

# The role of infrastructure in a portfolio

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- Investor enthusiasm for infrastructure is rising, buoyed both by its historically strong performance and expectations that infrastructure can contribute unique investment characteristics to a multiasset portfolio.
- We investigate these investment characteristics. We find that infrastructure has historically met some widely held expectations—it offers above-average dividend yields and earnings stability—but fallen short of others. For example, infrastructure hasn't been an especially effective inflation hedge.
- We conclude that an infrastructure overweight may be consistent with some investor goals, but find that those same goals can often be met with investment options that are more broadly diversified by company and industry.

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## I. Background

### Infrastructure

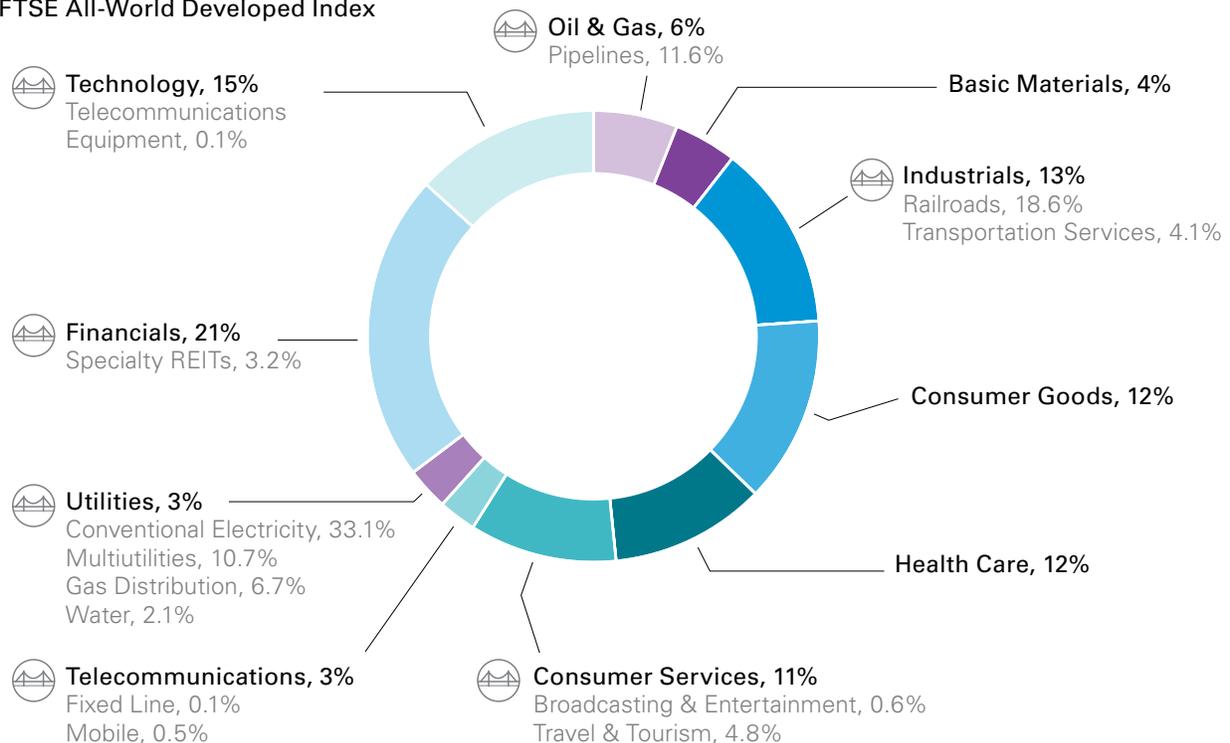
There are numerous ways to access infrastructure investments, and with them come a variety of definitions of what is and isn't included. There are different vehicles available for investors to gain exposure to both public and private infrastructure markets, such as closed- and open-ended funds, special purpose vehicles, mutual funds, and ETFs. Estimates of market size vary—though estimates of the private infrastructure equity market tend to center around \$0.5 trillion globally. A report by McKinsey & Company from 2018 estimates the capitalization of private infrastructure equity was \$0.4 trillion. This is considerably smaller than the value of public infrastructure equity. Using the FTSE Global Core Infrastructure Index, which includes both developed and emerging markets, the market capitalization of the publicly listed infrastructure equity market was \$1.9 trillion at the end of April 2018.

The scope of this paper is limited to a study of the listed infrastructure equity market, because of deficiencies in the data for unlisted infrastructure funds. The definition used to represent listed infrastructure is based on the FTSE Global Developed Core Infrastructure Index. Infrastructure is defined by FTSE Russell as “companies that own, manage or operate structures or networks, which are used for the processing or movement of goods, services, information/data, people, energy and necessities.”

A history of local currency globally listed infrastructure returns from 1990–2017 forms the basis of the analysis.<sup>1</sup> Figure 1 depicts the makeup of the benchmark, which is not a discrete sector in its own right but a collection of subsectors fitting the definition of infrastructure assets.

Figure 1. Infrastructure isn't a single sector

### FTSE All-World Developed Index



Note: Subcategories show the allocation within the FTSE Global Developed Core Infrastructure Index as of August 31, 2018.

Source: FTSE Russell.

<sup>1</sup> The back history of returns incorporates the FTSE Global Developed Core Infrastructure Index total returns from index inception in 2005; the period prior to 2005 has been constructed by applying the index methodology to infrastructure companies using FactSet.

## Industry landscape

In recent years, investor appetite for infrastructure investments has been increasing, with Morningstar data showing that allocations to listed infrastructure within multiasset funds has grown by 400% over the past five years. There are many possible explanations for the increased investor demand, including:

- Low bond yields have caused investors to replace traditional sources of diversification with alternative investments.
- Elevated equity valuations have resulted in a widening of the search for alternative sources of excess return and/or diversification.
- The political discourse has shifted from monetary stimulus to fiscal stimulus, profiling the role that infrastructure can play to boost economic growth, employment, and productivity.

