

The case for infrastructure

Revisiting the asset class in a period of high inflation and rising interest rates

Infrastructure has been growing in popularity in recent years, with unlisted infrastructure funds raising a record \$US125 billion of capital in 2021.¹

The increasing appetite from institutional investors could be explained by its impressive risk-adjusted return delivery as well as its attractive characteristics, including:

- inflation-linked revenues and potential to provide investors with a hedge against higher inflation
- defensiveness and consistent through-the-cycle performance
- attractive income and yield profile
- diversification benefits when added to a portfolio of equities and bonds
- ownership of real assets that provide an essential service to society
- high barriers to entry and large capital expenditure (capex) requirements.

In this paper we'll discuss:

- why the current environment may represent an attractive opportunity to invest in the asset class
- the asset class's historical performance, including during periods of high and low inflation as well as rising and falling interest rates
- long-term demand drivers for infrastructure.

1. Preqin database (June 2022).

The case for infrastructure

Revisiting the strategy in a period of high inflation and rising rates

Why now?

The current market environment offers investors several compelling reasons to consider infrastructure as part of a multi-asset investment portfolio. First, with inflationary pressures rising, infrastructure can provide an effective inflation hedge,² something that could be particularly attractive to institutional investors with liabilities linked to inflation. Second, in instances where rising interest rates are a reflection of higher inflation as in the current environment, infrastructure tends to fare relatively well due to its ability to pass through inflation. Lastly, changing macroeconomic conditions are often accompanied by increased volatility in listed markets. Unlisted infrastructure's long-term holding period and the regulated or contracted nature of its revenues can enable it to provide consistent and stable returns through the cycle. In this section, we take a look at each of these factors, along with the historical performance implications for infrastructure.

Inflation hedge potential

To examine infrastructure's inflation hedge potential, we compare the asset class's performance when inflation has been above average to its performance when inflation was below average. Figure 1 shows the results. When inflation was above average infrastructure delivered an annualised return of 12.4%, clearly stronger than its return of 7.6% when inflation was below average.³

This also makes sense from a bottom-up perspective. For many utilities, for example, inflation is included directly in the regulated asset base (which is increased by the rate of inflation over time) or the return (owners being given a real return).⁴ Within the transport sector the inflation link is sometimes less direct, but tariffs and pricing are sometimes escalated at the inflation rate. This is something that prevents margins from narrowing (as they often do for normal equity late in the economic cycle) and may even see them expand.

For infrastructure to be an effective inflation hedge it should perform better than other asset classes when inflation is high. Figure 2 shows infrastructure's relative performance versus equities and bonds when inflation is above the thresholds shown in the x-axis. At every inflation threshold – 1.9% year over year (YoY), 2.1% YoY, and 2.5% YoY – infrastructure has consistently performed better than equities and bonds.

Figure 1:
Infrastructure's performance when inflation was above and below average

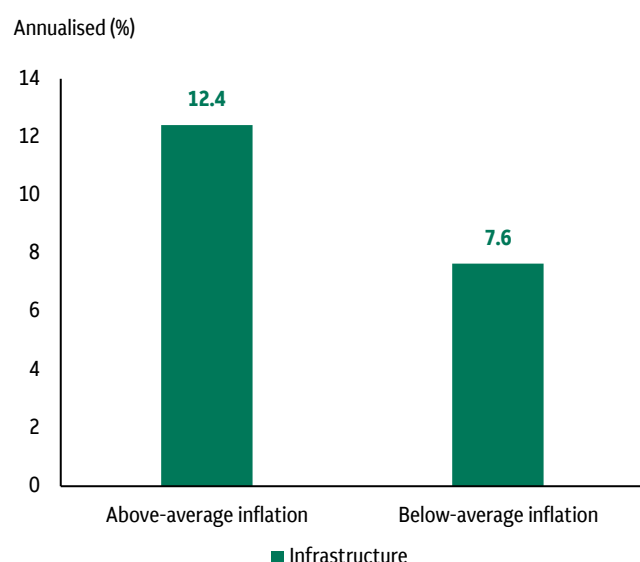
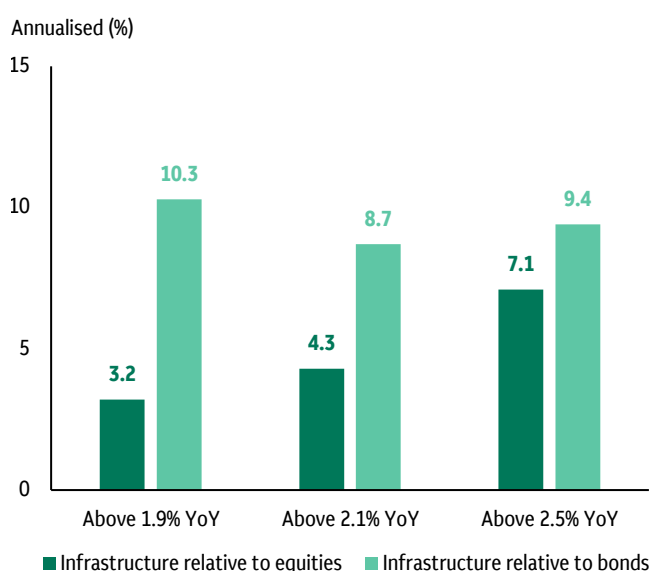


