S&P Dow Jones Indices

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RESEARCH
Real Assets

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# Approaches to Benchmarking Listed Infrastructure

Investing in infrastructure has become popular among institutional and private investors in recent years. Investors could be attracted to the potentially long-term, low-risk, and inflation-linked profile that can come with infrastructure assets, and they may believe that it is an alternative asset class that could provide new sources of return and diversification of risk.

## WHY CONSIDER INVESTING IN INFRASTRUCTURE?

Infrastructure assets provide essential services that are necessary for populations and economies to function, prosper, and grow. They include a variety of assets divided into five general sectors: transport (e.g., toll roads, airports, seaports, and rail); energy (e.g., gas and electricity transmission, distribution, and generation); water (e.g., pipelines and treatment plants); communications (e.g., broadcast, satellite, and cable); and social (e.g., hospitals, schools, and prisons). Infrastructure assets operate in an environment of limited competition as a result of natural monopolies, government regulations, or concessions. The stylized economic characteristics of this asset class include the following.

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- **Relatively steady cash flows with a strong yield component:** Infrastructure assets are generally long lived. Most companies have long-term regulatory contracts or concessions to operate the assets, which can provide a predictable return over time. As a result, infrastructure assets have the potential to generate consistent, stable cash flow streams, usually with lower volatility than other traditional asset classes.
- **High barriers to entry:** Due to significant economies of scale, infrastructure assets are often regulated in such a way that discourages competition. The high barriers to entry often result in a monopoly for existing owners and operators.
- **Inflation protection:** Revenues from infrastructure assets are typically linked to inflation and are often supported by regulation. In certain instances, revenue increases linked to inflation are embedded in concession agreements, licenses, and regulatory frameworks. In other cases, owners of infrastructure assets are able to pass inflation on to consumers via price increases, due to the essential nature of the assets and their inelastic demand.

Consequently, the infrastructure asset class may provide investors with a degree of protection from the business and economic cycles, as well as attractive income yields and inflation hedge. It could be expected to offer long-term, low-risk, non-correlated, inflation-protected, and acyclical returns.

It is also generally believed that infrastructure is, as an asset class, poised for strong growth. As the global population continues to expand and standards of living around the world become higher, there is a vast demand for improved infrastructure. This demand includes the refurbishment and replacement of existing infrastructure worldwide and new infrastructure development in emerging markets.

Financing public infrastructure has traditionally been the responsibility of the state. However, fiscally constrained governments are increasingly turning to the private sector to provide funding for new projects. As a result, the investment opportunities in this sector continue to grow.

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## DIRECT AND INDIRECT EXPOSURE TO INFRASTRUCTURE

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**Direct exposure** is gained through private markets in which investors own the companies that build or operate the infrastructure assets, like toll roads, airports, etc. The most important benefit of investing through these vehicles is that market participants obtain the direct exposure they are looking for and all of the benefits that come with owning the infrastructure itself.

On the other hand, infrastructure assets are often highly regulated, so this type of investment can have more concentrated regulatory risk. It also often involves significant leverage, along with the risks that are bundled with it. The other potential downside is that these assets are illiquid, so there is no price transparency on an ongoing basis. Market participants would typically have to invest in the asset class for the long term, as there are no liquid secondary markets in which their investments could be quickly traded.

**Indirect investment** can be achieved through publicly listed companies whose business is directly related to infrastructure assets.

The primary advantage of listed infrastructure vehicles is that they are traded on an exchange. The size of the listed market is large—the total market capitalization of the universe of “pure-play” infrastructure companies, from which the Dow Jones Brookfield Global Infrastructure Index is constructed, was USD 1.85 trillion as of Dec. 31, 2014. Listed companies also provide access to unique assets that might only be available in public markets. Daily price transparency and relative liquidity, which are characteristics of listed companies, are important to many market

participants. Listed firms also have extensive financial reporting requirements that are regulated by the various stock exchanges.

The primary disadvantage of this type of investment is that publicly traded stocks that make up the listed infrastructure vehicle may already be part of the investor's equity portfolio. Another negative aspect of this type of infrastructure investment is that infrastructure assets are sometimes just one piece of a larger conglomerate's operations, particularly on a global basis.

## BENCHMARKING PUBLICLY LISTED INFRASTRUCTURE SECURITIES

A number of new infrastructure indices (capturing only publicly listed infrastructure securities) have emerged since the mid-2000s. Most indices take one of two construction approaches: either applying a market-cap-weighting methodology to infrastructure sectors (in which case, utilities will always dominate the index) or imposing hard caps on these sectors. In order to identify effectively companies with the pure-play characteristics previously outlined, it is necessary to dig into financials and identify what percentage of earnings comes from competitively exposed versus regulated lines of business.

A number of new infrastructure indices have emerged since the mid-2000s.

Managers in infrastructure investment may consider different benchmarks depending on their own definition of the investment universe. Some managers favor pure-play infrastructure sectors, considering only stocks with the stable cash flow patterns and low correlations to broader equities for portfolio inclusion. Other managers operate under a less-constrained definition of the space, with a thematic view of what constitutes infrastructure. Such portfolios may include infrastructure-related companies such as shipping, diversified communications, power generation, etc.

S&P Dow Jones Indices has been a leader in benchmarking the publicly listed infrastructure market. Two distinct approaches are provided to the different types of managers for benchmarking. The Dow Jones Brookfield Global Infrastructure Indices use a pure-play approach. Companies that obtain a majority (70% or higher) of their cash flows from owning and operating infrastructure assets are selected for the indices. On the other hand, the S&P Global Infrastructure Index Series uses a broad-based approach. Companies from infrastructure-related sectors, industries, and subindustries, as defined by the Global Industry Classification Standard (GICS®), are selected for the indices. Both series of indices could be appropriate for market participants seeking diversified, globally listed infrastructure exposure. Exhibit 1 shows a detailed comparison of the methodologies of two examples from the index series mentioned above. Exhibit 2 shows the sector weights of the two indices, the Dow Jones

S&P Dow Jones Indices has been a leader in benchmarking the publicly listed infrastructure market.