The need for additional infrastructure investment is high, but challenges remain. Estimates vary widely, though the Organisation for Economic Co-operation and Development (OECD) suggests an investment requirement of \$6.3 trillion per year until 2030 to support global growth and development (OECD, 2017). Whether \$6 trillion is the right number or not, there is a huge gap between the current investible universe of infrastructure assets and the future requirement for infrastructure investment. Demand for established assets has been strong—with investors attracted to the added certainty of cash flows from proven projects, enabling a more reliable evaluation of the risks. However, there have been practical constraints to the supply of new infrastructure investment experienced globally, because of:

- Political sensitivities about how best to deploy fiscal spending on infrastructure.
- Short election cycles making it harder to effect the long-term commitments required for investment in new infrastructure projects (known as greenfield developments).
- Structuring arrangements between the government and the private sector to provide the right balance of risk and revenue sharing further impeding private sector investment in greenfield infrastructure.

Putting aside potential mismatches in supply of investment opportunities versus demand from investors, the global discourse on the role of infrastructure exposure in a portfolio has been increasing. We explore the case for infrastructure investing and test the investment merits posed by the investment industry to determine whether the increasing role of infrastructure in portfolios is well placed or misplaced.

## II. Risk characteristics

The past pattern of risk and return provides a clue to the motivation for investors globally who have been embracing the role of infrastructure in portfolios. Returns have run ahead of the broader equity market (Figure 2a), and historical volatility and correlations (Figures 2b, 2c, and 2d) have delivered a risk-reduction benefit. However, anchoring on past returns can lead to disappointment without an understanding of the drivers of return and the potential risks to which infrastructure is susceptible. We compare the characteristics of infrastructure with the broader equity market, as well as other asset types that may be commonly thought of as offering similar attributes. Real Estate Investment Trusts, or REITs, are often thought to fulfill a similar role in the portfolio, providing diversification benefits to multiasset portfolios and higher income yields than equities. Where comparisons to other asset types are made throughout the paper, the context is provided in the relevant section.

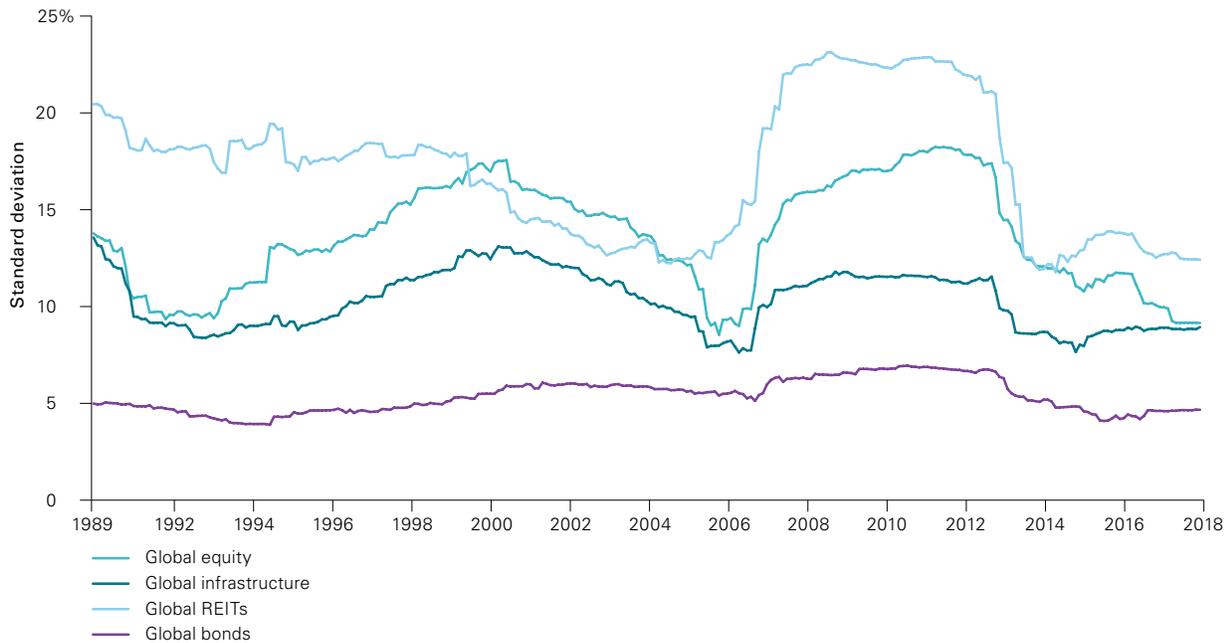
Figure 2a. Cumulative returns—local currency (1990-2017)



Notes: The chart shows the cumulative returns for the period from January 1, 1990, to December 31, 2017. The index returns are local currency total returns. Global equities are represented by the MSCI World Index, global infrastructure is represented by the FTSE Global Developed Core Infrastructure Index, global REITs are represented by the FTSE EPRA/NAREIT Global Developed Index, and global bonds are represented by the Bloomberg Barclays Global Aggregate Index.

Sources: Vanguard calculations, using FactSet data.

Figure 2b. Volatility—rolling five-year annualized standard deviation



Notes: The chart shows the rolling five-year annualized standard deviation for the period from January 1, 1990, to December 31, 2017. Global equities are represented by the MSCI World Index, global infrastructure is represented by the FTSE Global Developed Core Infrastructure Index, global REITs are represented by the FTSE EPRA/NAREIT Global Developed Index, and global bonds are represented by the Bloomberg Barclays Global Aggregate Index.

Sources: Vanguard calculations, using FactSet data.

Figure 2c. Rolling five-year correlation to equities



Notes: The chart shows the rolling five-year correlation for the period from January 1, 1990, to December 31, 2017. Global equities are represented by the MSCI World Index, global infrastructure is represented by the FTSE Global Developed Core Infrastructure Index, and global REITs are represented by the FTSE EPRA/NAREIT Global Developed Index. Sources: Vanguard calculations, using FactSet data.

Figure 2d. Rolling five-year correlation to bonds



Notes: The chart shows the rolling five-year correlation for the period from January 1, 1990, to December 31, 2017. Global bonds are represented by the Bloomberg Barclays Global Aggregate Index, global infrastructure is represented by the FTSE Global Developed Core Infrastructure Index, and global REITs are represented by the FTSE EPRA/NAREIT Global Developed Index. Sources: Vanguard calculations, using FactSet data.