Figure 2:
Infrastructure's relative performance during different inflation thresholds



Source: Cambridge associates, Macrobond, Bloomberg Finance LP. Infrastructure: Cambridge Associate Private Infrastructure Index; Global equities: MSCI World Index; Global bonds: Barclays Global-Aggregate Total Return Index. Analysis conducted from 4Q03 to 3Q21. (March 2022)

2. For more details see our Pathways report, "Inflation risk and infrastructure as an inflation hedge" (November 2020).

3. Cambridge Associates, Macrobond. Analysis conducted from 4Q03 to 3Q21.

4. For more detail, see our Pathways report "Core infrastructure: Its inflation hedge characteristics and the search for yield" (June 2021).

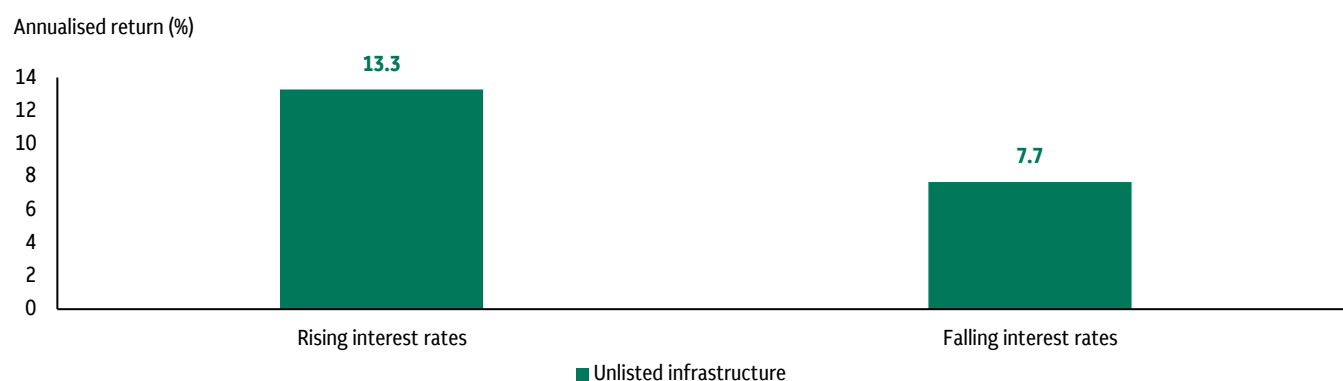
The case for infrastructure

Revisiting the strategy in a period of high inflation and rising rates

Infrastructure and interest rates

Figure 3 shows that in quarters when interest rates⁵ increased, infrastructure has delivered an annualised return of 13.3% compared with 7.7% when they are falling.⁶ If interest rates are being driven higher by strong gross domestic product (GDP) growth and rising inflation then there are two different pressures on returns that could be working in different directions. GDP growth and inflation are boosting revenues and earnings, while the increase in the discount rate is a headwind to value. Figure 3 shows that, for the period for which we have data, the former was a strong tailwind for returns than the latter was a headwind.

Figure 3:
Infrastructure's performance when interest rates are rising and falling



Source: Cambridge Associates, Macrobond. Analysis conducted from 4Q03 to 3Q21.

