to 0.25
- 0.00 to −0.24
- −0.25 to −0.49
- −0.50 to −0.74
- −0.75 to −1.00

Source: Morningstar Direct. Data as of Dec. 31, 2022

Exhibit A4 Correlation Matrix: Five Years

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Morningstar US Market	1.00												
2 Bloomberg Commodity	0.53	1.00											
3 CMBI Bitcoin PR	0.36	0.19	1.00										
4 LBMA Gold Price PM	0.09	0.10	0.07	1.00									
5 Morningstar DM xUS GR	0.91	0.60	0.33	0.14	1.00								
6 Morningstar EM GR	0.75	0.57	0.21	0.29	0.84	1.00							
7 Morningstar Global Core Bond GR	0.48	0.11	0.22	0.53	0.53	0.53	1.00						
8 Morningstar US 10+ Yr Treasury Bd	0.01	-0.34	0.03	0.38	-0.03	-0.02	0.70	1.00					
9 Morningstar US Cash T-bill	-0.20	-0.39	-0.17	0.10	-0.12	-0.13	0.16	0.23	1.00				
10 Morningstar US Core Bond	0.35	-0.08	0.17	0.38	0.35	0.34	0.91	0.86	0.20	1.00			
11 Morningstar US High-Yield Bond	0.84	0.57	0.41	0.16	0.83	0.73	0.58	0.04	-0.13	0.45	1.00		
12 Morningstar US REIT	0.82	0.48	0.31	0.14	0.76	0.59	0.49	0.20	-0.16	0.45	0.76	1.00	
13 Morningstar US Small Cap	0.94	0.57	0.36	0.01	0.88	0.76	0.39	-0.12	-0.22	0.26	0.86	0.78	1.00

0.76 to 1.00
0.51 to 0.75
0.26 to 0.50
0.01 to 0.25
0.00 to –0.24
–0.25 to –0.49
–0.50 to –0.74
–0.75 to –1.00

Source: Morningstar Direct. Data as of Dec. 31, 2022.

Exhibit A5 Correlation Matrix: 10 years

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Morningstar US Market	1.00												
2 Bloomberg Commodity	0.43	1.00											
3 CMBI Bitcoin PR	0.19	0.05	1.00										
4 LBMA Gold Price PM	0.03	0.25	-0.06	1.00									
5 Morningstar DM xUS GR	0.88	0.50	0.15	0.11	1.00								
6 Morningstar EM GR	0.69	0.51	0.06	0.26	0.81	1.00							
7 Morningstar Global Core Bond GR	0.37	0.16	0.06	0.52	0.47	0.52	1.00						
8 Morningstar US 10+ Yr Treasury Bd	-0.06	-0.31	-0.03	0.36	-0.06	0.01	0.65	1.00					
9 Morningstar US Cash T-bill	-0.16	-0.13	-0.12	0.14	-0.09	-0.06	0.10	0.12	1.00				
10 Morningstar US Core Bond	0.27	-0.07	0.05	0.37	0.29	0.33	0.85	0.86	0.11	1.00			
11 Morningstar US High-Yield Bond	0.80	0.54	0.16	0.18	0.81	0.72	0.53	0.04	-0.11	0.42	1.00		
12 Morningstar US REIT	0.72	0.30	0.04	0.12	0.65	0.53	0.48	0.33	-0.13	0.50	0.67	1.00	
13 Morningstar US Small Cap	0.93	0.45	0.17	-0.01	0.81	0.65	0.27	-0.17	-0.18	0.16	0.79	0.66	1.00

0.76 to 1.00
0.51 to 0.75
0.26 to 0.50
0.01 to 0.25
0.00 to –0.24
–0.25 to –0.49
–0.50 to –0.74
–0.75 to –1.00

Source: Morningstar Direct. Data as of Dec. 31, 2022.

Exhibit A6 Correlation Matrix: 15 Years

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Morningstar US Market	1.00												
2 Bloomberg Commodity	0.52	1.00											
3 CMBI Bitcoin PR	—	—	1.00										
4 LBMA Gold Price PM	0.05	0.36	—	1.00									
5 Morningstar DM xUS GR	0.90	0.61	—	0.13	1.00								
6 Morningstar EM GR	0.77	0.62	—	0.25	0.88	1.00							
7 Morningstar Global Core Bond GR	0.35	0.28	—	0.50	0.47	0.47	1.00						
8 Morningstar US 10+ Yr Treasury Bd	-0.18	-0.28	—	0.27	-0.18	-0.14	0.54	1.00					
9 Morningstar US Cash T-bill	-0.18	-0.10	—	0.09	-0.15	-0.17	0.05	0.08	1.00				
10 Morningstar US Core Bond	0.18	-0.01	—	0.37	0.21	0.24	0.81	0.81	0.05	1.00			
11 Morningstar US High-Yield Bond	0.76	0.54	—	0.16	0.79	0.77	0.43	-0.12	-0.18	0.32	1.00		
12 Morningstar US REIT	0.77	0.38	—	0.09	0.71	0.64	0.41	0.07	-0.09	0.33	0.72	1.00	
13 Morningstar US Small Cap	0.94	0.49	—	0.01	0.84	0.73	0.27	-0.25	-0.17	0.10	0.76	0.77	1.00