To view a historical illustration of the risk-reduction benefit, **Figure 3** compares the rolling five-year Sharpe ratios of a 60:40 market-cap-weighted global equity/global bond portfolio, with a portfolio that includes a 20% allocation to global listed infrastructure, funded from the global equity allocation. For much of the past three decades, a 20% allocation to infrastructure in a 60:40 equity/bond portfolio would have been additive in terms of excess return per unit of risk, with an average improvement in Sharpe ratio of 17% over the period. An exception was in the mid- to late 1990s, when equity returns materially exceeded those of infrastructure.

### III. Applying a risk factor lens to infrastructure

Looking at infrastructure through a risk factor lens can aid our understanding of the differentiating characteristics that an infrastructure overweight may introduce to a portfolio. **Figure 4** provides the ex-ante exposure to a selection of Barra risk factors for infrastructure, REITs, a minimum volatility index, and a high dividend index, relative to the MSCI World Index.

A comparison of factor exposures highlights infrastructure’s significant underweight to volatility, as expected. Other noteworthy exposures include an

underweight to size and an overweight to financial leverage. The latter is driven by the higher level of debt held by infrastructure companies.

Assessing the merit of including an overweight to infrastructure compared with other exposures requires an understanding of an investor’s goals and which characteristics will best help meet those goals. If the motivation to consider infrastructure is to lower portfolio volatility, factor-based analysis can help assess the merits of an infrastructure overweight compared with other exposures. When it comes to understanding the effect of lower volatility at the portfolio level, correlation with other assets is also critical. This is considered further in Section IV.

Another defining characteristic of infrastructure compared with global equities has been the higher income yield, owing to higher payout ratios for infrastructure securities. For investors with a preference for income, consideration of an infrastructure overweight might be compared against a high dividend exposure or equity income fund. **Figure 5** illustrates the additional income yield from listed infrastructure compared with global equities, and contrasts with an exposure to the MSCI World High Dividend Yield Index. The High Dividend Yield Index has delivered an additional pickup in yield compared with infrastructure.

**Figure 3. Rolling five-year Sharpe ratio**



**Notes:** The chart shows the rolling five-year Sharpe ratio (excess return per unit of risk) for the period from January 1, 1990, to December 31, 2017. Global equities are represented by the MSCI World Index, global infrastructure is represented by the FTSE Global Developed Core Infrastructure Index, and global bonds are represented by the Bloomberg Barclays Global Aggregate Index. The risk-free rate is represented by the Bloomberg Barclays Global Government 10-Year Treasury yield.

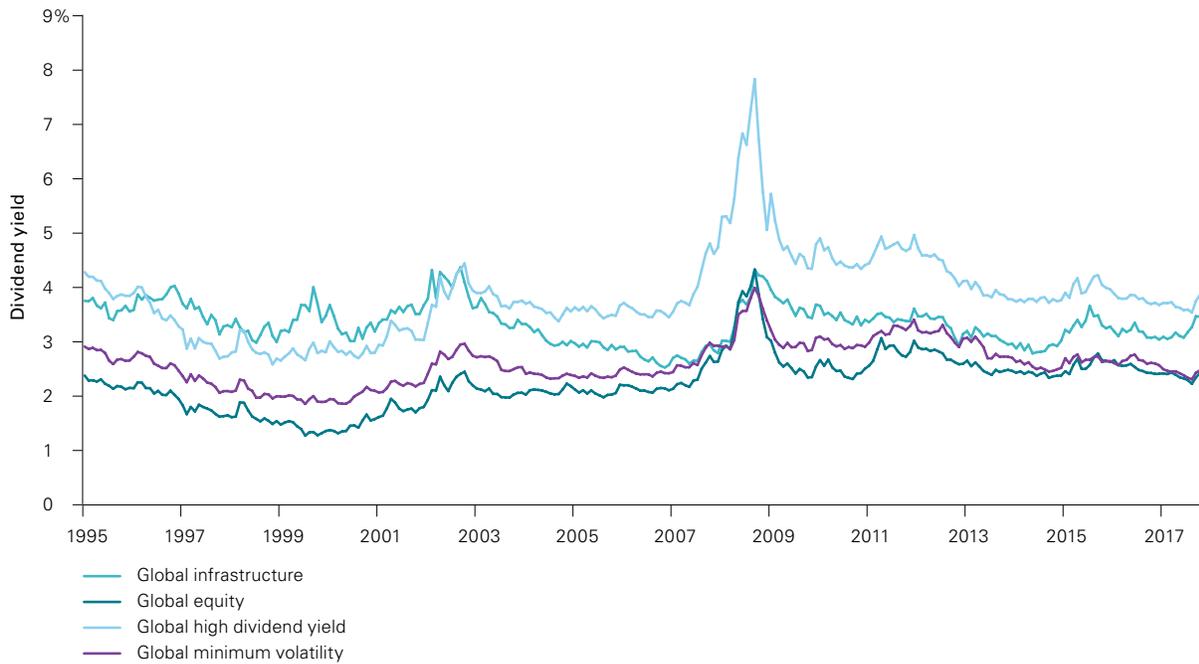
**Sources:** Vanguard calculations, using FactSet data.

Figure 4. Barra Factor exposure (relative to MSCI World Index)



Notes: The chart shows the equity risk factor exposures from the MSCI Barra GEM Long Term model for various indexes relative to the MSCI World Index. Global high dividend is represented by the MSCI World High Dividend Yield Index, global minimum volatility is represented by the MSCI World Minimum Volatility Index, global infrastructure is represented by the FTSE Global Developed Core Infrastructure Index, and global REITs are represented by the FTSE EPRA/NAREIT Global Developed Index. Source: FactSet PA3.

Figure 5. Dividend yields—June 1995 to April 2018



Notes: The chart shows the gross dividend yield for the period from June 30, 1995, to April 30, 2018. Global infrastructure is represented by the FTSE Global Developed Core Infrastructure Index, global equities are represented by the MSCI World Index, global high dividend is represented by the MSCI World High Dividend Yield Index, and global minimum volatility is represented by the MSCI World Minimum Volatility Index. Sources: Vanguard calculations, using FactSet data.