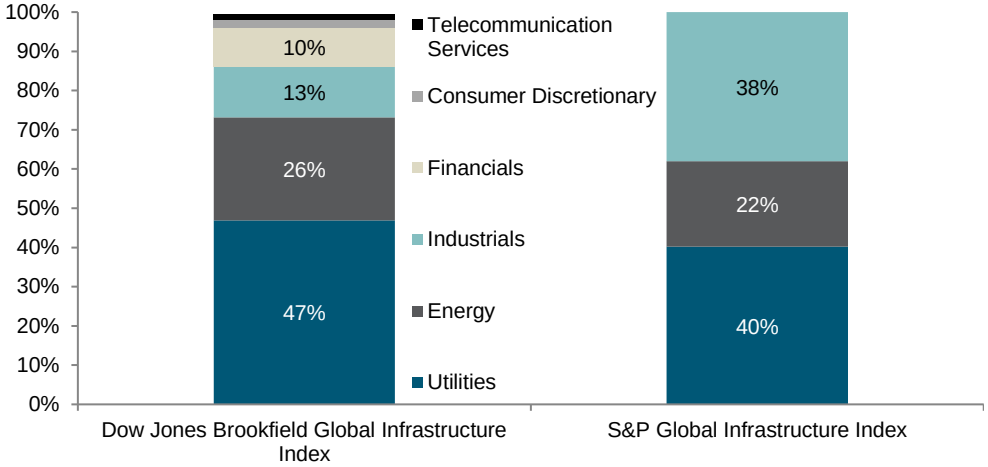
Brookfield Global Infrastructure Index and the S&P Global Infrastructure Index, as of June 30, 2016.

**Exhibit 1: Methodology Comparison**

| CATEGORY | DOW JONES BROOKFIELD GLOBAL INFRASTRUCTURE INDEX | S&P GLOBAL INFRASTRUCTURE INDEX | |
|---|---|---|---|
| Summary | Developed through a partnership with Brookfield, a leader in the infrastructure space, this index relies on a pure-play approach. Cash flows of companies are evaluated to make sure that the primary driver of revenues for those companies comes from owning and operating infrastructure assets. | Relying on a transparent, rules-based methodology that relies on the GICS classification system, this index seeks to provide a more broad-based exposure to infrastructure that includes access to pure-play infrastructure and infrastructure service companies. | |
| Index Universe | Maintained collaboratively by S&P Dow Jones Indices and Brookfield Asset Management | Three infrastructure clusters (combination of GICS industries) from the S&P Global BMI | |
| Sectors | Airports | Energy | Oil & gas storage & transportation |
| | Toll roads | Transportation | Airport services |
| | Ports | | Highways & railtracks |
| | Communications | | Marine ports & services |
| | Electrical transmission and distribution | Utilities | Electric utilities |
| | Oil & gas storage & transportation | | Gas utilities |
| | Water | | Multi-utilities |
| | Diversified (multiple sectors) | | Water utilities |
| | | | Independent power producers & energy traders |
| | | | Renewable electricity |
| Size | Minimum float-adjusted market cap: USD 500 million | Minimum total market cap: USD 250 million<br>Minimum float-adjusted market cap: USD 100 million | |
| Liquidity | Thresholds of 3-month average daily value traded:<br>USD 1 million | Thresholds of 3-month average daily value traded:<br>USD 1 million for developed markets.<br>USD 500,000 for emerging markets | |
| Listing | Have a developed market listing | Have a developed market listing | |
| Diversification | Individual stock weights are capped at 10%<br>Country weights are capped at 50%<br>Industry weights are capped at 50% | Individual stock weights are capped at 5%<br>15 stocks from emerging markets and 60 from developed markets<br>The target number of stocks from the energy cluster is 15, with the total weight capped at 20%; 30 stocks each from the transportation and utilities clusters, with the total weight capped at 40% each. | |
| Number of Constituents | Variable; 100 stocks as of June 30, 2016 | 75 stocks | |
| Rebalanced | Quarterly in March, June, September, and December | Semiannually in March and September | |
| Launch Date | July 14, 2008 | Feb. 22, 2007 | |

Source: S&P Dow Jones Indices LLC. Table is provided for illustrative purposes.

**Exhibit 2: Sector Weights of the Dow Jones Brookfield Global Infrastructure Index and the S&P Global Infrastructure Index**




Source: S&P Dow Jones Indices LLC. Data as of June 30, 2016. Chart is provided for illustrative purposes.

Several other indices are offered by competitors (UBS, MSCI, Macquarie, and FTSE) in this space—the UBS Global 50/50 Infrastructure & Utilities Net of Tax Index (which has retired), the MSCI ACWI Infrastructure Index, the Macquarie Global Infrastructure 100 Index, and the FTSE Global Core Infrastructure 50/50 Index. All of them rely on a broad-based approach that is similar to the S&P Global Infrastructure Index (see Exhibit 3).

The risk/return profile of the Dow Jones Brookfield Global Infrastructure Index is differentiated from that of an index taking a broad-based approach.

**Exhibit 3: Comparison of Methodologies (High Level)**

| CATEGORY | DOW JONES BROOKFIELD GLOBAL INFRA-STRUCTURE INDEX | S&P GLOBAL INFRA-STRUCTURE INDEX | MSCI ACWI INFRA-STRUCTURE INDEX | MACQUARIE GLOBAL INFRA-STRUCTURE INDEX 100 INDEX | FTSE GLOBAL CORE INFRA-STRUCTURE 50/50 INDEX |
|---|---|---|---|---|---|
| Components | 100 | 75 | 267 | 100 | 229 |
| Selection Process | Driven by cash flow from infrastructure-related operations (has to be greater than 70%). | Based on GICS (combination of GICS sectors). Clusters include energy (20%), transportation (40%), and utilities (40%). | Based on GICS (combination of GICS sectors). Categorized into five infrastructure clusters, including telecommunication services, utilities, energy, transportation, and social. | Driven by revenue analysis done by Macquarie (revenues from infrastructure operations must be greater than 50%). | Based on ICB (combination of ICB subsectors). Clusters include utilities (50%), transportation (30%), and others (20%). |
| Review | Quarterly | Semiannually | Quarterly | Semiannually | Semiannually |

Source: S&P Dow Jones Indices LLC, MSCI, Macquarie, FTSE. Components as of June 30, 2016. Table is provided for illustrative purposes.

The risk/return profile of the Dow Jones Brookfield Global Infrastructure Index, which takes a pure-play approach, is differentiated from that of an index taking a broad-based approach (as seen in Exhibit 4). The Dow Jones Brookfield Global Infrastructure Index has shown the highest returns over the past 5-, 7-, and 10-year periods (7- and 10-year comparisons do not include the FTSE Global Core Infrastructure 50/50, which has a shorter

history). The index has an annualized return of 9.1% over the past 10 years, outperforming the S&P Global BMI by 4.5% and all other infrastructure indices here studied by more than 3.7% per year.

The Dow Jones Brookfield Global Infrastructure Index outperformed the S&P Global BMI and all other infrastructure indices here studied over the past 10 years.