- 0.76 to 1.00
- 0.51 to 0.75
- 0.26 to 0.50
- 0.01 to 0.25
- 0.00 to –0.24
- –0.25 to –0.49
- –0.50 to –0.74
- –0.75 to –1.00

Source: Morningstar Direct. Data as of Dec. 31, 2022.

Exhibit A7 Correlation Matrix: 20 Years

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Morningstar US Market	1.00												
2 Bloomberg Commodity	0.46	1.00											
3 CMBI Bitcoin PR	—	—	1.00										
4 LBMA Gold Price PM	0.07	0.39	—	1.00									
5 Morningstar DM xUS GR	0.89	0.58	—	0.18	1.00								
6 Morningstar EM GR	0.74	0.59	—	0.30	0.87	1.00							
7 Morningstar Global Core Bond GR	0.31	0.28	—	0.49	0.45	0.42	1.00						
8 Morningstar US 10+ Yr Treasury Bd	-0.18	-0.23	—	0.23	-0.17	-0.13	0.56	1.00					
9 Morningstar US Cash T-bill	-0.08	0.00	—	0.11	-0.00	0.04	0.08	0.05	1.00				
10 Morningstar US Core Bond	0.14	0.00	—	0.32	0.19	0.20	0.79	0.83	0.08	1.00			
11 Morningstar US High-Yield Bond	0.74	0.48	—	0.15	0.76	0.71	0.40	-0.09	-0.09	0.31	1.00		
12 Morningstar US REIT	0.75	0.32	—	0.12	0.68	0.58	0.38	0.07	-0.04	0.30	0.69	1.00	
13 Morningstar US Small Cap	0.94	0.44	—	0.05	0.83	0.71	0.23	-0.24	-0.09	0.06	0.73	0.75	1.00

- 0.76 to 1.00
- 0.51 to 0.75
- 0.26 to 0.50
- 0.01 to 0.25
- 0.00 to –0.24
- –0.25 to –0.49
- –0.50 to –0.74
- –0.75 to –1.00

Source: Morningstar Direct. Data as of Dec. 31, 2022.

Exhibit A8 Five-Year Correlation Trends vs. Morningstar US Market Index

	2003–2007	2008–2012	2013–2017	2018–2022
Morningstar US Market	1.00	1.00	1.00	1.00
Bloomberg Commodity	0.13	0.61	0.23	0.53
CMBI Bitcoin PR	—	—	0.19	0.37
LBMA Gold Price PM	0.18	0.08	-0.04	0.09
Morningstar DM xUS GR	0.82	0.93	0.79	0.91
Morningstar EM GR	0.66	0.86	0.58	0.75
Morningstar Global Core Bond GR	0.08	0.36	0.09	0.48
Morningstar US 10+ Yr Treasury Bond	-0.14	-0.33	-0.25	0.01
Morningstar US Cash T-bill	-0.01	-0.09	0.13	-0.19
Morningstar US Core Bond	-0.08	0.09	-0.06	0.36
Morningstar US High-Yield Bond	0.55	0.76	0.67	0.85
Morningstar US REIT	0.61	0.84	0.46	0.82
Morningstar US Small Cap	0.92	0.97	0.88	0.94

0.80 to 1.00
0.60 to 0.80
0.40 to 0.60
0.20 to 0.40
0.00 to 0.20
-0.20 to 0.00
-0.40 to -0.20
-0.60 to -0.40
-0.80 to -0.60
-1.00 to -0.80

Source: Morningstar Direct. Data as of Dec. 31, 2022.

Corrections and Clarifications

In a previous version of this paper, Exhibit 17 had the wrong title. The title has been corrected.

About Morningstar Portfolio and Planning Research

Morningstar Portfolio and Planning Research provides independent, fundamental analysis on topics like portfolio construction, retirement planning, personal finance, and investment strategy. The analysis seeks to frame the critical choices that investors face in designing and implementing a financial plan and offers practical solutions covering areas like setting goals, allocating assets, selecting investments, and withdrawing retirement income. The research takes various forms, including articles on Morningstar's flagship research platforms as well as in-depth studies of topics that are particularly relevant to investors seeking to build cohesive portfolios or achieve other financial goals like retirement security.

22 West Washington Street
Chicago, IL 60602 USA