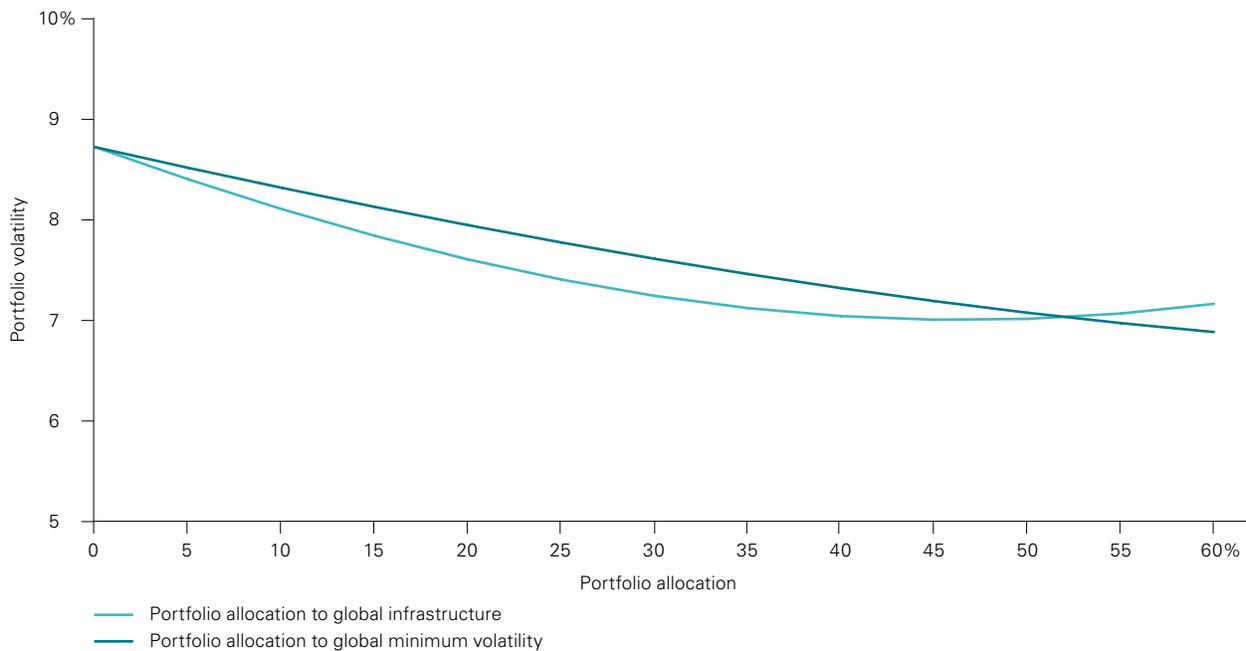
#### IV. Infrastructure's role in a portfolio

The prior sections have illustrated the lower volatility and higher income characteristics of infrastructure compared with global equities, and how infrastructure compares with other alternative exposures that may have similar characteristics, namely global minimum volatility, global high dividend, and REITs. The analysis of factor exposures provides a lens into the defining characteristics of infrastructure. To assess the effect that an overweight to infrastructure would have had on a 60:40 market-cap-weighted global equity/global bond portfolio, **Figure 6a** utilizes a mean-variance approach to demonstrate the historical effect of substituting global equities for either global infrastructure or global minimum volatility, in 5% increments. Both global infrastructure and global minimum volatility would have served as effective diversifiers during the historical period of analysis. Either exposure would have performed a reasonably similar role from a volatility reduction standpoint. However, minimum volatility provides a more diversified exposure, by stocks and sector, than infrastructure.

**Figure 6b** looks at the effect on volatility when substituting global bonds. Not surprisingly for the latter, the addition of either global infrastructure or global minimum volatility in place of bonds would have magnified volatility with even a small incremental increase. Therefore, the funding source is relevant if the investor's aim is volatility reduction.

**Figure 7** illustrates the effect of funding an allocation to infrastructure from a mix of both global equities and global bonds. Again, the analysis doesn't take into account the concentration risk of allocating large exposures to infrastructure, though it illustrates, for example, that the equivalent risk of a 60:40 equity/bond portfolio could have been maintained by funding a 10% allocation to infrastructure from a mix of 5% bonds and 5% equities.

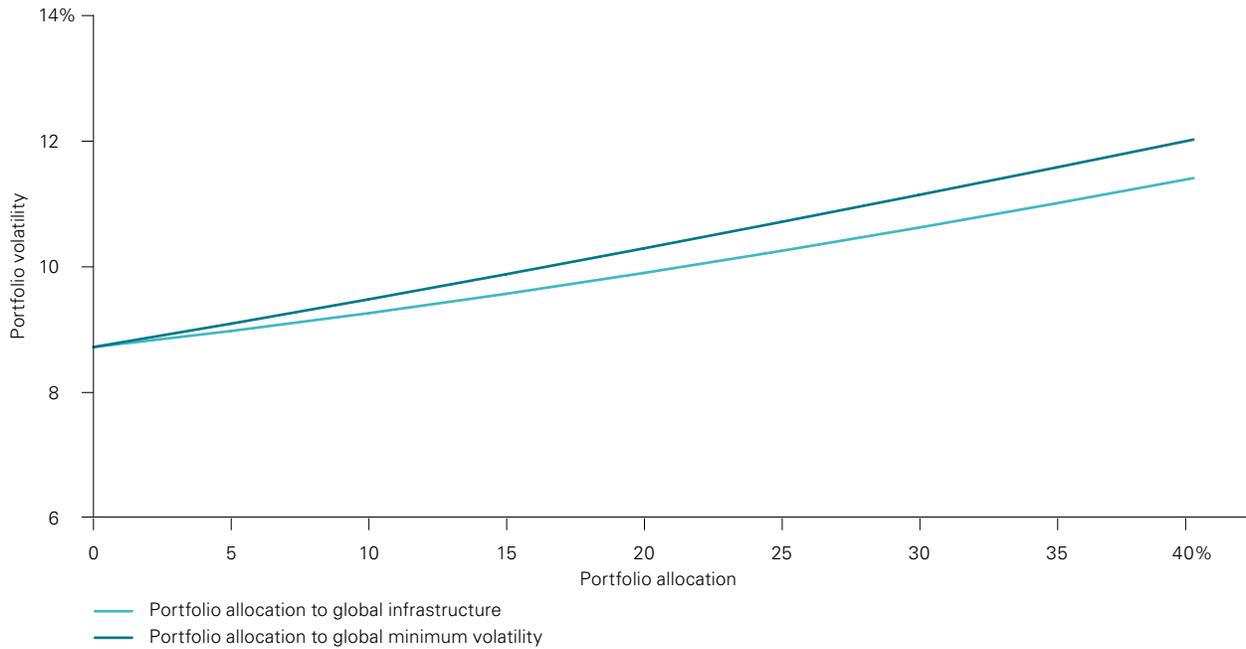
**Figure 6a. Portfolio volatility—substituting global equities with global infrastructure and global minimum volatility within a 60:40 growth/defensive portfolio**