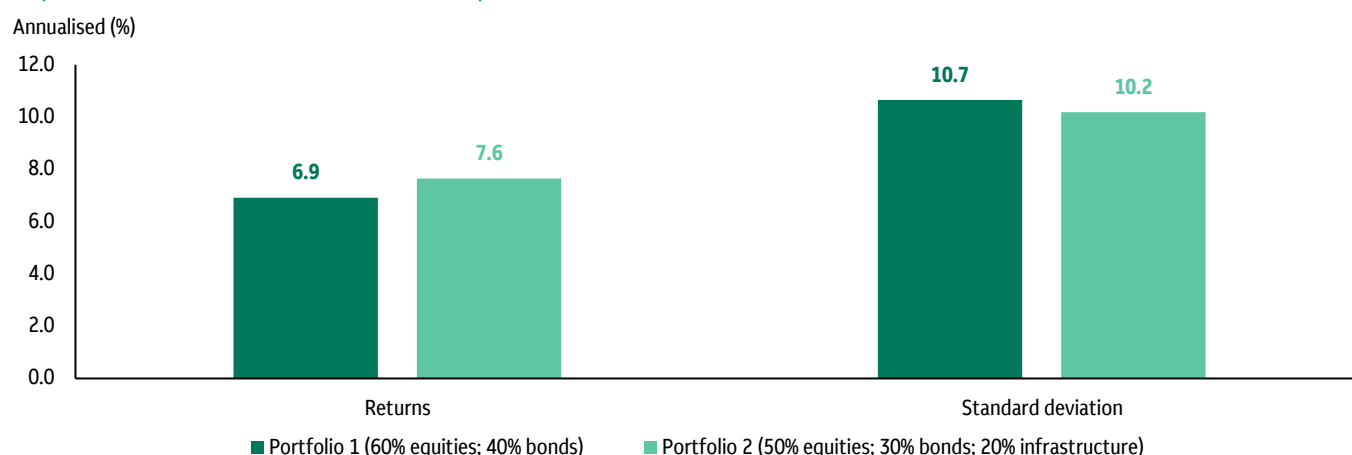
Diversification benefits of adding infrastructure to a “standard” portfolio

Infrastructure potentially adds to portfolio performance, courtesy of both its superior risk-adjusted return and raw diversification effects. In the example below, we compare the returns and volatility of two hypothetical portfolios:

- Portfolio 1 – 60% equities and 40% bonds
- Portfolio 2 – 50% equities, 30% bonds, and 20% infrastructure

As Figure 4 shows, adding a 20% infrastructure allocation improved portfolio returns by 0.7 percentage points per year and lowered volatility by 0.5 percentage points.⁷

Figure 4:
Impact of infrastructure allocation on a portfolio



Source: Cambridge Associates, Macrobond. Analysis conducted from 4Q03 to 3Q21. (March 2022).

5. Interest rates refer to a GDP-weighted average of 10-year government bonds yields for the US, the UK and the euro area (10-year German government bond yield was used for the euro area calculation).

6. Cambridge Associates, Macrobond, Bloomberg Finance LP. Analysis conducted from 4Q03 to 3Q21.

7. Cambridge Associates, Macrobond, Bloomberg Finance LP. Analysis conducted from 4Q03 to 3Q21.

The case for infrastructure

Revisiting the strategy in a period of high inflation and rising rates

Superior risk-adjusted returns

Since 2004, unlisted infrastructure has delivered a robust 9.9% annualised return, above 8.8% for global equities, 8.6% for global real estate, 4.2% for 10-year US Treasuries and 3.5% for global bonds (Figure 5).⁸ In terms of the volatility of returns, infrastructure has also delivered relatively stable returns with an annualised standard deviation of 10.3%,⁹ significantly below listed equities but above global bonds (Figure 6). On a risk-adjusted basis, unlisted infrastructure has outperformed other asset classes and delivered a superior risk-adjusted return (Figure 7).