**Exhibit 4: Historical Risk/Return Profile of Listed Infrastructure Equity Indices**

| TIME PERIOD | S&P GLOBAL BMI | DOW JONES BROOKFIELD GLOBAL INFRA-STRUCTURE INDEX | S&P GLOBAL INFRA-STRUCTURE INDEX | MSCI ACWI INFRA-STRUCTURE INDEX | MACQUARIE GLOBAL INFRA-STRUCTURE 100 INDEX | FTSE GLOBAL INFRA-STRUCTURE 50/50 INDEX |
|---|---|---|---|---|---|---|
| **ANNUALIZED RETURNS (%)** | | | | | | |
| 1-Year | -3.98 | 3.22 | 2.80 | 4.37 | 9.02 | 7.19 |
| 3-Year | 6.11 | 8.45 | 7.78 | 6.91 | 7.25 | 8.15 |
| 5-Year | 5.38 | 9.61 | 5.27 | 5.05 | 4.85 | 9.01 |
| 7-Year | 9.85 | 14.08 | 8.63 | 7.64 | 6.62 | - |
| 10-Year | 4.49 | 9.12 | 5.00 | 5.39 | 4.17 | - |
| **ANNUALIZED VOLATILITY (%)** | | | | | | |
| 3-Year | 11.80 | 11.48 | 11.23 | 10.42 | 10.94 | 10.30 |
| 5-Year | 13.70 | 10.93 | 11.92 | 10.84 | 10.89 | 10.37 |
| 7-Year | 14.53 | 12.01 | 13.27 | 11.65 | 11.91 | - |
| 10-Year | 17.30 | 14.05 | 16.39 | 13.80 | 14.05 | - |
| **RETURN/VOLATILITY** | | | | | | |
| 3-Year | 0.52 | 0.74 | 0.69 | 0.66 | 0.66 | 0.79 |
| 5-Year | 0.39 | 0.88 | 0.44 | 0.47 | 0.44 | 0.87 |
| 7-Year | 0.68 | 1.17 | 0.65 | 0.66 | 0.56 | - |
| 10-Year | 0.26 | 0.65 | 0.30 | 0.39 | 0.30 | - |
| **MAXIMUM DRAWDOWN (%)** | | | | | | |
| 5-Year | -18.04 | -17.05 | -15.72 | -12.04 | -14.22 | -9.98 |
| 10-Year | -55.44 | -45.23 | -53.21 | -44.30 | -43.65 | - |
| **RETURN/MAXIMUM DRAWDOWN** | | | | | | |
| 10-Year | 0.08 | 0.20 | 0.09 | 0.12 | 0.10 | - |
| **CORRELATION WITH THE S&P GLOBAL BMI** | | | | | | |
| 3-Year | - | 0.77 | 0.81 | 0.83 | 0.65 | 0.75 |
| 5-Year | - | 0.75 | 0.85 | 0.80 | 0.66 | 0.77 |
| 7-Year | - | 0.80 | 0.88 | 0.84 | 0.74 | - |
| 10-Year | - | 0.87 | 0.93 | 0.88 | 0.82 | - |
| **BETA TO THE S&P GLOBAL BMI** | | | | | | |
| 3-Year | - | 0.75 | 0.77 | 0.73 | 0.60 | 0.65 |
| 5-Year | - | 0.60 | 0.74 | 0.63 | 0.53 | 0.58 |
| 7-Year | - | 0.66 | 0.81 | 0.68 | 0.61 | - |
| 10-Year | - | 0.71 | 0.88 | 0.70 | 0.67 | - |

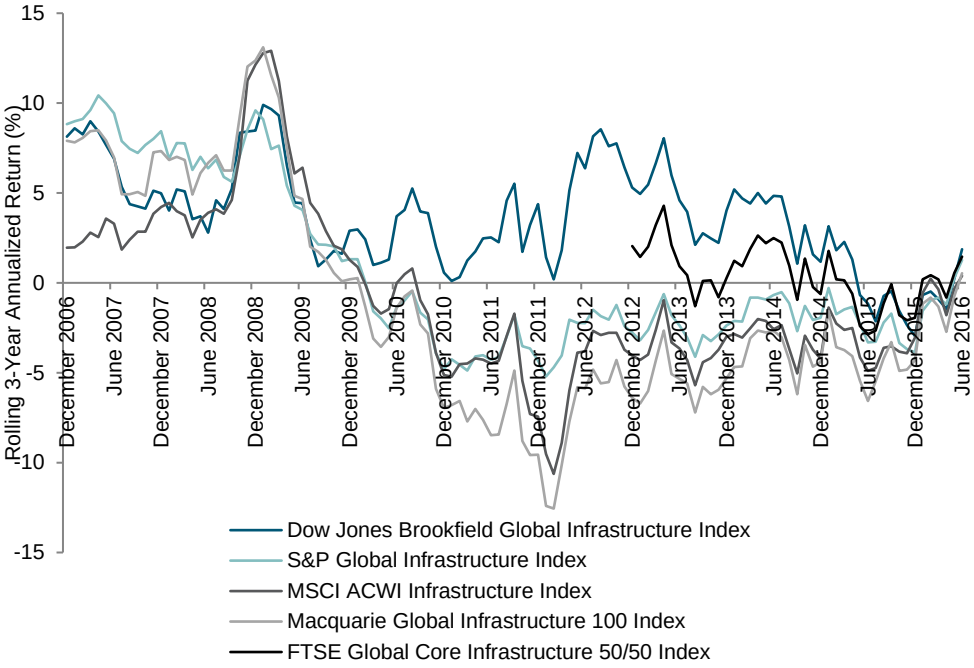
Source: S&P Dow Jones Indices LLC, MSCI, Macquarie FTSE. Data from June 30, 2006, to June 30, 2016. Index performance is based on net total return in USD. Past performance is no guarantee of future results. It is not possible to invest directly in an index, and index returns do not reflect expenses an investor would pay. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

The Dow Jones Brookfield Global Infrastructure Index has shown continuous, significant positive returns in excess of the S&P Global BMI.

In terms of downside protection and diversification benefits, the Dow Jones Brookfield Global Infrastructure Index, the MSCI ACWI Infrastructure Index, and the Macquarie Global Infrastructure 100 Index show the best statistics over the 10-year period. For these indices, the maximum drawdowns are cut from 55% for the S&P Global BMI to below 46%; betas against the S&P Global BMI are below 0.9 over the past 10 years. On a rolling three-year basis, the Dow Jones Brookfield Global Infrastructure Index has shown continuous, significant positive returns in excess of the S&P Global BMI; while the other infrastructure indices have experienced diminished outperformance since the global financial crisis in 2008 and 2009 (see Exhibit 5). On a rolling three-year basis, the Dow Jones Brookfield Global Infrastructure Index underperformed the S&P Global BMI from May 2015 to April 2016, with a prolonged period of oil crisis in the background.