**Notes:** The chart shows the change in portfolio volatility for a 60% global equity and 40% global bond portfolio when substituting global equities for either global infrastructure or global minimum volatility. Mean-variance analysis based on returns, correlations, and volatility from January 1, 1990, to December 31, 2017, has been used to illustrate the effect on portfolio volatility. Global equities are represented by the MSCI World Index, global bonds are represented by the Bloomberg Barclays Global Aggregate Index, global infrastructure is represented by the FTSE Global Developed Core Infrastructure Index, and global minimum volatility is represented by the MSCI World Minimum Volatility Index.

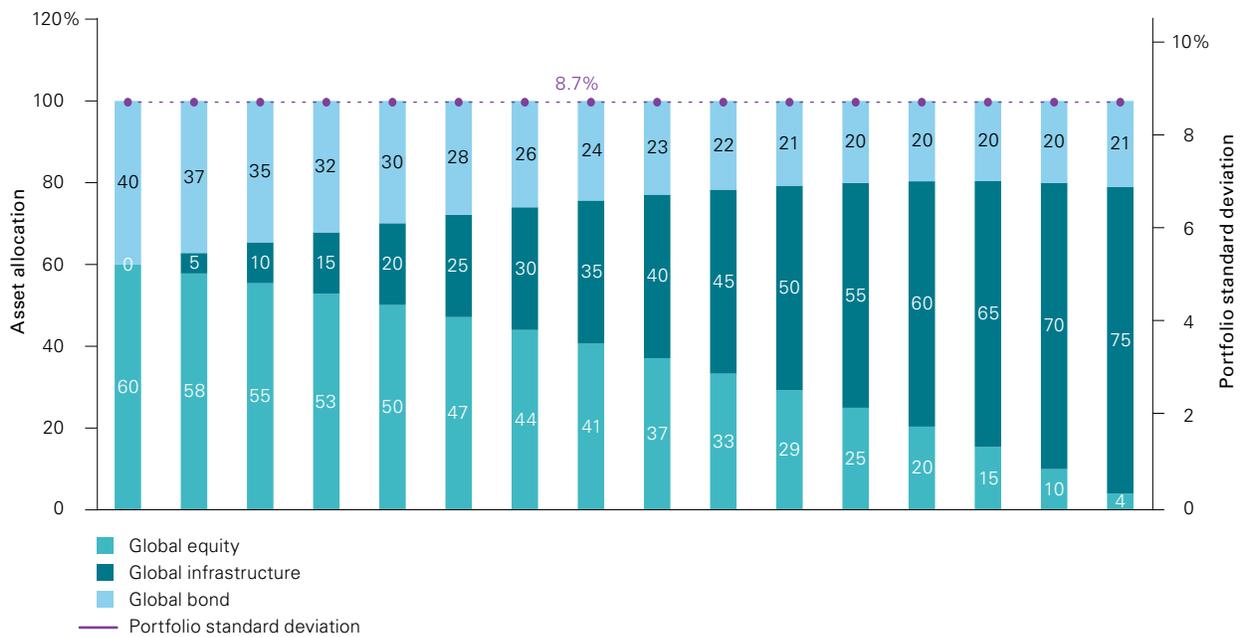
**Sources:** Vanguard calculations, using FactSet data.

**Figure 6b. Portfolio volatility—substituting global bonds with global infrastructure and global minimum volatility within a 60:40 growth/defensive portfolio**



**Notes:** The chart shows the change in portfolio volatility for a 60% global equity and 40% global bond portfolio, when substituting global bonds for either global infrastructure or global minimum volatility. Mean-variance analysis based on returns, correlations, and volatility from January 1, 1990, to December 31, 2017, has been used to illustrate the effect on portfolio volatility. Global equities are represented by the MSCI World Index, global bonds are represented by the Bloomberg Barclays Global Aggregate Index, global infrastructure is represented by the FTSE Global Developed Core Infrastructure Index, and global minimum volatility is represented by the MSCI World Minimum Volatility Index.  
**Sources:** Vanguard calculations, using FactSet data.

**Figure 7. Risk-equivalent asset allocation at different increments of infrastructure exposure**



**Notes:** The chart shows the proportion of global equity and global bonds required to fund incremental gains to global infrastructure while keeping portfolio volatility constant. Mean-variance analysis based on returns, correlations, and volatility from January 1, 1990, to December 31, 2017, has been used to illustrate the effect on portfolio volatility. Global equities are represented by the MSCI World Index, global bonds are represented by the Bloomberg Barclays Global Aggregate Index, global infrastructure is represented by the FTSE Global Developed Core Infrastructure Index, and global minimum volatility is represented by the MSCI World Minimum Volatility Index.  
**Sources:** Vanguard calculations, using FactSet data.

## V. Investigating infrastructure’s investment characteristics

Infrastructure investment managers and investors often refer to the “infrastructure investment narrative” (Blanc-Brude, 2013), in which a set of commonly held beliefs consisted of improved diversification, better liability-hedging, and less volatility than capital market valuations. In addition, much has been written by infrastructure managers on the impact of rising interest rates on infrastructure investments.

Some of the beliefs about infrastructure’s performance characteristics don’t hold up to empirical scrutiny. It’s also possible that infrastructure’s impressive performance over the past 25 years has, in part, been driven by falling interest rates—an environment that can’t persist indefinitely. We examine the following questions

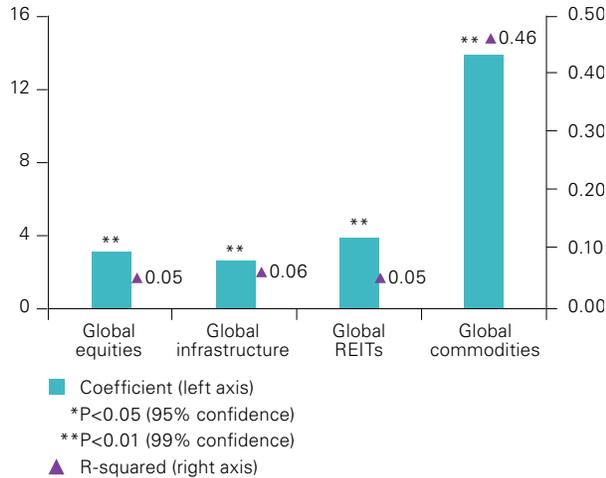
to better understand the investment case for an infrastructure overweight and the risks:

- Is infrastructure an effective inflation hedge for the portfolio?
- Are earnings of infrastructure companies less sensitive to changes in the business cycle?
- What is the sensitivity of infrastructure to changes in interest rates?

### Is infrastructure an effective inflation hedge for the portfolio?

Some proponents of infrastructure investing have claimed superior inflation protection characteristics compared with the broader equity market. The intuition here is appealing—these are monopoly assets with strong pricing power, and in many cases, contractual arrangements with price rises linked to inflation.

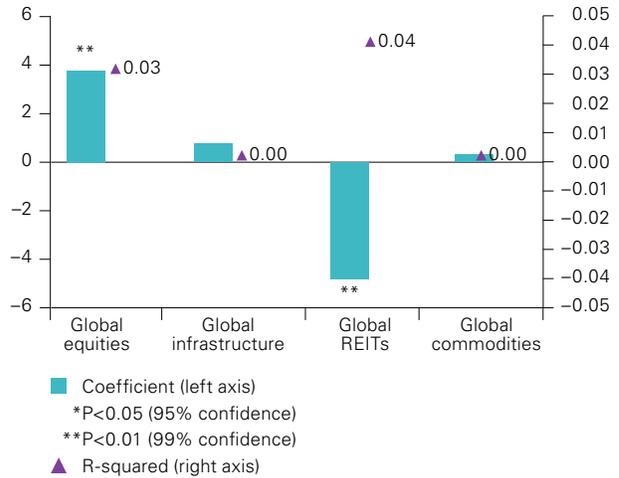
Figure 8a. Year-on-year inflation change and asset returns—statistical significance and R-squared



**Notes:** The chart shows the statistical relationship between the annual change in inflation using a global inflation basket, compared with the annual returns of various asset classes. Regression analysis shows the statistical significance of the relationship by comparing the coefficients to a 95% confidence interval and a 99% confidence interval. The R-squared is represented by the purple triangle. All asset returns are in local currency, to remove the influence of currency fluctuations on the results. Global equities are represented by the MSCI World Index, global infrastructure is represented by the FTSE Global Developed Core Infrastructure Index, global REITs are represented by the FTSE EPRA/NAREIT Global Developed Index, and global commodities are represented by the S&P GSCI.

**Sources:** Vanguard calculations, using FactSet data.

Figure 8b. Inflation rate and asset returns—statistical significance and R-squared



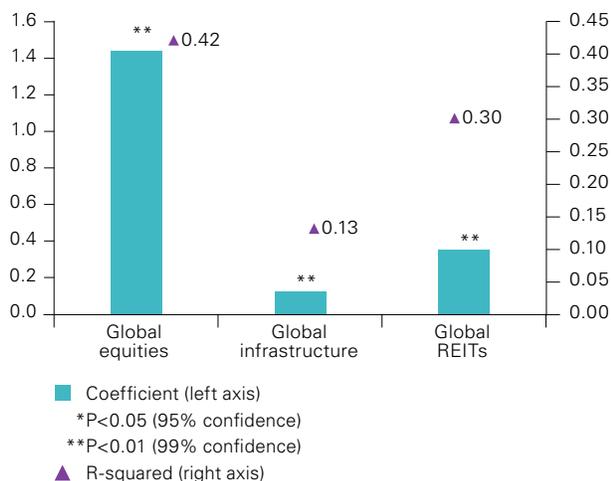
**Notes:** The chart shows the statistical relationship between the level of inflation using a global inflation basket, compared with the annual returns of various asset classes. Regression analysis shows the statistical significance of the relationship by comparing the coefficients to a 95% confidence interval and a 99% confidence interval. The R-squared is represented by the purple triangle. All asset returns are in local currency, to remove the influence of currency fluctuations on the results. Global equities are represented by the MSCI World Index, global infrastructure is represented by the FTSE Global Developed Core Infrastructure Index, global REITs are represented by the FTSE EPRA/NAREIT Global Developed Index, and global commodities are represented by the S&P GSCI.

**Sources:** Vanguard calculations, using FactSet data.

To test this we used regression analysis to compare the relationship between annual returns for various global asset types with the level of inflation, and the rate of change for inflation, using a global inflation basket. Commodities have been included in the analysis as an example of an asset that investors more commonly include as an inflation hedge. **Figures 8a** and **8b** show no material difference between the inflation-hedging benefit of infrastructure when compared with either the broader equity market or REITs. This finding is consistent with a number of empirical studies, including Peng and Newell (2007) and Bitsch, Buchner, and Kaserer (2010), which covered unlisted infrastructure, and Rödel and Rothballer (2012) and Dechant and Finkenzeller (2012), which covered listed infrastructure.

Evident in Figure 8b is a weaker relationship between asset returns and the absolute level of inflation, when compared with the year-on-year change in inflation. Neither global listed infrastructure returns nor commodity returns had a statistically significant relationship with the level of interest rates.

**Figure 9. Business cycle and asset returns—statistical significance and R-squared**



**Notes:** The chart shows the statistical relationship between the global business cycle, proxied using VLEI, compared with the annual returns of various asset classes. Regression analysis shows the statistical significance of the relationship by comparing the coefficients with a 95% confidence interval and a 99% confidence interval. The R-squared is represented by the purple triangle. All asset returns are in local currency, to remove the influence of currency fluctuations on the results. Global equities are represented by the MSCI World Index, global infrastructure is represented by the FTSE Global Developed Core Infrastructure Index, and global REITs are represented by the FTSE EPRA/NAREIT Global Developed Index.