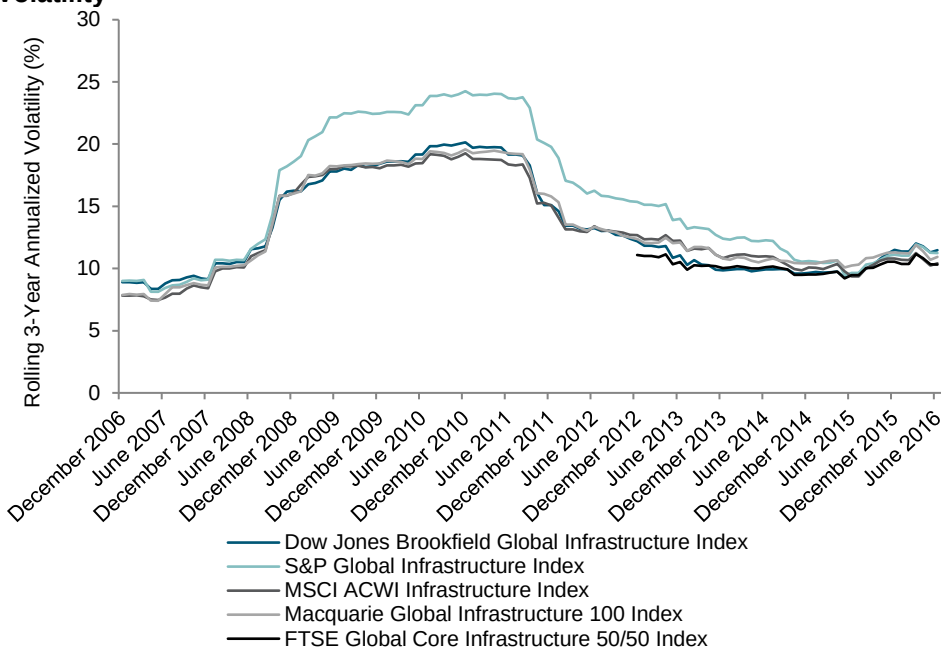
In terms of volatility and correlation, the S&P Global Infrastructure Index is on the high side of the spectrum (see Exhibits 6 and 7). This is consistent with the index's construction idea. Of note is that volatility and correlation have increased dramatically since 2008. This phenomenon has been observed among all asset classes, making it extremely challenging for market participants to construct a diversified portfolio during crisis periods. Fortunately, we have seen volatility and correlation coming down since the end of 2011.

**Exhibit 5: Listed Infrastructure Equity Indices: Rolling 3-Year Annualized Return in Excess of the S&P Global BMI**




Source: S&P Dow Jones Indices LLC, MSCI, Macquarie, FTSE. Data from Dec. 31, 2003, to June 30, 2016. Index performance based on net total return in USD. Past performance is no guarantee of future results. It is not possible to invest directly in an index, and index returns do not reflect expenses an investor would pay. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

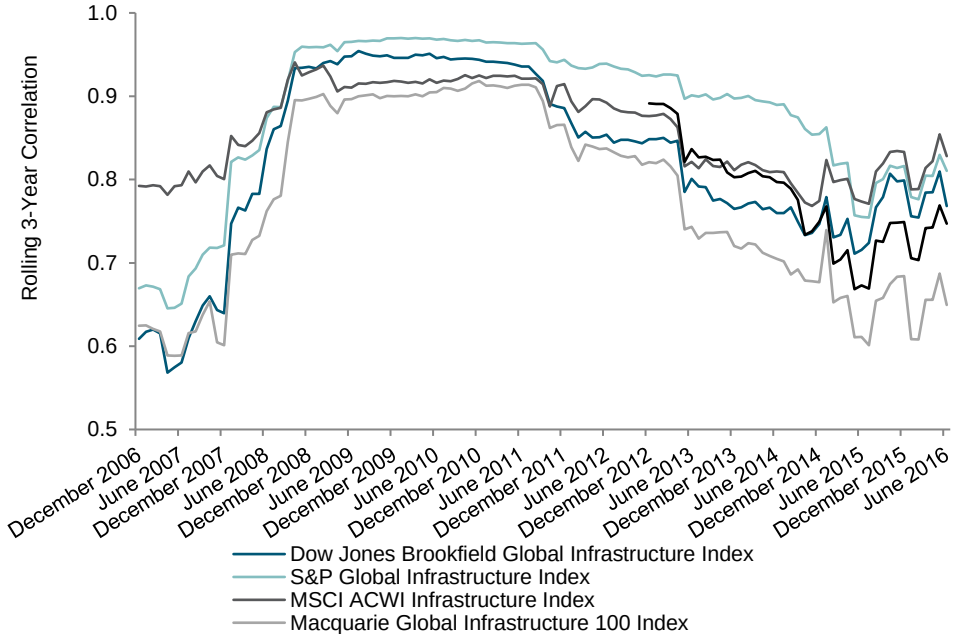
**Exhibit 6: Listed Infrastructure Equity Indices: Rolling 3-Year Annualized Volatility**




Source: S&P Dow Jones Indices LLC, MSCI, Macquarie, FTSE. Data from Dec. 31, 2003, to June 30, 2016. Index performance based on net total return in USD. Past performance is no guarantee of future results. It is not possible to invest directly in an index, and index returns do not reflect expenses an investor would pay. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

In terms of volatility and correlation, the S&P Global Infrastructure Index is on the high side of the spectrum.