**Sources:** Vanguard calculations, using FactSet data.

### Are earnings of infrastructure companies less sensitive to changes in the business cycle?

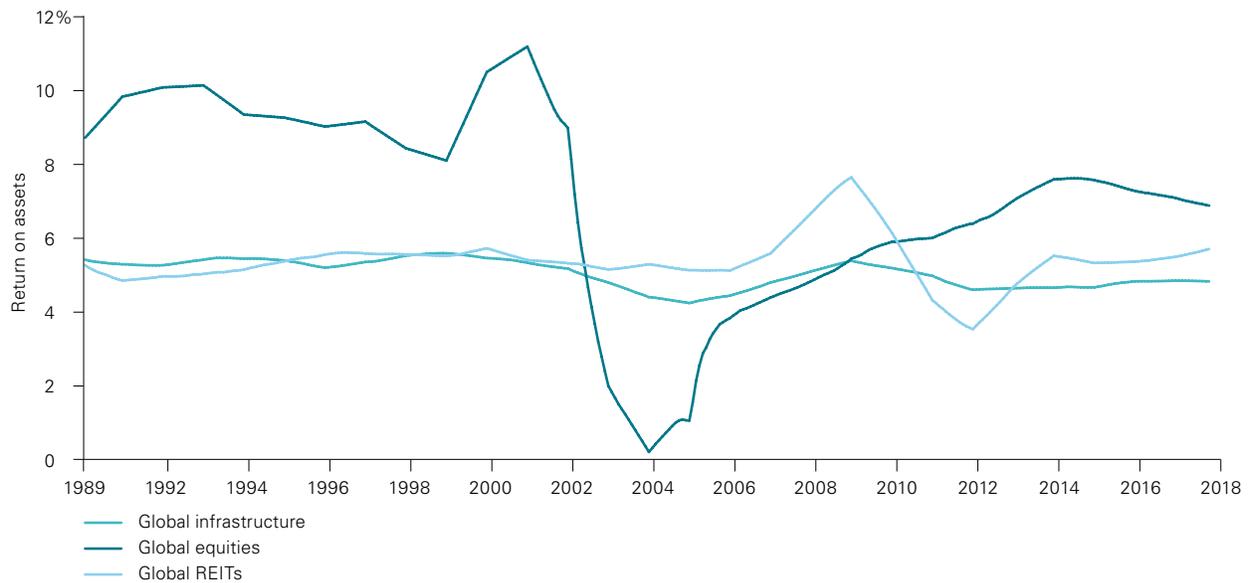
Investors have been attracted to infrastructure for the stability of returns compared with that of the broader equity market, with the contention being that the monopoly position of many infrastructure assets results in lower sensitivity to the business cycle. To test the sensitivity of listed infrastructure to the business cycle, we have used the Vanguard Leading Economic Indicators (VLEI) series, a monthly series going back to the start of our analysis period, as a proxy for the global business cycle. We have compared the sensitivity of infrastructure with that of the broader equity market and REITs, as shown in **Figure 9**.

The analysis shows a statistically significant relationship for all three global asset types. However, the proportion of returns explained by the business cycle, denoted by the R-squared, was much stronger for equities and REITs, compared with that of infrastructure. To test this further, we have bypassed returns and looked at an earnings-based measure using return on assets (ROA). **Figure 10** shows that the ROA of infrastructure has been much less volatile over the measurement period when compared with that of the equity market. Comparing the volatility of ROA for each of the three asset types showed infrastructure to be the lowest (1.7% per annum), followed by REITs (4.0% per annum) and equities (13.0% per annum). The analysis indicates that the sensitivity of listed infrastructure to the business cycle is lower than that of the broader equity market and REITs.

### What is the sensitivity of infrastructure returns to changes in interest rates?

A key question to address when understanding the risks associated with an overweight to infrastructure is whether the favorable historic returns achieved may be related to falling bond yields over the past three decades. Some of the characteristics of infrastructure may result in it having a higher interest rate sensitivity than other asset types, with infrastructure characterized by high levels of financial leverage, stable earnings, and higher yields. This is relevant in the current environment, as interest-rate-sensitive exposures may have disproportionately benefited from the falling bond yields. Looking ahead, this may present an underappreciated risk in an environment of interest rate normalization.

Figure 10. Rolling 3-year average return on assets



Notes: The chart shows the 3-year average return on assets for the period from January 1, 1987, to December 31, 2017. Global infrastructure is represented by the FTSE Global Developed Core Infrastructure Index, global equities are represented by the MSCI World Index, and global REITs are represented by the FTSE EPRA/NAREIT Global Developed Index. Sources: Vanguard calculations, using FactSet data.

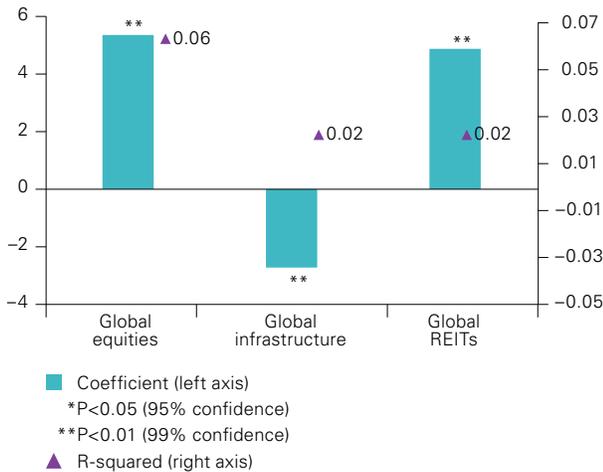
Figures 11a and 11b provide the regression analysis comparing asset returns to the level of bond yields and the year-on-year change in bond yields.

Of note in the regressions is the direction of the relationship which shows an inverse relationship between changes in interest rates and infrastructure returns, whereas rising rates have been mildly positive for equities and REITs. Figure 11b shows that the results are not statistically different from zero. As in the case with the inflation comparison, it is the rate of change, rather than the absolute level of interest rates, that has a more pronounced effect on returns.

In summary, the findings above indicate the following:

- Evidence of infrastructure’s role as a superior inflation hedge hasn’t been borne out in the data.
- There is a statistical relationship between infrastructure and the business cycle, albeit it is considerably more muted than it has been for equities.
- Infrastructure has had a statistically significant inverse relationship with changes in interest rates, indicating a potential vulnerability in the event of a rising rate environment.

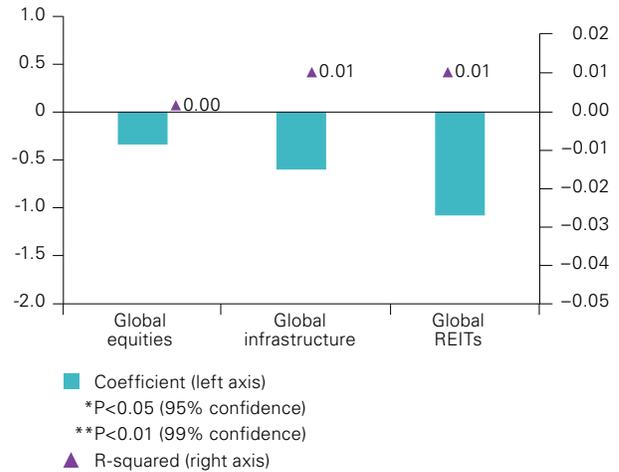
**Figure 11a. Year-on-year interest rate change and asset returns—statistical significance and R-squared**



**Notes:** The chart shows the statistical relationship between the annual change in interest rates represented by the Bloomberg Barclays Global Aggregate Index yield, compared with the annual returns of various asset classes. Regression analysis shows the statistical significance of the relationship by comparing the coefficients to a 95% confidence interval and a 99% confidence interval. The R-squared is represented by the purple triangle. All asset returns are in local currency, to remove the influence of currency fluctuations on the results. Global equities are represented by the MSCI World Index, global infrastructure is represented by the FTSE Global Developed Core Infrastructure Index, and global REITs are represented by the FTSE EPRA/NAREIT Global Developed Index.

**Sources:** Vanguard calculations, using FactSet data.

**Figure 11b. Interest rate level and asset returns—statistical significance and R-squared**



**Notes:** The chart shows the statistical relationship between the level of interest rates represented by the Bloomberg Barclays Global Aggregate Index yield, compared with the annual returns of various asset classes. Regression analysis shows the statistical significance of the relationship by comparing the coefficients to a 95% confidence interval and a 99% confidence interval. The R-squared is represented by the purple triangle. All asset returns are in local currency, to remove the influence of currency fluctuations on the results. Global equities are represented by the MSCI World Index, global infrastructure is represented by the FTSE Global Developed Core Infrastructure Index, and global REITs are represented by the FTSE EPRA/NAREIT Global Developed Index.

**Sources:** Vanguard calculations, using FactSet data.

## VI. Risks of overweighting infrastructure

When it comes to addressing the role of infrastructure in a portfolio, there are two key risks that investors need to consider when overweighting the sector—time period dependence and concentration risk.

**Time period dependence**—As part of the regression analysis, a statistically significant inverse relationship has existed between infrastructure returns and changes in interest rates, as discussed in prior sections. For global equities, a positive relationship has existed between returns and changes in interest rates. The 28-year period of analysis has been characterized by a bull market in bonds, which may have created a tailwind for infrastructure investments, with prospective returns potentially vulnerable in an environment of rising rates.

The returns used in the historical analysis are limited to a time period where interest rates have mostly moved one way, which is a limitation on the investment case that needs to be carefully weighed with the potential benefits.

**Concentration risk**—The concentration risk that comes with an overweight to an individual sector is difficult to capture in analysis that is informed by history. The top ten securities in the FTSE Global Developed Core Infrastructure Index make up 32% of the infrastructure sector. The sector exposures also demonstrate a high degree of industry concentration, with 34% of the infrastructure index made up of conventional electricity companies and 17% in railroads. These two sub-sectors, together with multiutilities, pipelines, and gas distribution, make up 80% of the infrastructure sector.

Concentration risk can present in many ways; for example, solar and wind power generation can put pressure on conventional electricity. In addition, political pressures arising from stretched government balance sheets and low wage growth may reduce the regulated returns that can be generated from certain infrastructure subsectors. For investors seeking to overweight infrastructure, it would be prudent to recognize the presence of concentration risk and limit overweight positions accordingly.

## **VII. Summing up the investment case**

For investors considering an overweight exposure to infrastructure, the historical attributes displayed by the asset class are appealing: excess returns when compared with global equities, lower volatility, and a correlation benefit. The relative stability of earnings, illustrated by very low volatility of ROA, appears to validate the lower observed volatility of infrastructure.

To determine the merits of an overweight exposure to infrastructure, it is critical to reframe the portfolio goal or objective that infrastructure may help to achieve. For many investors seeking exposure to a well-diversified, low-cost and risk-efficient portfolio, a global market-cap exposure to equities and bonds may best meet their needs. Investors that have reframed the investment objective to achieve a higher-than-market income yield or to lower portfolio volatility without compromising the growth/defensive asset mix might consider an overweight to infrastructure. To determine the appropriateness of infrastructure to achieve the investor's goal, the

alternatives also need to be considered. The analysis contained in Section III compared the volatility reduction benefit of infrastructure with a minimum volatility index, and the yield premium of infrastructure with a high dividend index. For investors with unique goals that may be met through an overweight to infrastructure, the potential to emphasize similar characteristics through more diversified allocations, such as factor exposures or a high dividend exposure, may also be considered. Either exposure carries risks. Ultimately, it is essential that the potential benefits of an infrastructure overweight are weighed against the concentration risks that an overweight position introduces.

## **VIII. Conclusion**

Our analysis suggests that an infrastructure overweight has enhanced a portfolio's risk-adjusted returns. However, some beliefs about infrastructure's investment merits are misguided. Rather than a superior inflation hedge, for example, infrastructure has been less effective than commodities, and no more effective than REITs and even equities. Infrastructure has displayed characteristics that may be attractive to investors, such as lower volatility and higher income yields—the benefits of which need to be weighed against the concentration risk that comes with an overweight allocation to infrastructure. For some, targeting factor exposures that offer similar characteristics to infrastructure with less sector concentration risk may be a preferable strategy for meeting investment goals.

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**Investments in bonds are subject to interest rate, credit, and inflation risk.**

**Investments in stocks or bonds issued by non-U.S. companies are subject to risks including country/regional risk and currency risk.**

**Funds that concentrate on a relatively narrow market sector face the risk of higher share-price volatility.**

**All investing is subject to risk, including the possible loss of the money you invest. Diversification does not ensure a profit or protect against a loss.**



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