**Exhibit 7: Listed Infrastructure Equity Indices: Rolling 3-Year Correlation With the S&P Global BMI**



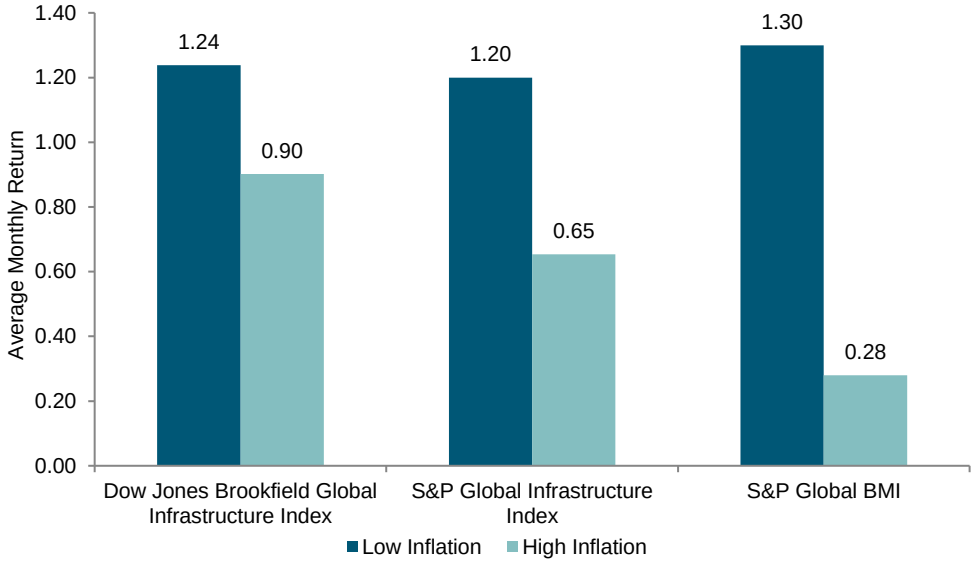

Source: S&P Dow Jones Indices LLC, MSCI, Macquarie, FTSE. Data from Dec. 31, 2003, to June 30, 2016. Index performance based on net total return in USD. Past performance is no guarantee of future results. It is not possible to invest directly in an index, and index returns do not reflect expenses an investor would pay. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

## Inflation Hedge

One of the potential benefits of investing in infrastructure is the historical inflation hedge that it has provided.

One of the potential benefits of investing in infrastructure is the historical inflation hedge that it has provided. To illustrate this, we studied the relationship between the indices' monthly returns and inflation rates[1] compared with the broad market benchmark. Exhibit 8 shows that over the past 13.5 years (from Dec. 31, 2002, to Apr. 29, 2016), the Dow Jones Brookfield Global Infrastructure Index and the S&P Global Infrastructure Index have outperformed the S&P Global BMI by a monthly average of 62 bps and 37 bps, respectively, in high-inflation months. These two indices have slightly underperformed the S&P Global BMI in low-inflation months.

**Exhibit 8: Average Monthly Return of the Dow Jones Brookfield Global Infrastructure Index and the S&P Global Infrastructure Index Versus the S&P Global BMI During Different Inflation Periods**




Source: S&P Dow Jones Indices LLC, OECD. Data from Dec. 31, 2002, to Apr. 29, 2016. Index performance based on net total return. Past performance is no guarantee of future results. It is not possible to invest directly in an index, and index returns do not reflect expenses a market participant would pay. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

## Listed Infrastructure and Oil Prices

The impact of oil prices on companies owning or operating infrastructure assets is not trivial. First, there is generally low exposure to oil prices, as companies that typically own or operate these assets tend to have stable cash flows backed by long-term contracts that are sometimes regulation enabled. It also helps that most of these assets are monopolistic in nature.

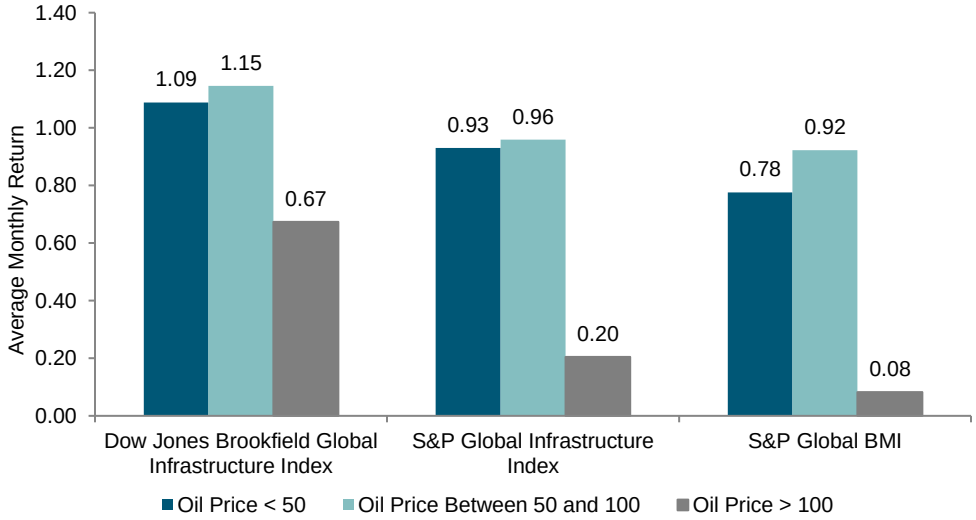
[1] Inflation was measured by year-over-year changes in the U.S. Consumer Price Index (Harmonized Index of Consumer Prices: All Items for United States, Source: Eurostat). The median of inflation was calculated from January 2003 to April 2016. Months when inflation was greater than median inflation were considered to be high inflation, and vice versa. This analysis was performed from the hypothetical point of view of investors based in the U.S. or having exposure to U.S. inflation in their portfolios.

The sensitivity to oil prices varies from company to company, depending on whether they are net oil consumers or oil producers.

Second, there is no linear relationship between oil prices and performance of listed infrastructure. Exhibit 9 shows that from Dec. 31, 2002, to June 30, 2016, the Dow Jones Brookfield Global Infrastructure Index and the S&P Global Infrastructure Index outperformed the S&P Global BMI regardless of oil prices. When oil prices were high (above USD 100 per barrel), the monthly outperformance was 59 bps and 12 bps on average, respectively. When oil prices were low (below USD 50 per barrel), the monthly outperformance was 31 bps and 15 bps on average, respectively. When oil prices were moderate (between USD 50 and USD 100 per barrel), the monthly outperformance was 22 bps and 4 bps on average, respectively. It seems that low oil prices may not be a bad thing for listed infrastructure.

Third, the sensitivity to oil prices varies from company to company, depending on whether they are net oil consumers or oil producers. Exhibit 10 shows the average monthly return of the Dow Jones Brookfield Global Infrastructure Sector Indices at different oil prices from Dec. 31, 2002, to June 30, 2016. Oil & gas storage & transportation seemed to be the infrastructure subsector most negatively affected by low oil prices. Other sectors, except water, seemed to benefit from low oil prices.

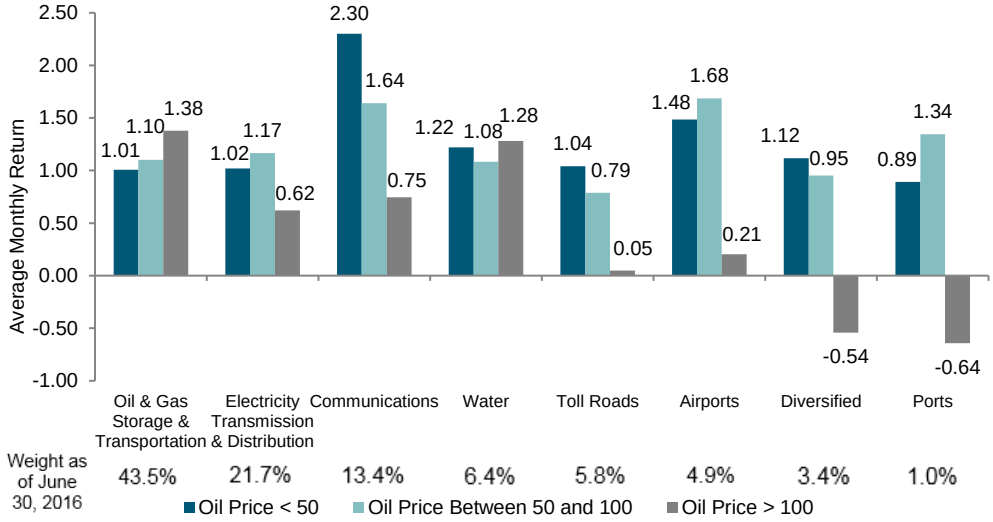
**Exhibit 9: Average Monthly Return of the Dow Jones Brookfield Global Infrastructure Index and the S&P Global Infrastructure Index Versus the S&P Global BMI at Different Oil Prices**




Source: S&P Dow Jones Indices LLC, CME. Oil price is represented by WTI crude oil prices (the generic 1st 'CL' future). Data from Dec. 31, 2002, to June 30, 2016. Index performance based on net total return. Past performance is no guarantee of future results. It is not possible to invest directly in an index, and index returns do not reflect expenses an investor would pay. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Infrastructure could offer return, risk, and diversification characteristics that are different from those of other asset classes.

**Exhibit 10: Average Monthly Return of the Dow Jones Brookfield Global Infrastructure Sector Indices at Different Oil Prices**




Source: S&P Dow Jones Indices LLC, CME. Oil price is represented by WTI crude oil prices (the generic 1st 'CL' future). Data from Dec. 31, 2002, to June 30, 2016. Index performance based on net total return. Past performance is no guarantee of future results. It is not possible to invest directly in an index, and index returns do not reflect expenses an investor would pay. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

## LISTED INFRASTRUCTURE IN ASSET ALLOCATION

Infrastructure could offer return, risk, and diversification characteristics that are different from those of other asset classes; thus, it may merit consideration for allocation in a diversified portfolio.

Exhibit 11 provides a detailed comparative overview of two infrastructure indices from S&P Dow Jones Indices versus a few major asset classes, including U.S. medium-term Treasury Bonds (as measured by the S&P U.S. Treasury Bond 7-10 Year Index[2]), U.S. investment-grade corporate bonds (as measured by the S&P U.S. Issued Investment Grade Corporate Bond Index), U.S. high-yield corporate bonds (as measured by the S&P U.S. Issued High Yield Corporate Bond Index), global leveraged loans (as measured by the S&P/LSTA Leveraged Loan 100 Index), and global equities (as measured by the S&P Global BMI). The exhibit demonstrates that, over the past 10 years, the Dow Jones Brookfield Global Infrastructure Index outperformed all other asset classes in terms of absolute return. It also outperformed the S&P Global BMI and S&P/LSTA Leveraged Loan 100 Index in terms of the Sharpe, Sortino, and MAR ratios. The latter two of these ratios could be of interest to market participants who are more concerned about downside risk. The S&P Global Infrastructure Index has a profile similar to the broad equity market, but it has shown higher returns and reduced volatility.

[2] The S&P U.S. Treasury Bond 7-10 Year Index was formerly known as the S&P/BGCantor 7-10 Year U.S. Treasury Bond Index.

**Exhibit 11: Return Profile of S&P Dow Jones Infrastructure Indices Versus Alternatives**

| METRIC | S&P U.S. TREASURY BOND 7-10 YEAR INDEX | S&P U.S. ISSUED INVESTMENT GRADE CORPORATE BOND INDEX | S&P U.S. ISSUED HIGH YIELD CORPORATE BOND INDEX | S&P/LSTA LEVERAGED LOAN 100 INDEX | S&P GLOBAL BMI | DOW JONES BROOKFIELD GLOBAL INFRASTRUCTURE INDEX | S&P GLOBAL INFRA-STRUCTURE INDEX |
|---|---|---|---|---|---|---|---|
| Annual Return (%) | 6.70 | 6.04 | 7.71 | 4.35 | 4.49 | 9.12 | 5.00 |
| Maximum Drawdown (%) | -7.54 | -14.11 | -30.78 | -29.23 | -55.44 | -45.23 | -53.21 |
| Annual Volatility (%) | 6.60 | 5.42 | 10.06 | 8.85 | 17.30 | 14.05 | 16.39 |
| Annual Skewness | 0.13 | -0.31 | -0.25 | -0.27 | -0.22 | -0.23 | -0.25 |
| Monthly Alpha to the S&P Global BMI (%) | 0.61 | 0.44 | 0.44 | 0.21 | -- | 0.46 | 0.09 |
| T-Stats of Alpha | 3.60 | 3.33 | 2.65 | 1.26 | -- | 2.54 | 0.54 |
| Beta to the S&P Global BMI | -0.10 | 0.12 | 0.46 | 0.35 | -- | 0.71 | 0.88 |
| Correlation With the S&P Global BMI | -0.26 | 0.40 | 0.79 | 0.69 | -- | 0.87 | 0.93 |
| Sharpe Ratio[3] | 0.89 | 0.96 | 0.68 | 0.40 | 0.21 | 0.59 | 0.25 |
| Sortino Ratio | 1.69 | 1.48 | 1.01 | 0.56 | 0.29 | 0.86 | 0.35 |
| MAR Ratio | 0.89 | 0.43 | 0.25 | 0.15 | 0.08 | 0.20 | 0.09 |
| Omega Ratio | 2.20 | 2.53 | 1.95 | 1.71 | 1.31 | 1.67 | 1.34 |

Source: S&P Dow Jones Indices LLC. Data from June 30, 2006, to June 30, 2016. Index performance based on net total return. Past performance is no guarantee of future results. It is not possible to invest directly in an index, and index returns do not reflect expenses an investor would pay. Table is provided for illustrative purposes reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

With the same downside risk, the Dow Jones Brookfield Global Infrastructure Index generated higher return than global equities and leveraged loans.

Exhibit 12 provides a visual illustration of the return versus the drawdown of the Dow Jones Brookfield Global Infrastructure Index, the S&P Global Infrastructure Index, and other asset classes. All index returns and drawdowns are leveraged to a 17.3% annual volatility level, which is the annual volatility of the S&P Global BMI's net total returns over the past 10 years. For market participants who focus on return per unit of risk, it is worth noting that with the same downside risk, the Dow Jones Brookfield Global Infrastructure Index generated higher return than global equities and leveraged loans from June 30, 2006, to June 30, 2016.

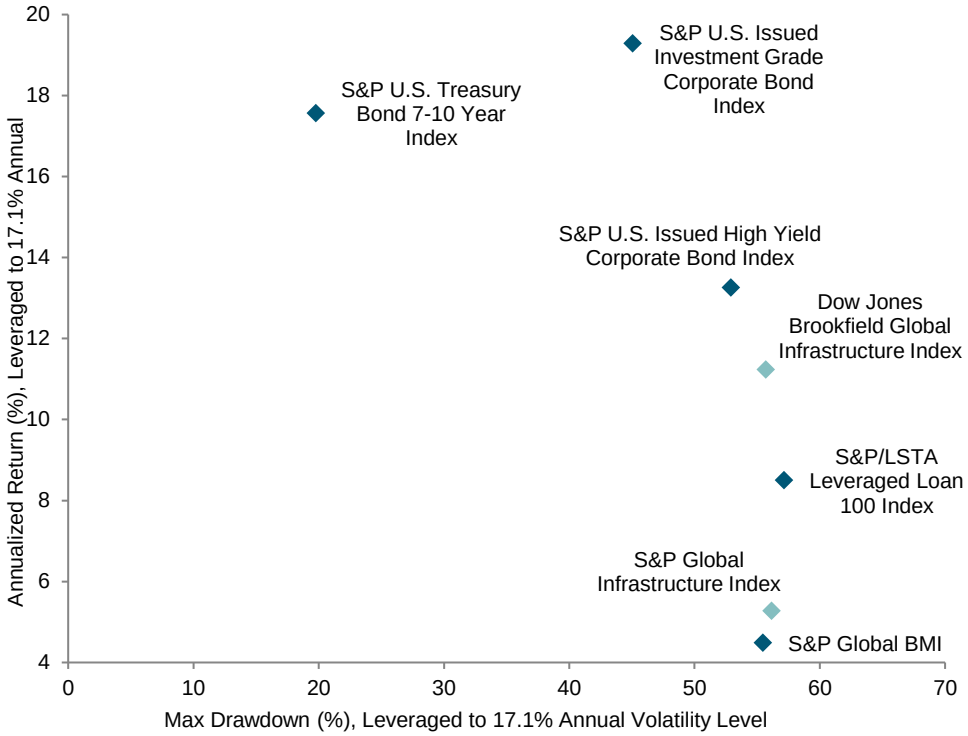
Diversification is the key advantage of infrastructure ownership in a portfolio context. Over the past 10 years, the Dow Jones Brookfield Global Infrastructure Index had a correlation of -0.11 with U.S. Treasury Bonds, 0.48 with U.S. investment-grade corporate bonds, 0.76 with U.S. high-yield

[3] The Sharpe ratio is the annualized excess return of an index over the U.S. three-month Treasury Bill divided by the annualized standard deviation of monthly returns. The Sortino ratio is the annualized excess return of an index over the U.S. three-month Treasury Bill divided by the standard deviation of negative asset returns. The MAR ratio is the annualized return divided by the maximum drawdown for the measurement period. The Omega ratio is the absolute value of the sum of positive returns divided by the sum of negative returns, based on monthly returns.

bonds, 0.64 with global leveraged loans, and 0.87 with global equities (see Exhibit 13).

Diversification is the key advantage of infrastructure ownership in a portfolio context.

**Exhibit 12: Risk/Return Profile of S&P Dow Jones Indices' Infrastructure Indices Versus Alternatives**




Source: S&P Dow Jones Indices LLC. Data from June 30, 2006, to June 30, 2016. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance. Net total returns displayed are actual performance leveraged to a 17.1% annual volatility level, which is the annual volatility of the S&P Global BMI during the period.

**Exhibit 13: Correlation of S&P Dow Jones Indices' Infrastructure Indices With Alternatives**

| INDEX | S&P U.S. TREASURY BOND 7-10 YEAR INDEX | S&P U.S. ISSUED INVESTMENT-GRADE CORPORATE BOND INDEX | S&P U.S. ISSUED HIGH YIELD CORPORATE BOND INDEX | S&P/LSTA LEVERAGED LOAN 100 INDEX | S&P GLOBAL BMI | DOW JONES BROOKFIELD GLOBAL INFRASTRUCTURE INDEX | S&P GLOBAL INFRASTRUCTURE INDEX |
|---|---|---|---|---|---|---|---|
| S&P U.S. TREASURY BOND 7-10 YEAR INDEX | - | 0.50 | -0.19 | -0.41 | -0.26 | -0.11 | -0.10 |
| S&P U.S. ISSUED INVESTMENT-GRADE CORPORATE BOND INDEX | 0.50 | - | 0.59 | 0.40 | 0.40 | 0.48 | 0.50 |
| S&P U.S. ISSUED HIGH YIELD CORPORATE BOND INDEX | -0.19 | 0.59 | - | 0.89 | 0.79 | 0.76 | 0.76 |
| S&P/LSTA LEVERAGED LOAN 100 INDEX | -0.41 | 0.40 | 0.89 | - | 0.69 | 0.64 | 0.62 |
| S&P GLOBAL BMI | -0.26 | 0.40 | 0.79 | 0.69 | - | 0.87 | 0.93 |
| DOW JONES BROOKFIELD GLOBAL INFRASTRUCTURE INDEX | -0.11 | 0.48 | 0.76 | 0.64 | 0.87 | - | 0.95 |
| S&P GLOBAL INFRASTRUCTURE INDEX | -0.10 | 0.50 | 0.76 | 0.62 | 0.93 | 0.95 | - |

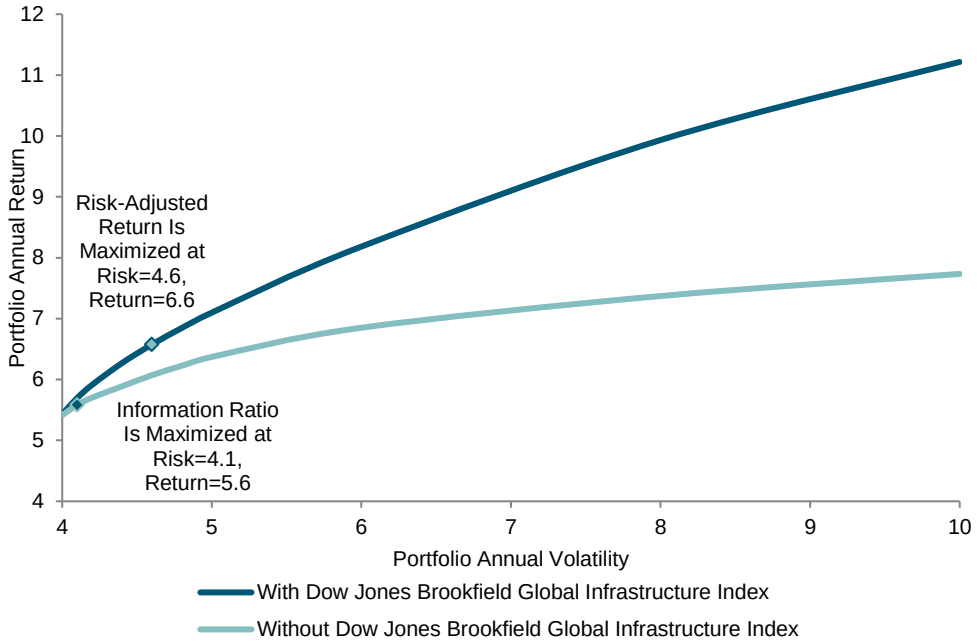
Source: S&P Dow Jones Indices LLC. Data from June 30, 2006, to June 30, 2016. Index performance based on net total return. Past performance is no guarantee of future results. It is not possible to invest directly in an index, and index returns do not reflect expenses an investor would pay. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

There is a clear improvement in the efficiency of the resulting asset allocations after adding infrastructure into the opportunity set.

Finally, we performed two traditional Markowitz mean-variance optimizations, with and without the Dow Jones Brookfield Global Infrastructure Index included in the opportunity set of U.S. medium-term Treasury Bonds, investment-grade corporate bonds, high-yield corporate bonds, leveraged loans, and global equities. The resulting historical efficient frontiers are presented in Exhibit 14. There is a clear improvement in the efficiency of the resulting asset allocations after adding infrastructure into the opportunity set. The portfolio information ratio was maximized with an allocation of 60% to U.S. medium-term Treasury Bonds, 28% to leveraged loans, and 12% to the Dow Jones Brookfield Global Infrastructure Index.

Infrastructure is an emerging asset class in its own right.

**Exhibit 14: Historical Efficient Frontier**




Source: S&P Dow Jones Indices LLC, UBS, MSCI, Macquarie Bloomberg. Data from Dec. 31, 2002, to June 30, 2016. Index performance based on net total return in USD. Past performance is no guarantee of future results. It is not possible to invest directly in an index, and index returns do not reflect expenses an investor would pay. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance. The following indices were used in preparation of the exhibit: S&P U.S. Treasury Bond 7-10 Year Index, S&P U.S. Issued Investment Grade Corporate Bond Index, S&P U.S. Issued High Yield Corporate Bond Index, S&P/LSTA Leverage Loan 100 Index, S&P Global BMI, and Dow Jones Brookfield Global Infrastructure.

## CONCLUSION

Infrastructure is an asset class that has proven to be a strong source of diversification, yield, and attractive net total returns. Given the essential role of infrastructure assets as a backbone for economic growth, and in light of the growing trend of privatization of these assets, this sector is an emerging asset class in its own right. Unlike other listed infrastructure indices, the Dow Jones Brookfield Global Infrastructure Index and the S&P Global Infrastructure Index use a broad-based approach that identifies companies that fall into the "pure-play" infrastructure category. Listed infrastructure, in particular, may offer a sound anchor and immediate entry point into the asset class.

# PERFORMANCE DISCLOSURE

The S&P Global Infrastructure Index was launched on February 22, 2007. The Dow Jones Brookfield Global Infrastructure Index was launched on July 14, 2008. The S&P U.S. Treasury Bond 7-10 Year Index was launched on March 24, 2010. The S&P U.S. Issued Investment Grade Corporate Bond Index was launched on January 2, 2014. The S&P U.S. Issued High Yield Corporate Bond Index was launched on April 9, 2013. The S&P/LSTA Leverage Loan 100 Index was launched on October 20, 2008. All information presented prior to an index's Launch Date is hypothetical (back-tested), not actual performance. The back-test calculations are based on the same methodology that was in effect on the index Launch Date. Complete index methodology details are available at www.spdji.com.

S&P Dow Jones Indices defines various dates to assist our clients in providing transparency. The First Value Date is the first day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which the Index is set at a fixed value for calculation purposes. The Launch Date designates the date upon which the values of an index are first considered live: index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P Dow Jones Indices defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via the company's public website or its datafeed to external parties. For Dow Jones-branded indices introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of introduction") is set at a date upon which no further changes were permitted to be made to the index methodology, but that may have been prior to the Index's public release date.

Past performance of the Index is not an indication of future results. Prospective application of the methodology used to construct the Index may not result in performance commensurate with the back-test returns shown. The back-test period does not necessarily correspond to the entire available history of the Index. Please refer to the methodology paper for the Index, available at www.spdji.com for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations.

Another limitation of using back-tested information is that the back-tested calculation is generally prepared with the benefit of hindsight. Back-tested information reflects the application of the index methodology and selection of index constituents in hindsight. No hypothetical record can completely account for the impact of financial risk in actual trading. For example, there are numerous factors related to the equities, fixed income, or commodities markets in general which cannot be, and have not been accounted for in the preparation of the index information set forth, all of which can affect actual performance.

The Index returns shown do not represent the results of actual trading of investable assets/securities. S&P Dow Jones Indices LLC maintains the Index and calculates the Index levels and performance shown or discussed, but does not manage actual assets. Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the Index or investment funds that are intended to track the performance of the Index. The imposition of these fees and charges would cause actual and back-tested performance of the securities/fund to be lower than the Index performance shown. As a simple example, if an index returned 10% on a US $100,000 investment for a 12-month period (or US $10,000) and an actual asset-based fee of 1.5% was imposed at the end of the period on the investment plus accrued interest (or US $1,650), the net return would be 8.35% (or US $8,350) for the year. Over a three year period, an annual 1.5% fee taken at year end with an assumed 10% return per year would result in a cumulative gross return of 33.10%, a total fee of US $5,375, and a cumulative net return of 27.2% (or US $27,200).

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