Figure 5:
Long-run returns
For the period December 31, 2003–September 30, 2021

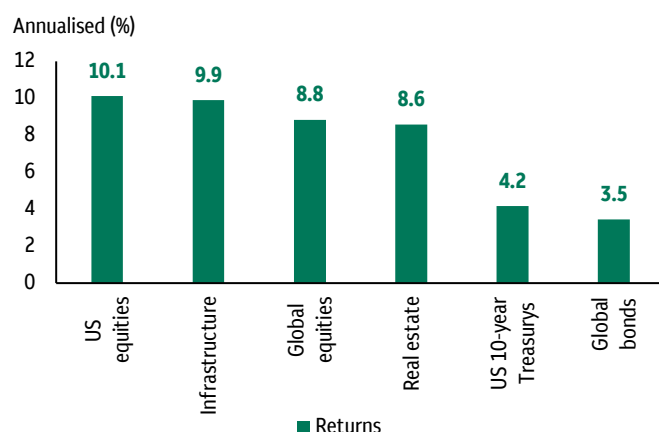
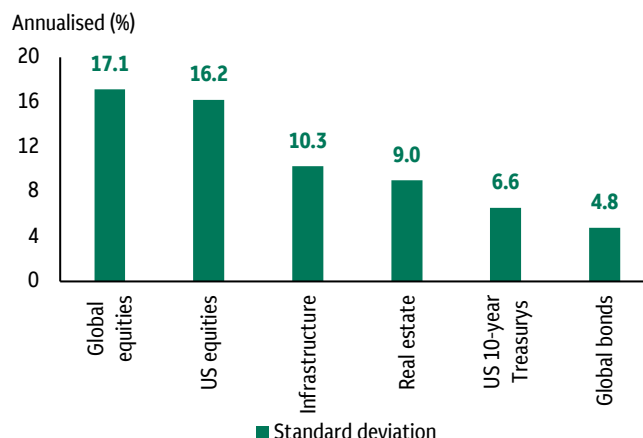
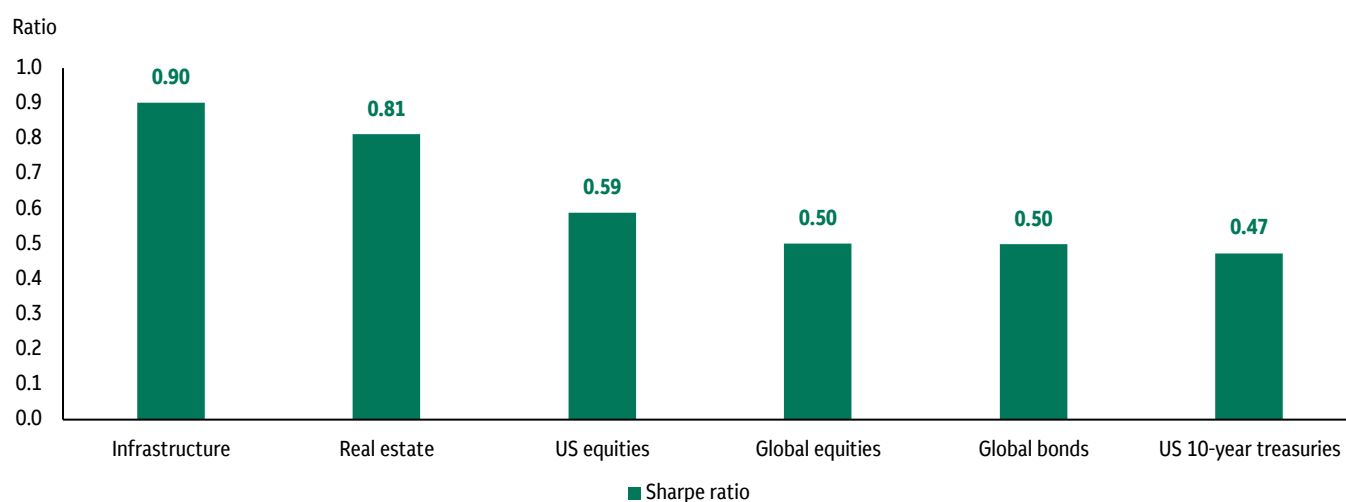


Figure 6:
Volatility



Sources: Cambridge Associates, Macrobond, Bloomberg Finance LP. US equities: S&P 500 Index; Infrastructure: Cambridge Associate Private Infrastructure Index; Global equities: MSCI World Index; Global bonds: Bloomberg Global Aggregate Index; Real estate: Unlevered global real estate index, CoStar/PMA/JLL. Analysis conducted from 4Q03 to 3Q21. (March 2022)

Figure 7:
Sharpe ratio by asset class



Sources: Cambridge Associates, Macrobond, Bloomberg Finance LP. US equities: S&P 500 Index; Infrastructure: Cambridge Associate Private Infrastructure Index; Global equities: MSCI World Index; Global bonds: Bloomberg Global Aggregate Index; Real estate: Unlevered global real estate index, CoStar/PMA/JLL. Analysis conducted from 4Q03 to 3Q21. (March 2022).

8. Cambridge Associates, Macrobond, Bloomberg Finance LP. Analysis conducted from 4Q03 to 3Q21.

9. Cambridge Associates, Macrobond, Bloomberg Finance LP. Analysis conducted from 4Q03 to 3Q21.

The case for infrastructure

Revisiting the strategy in a period of high inflation and rising rates

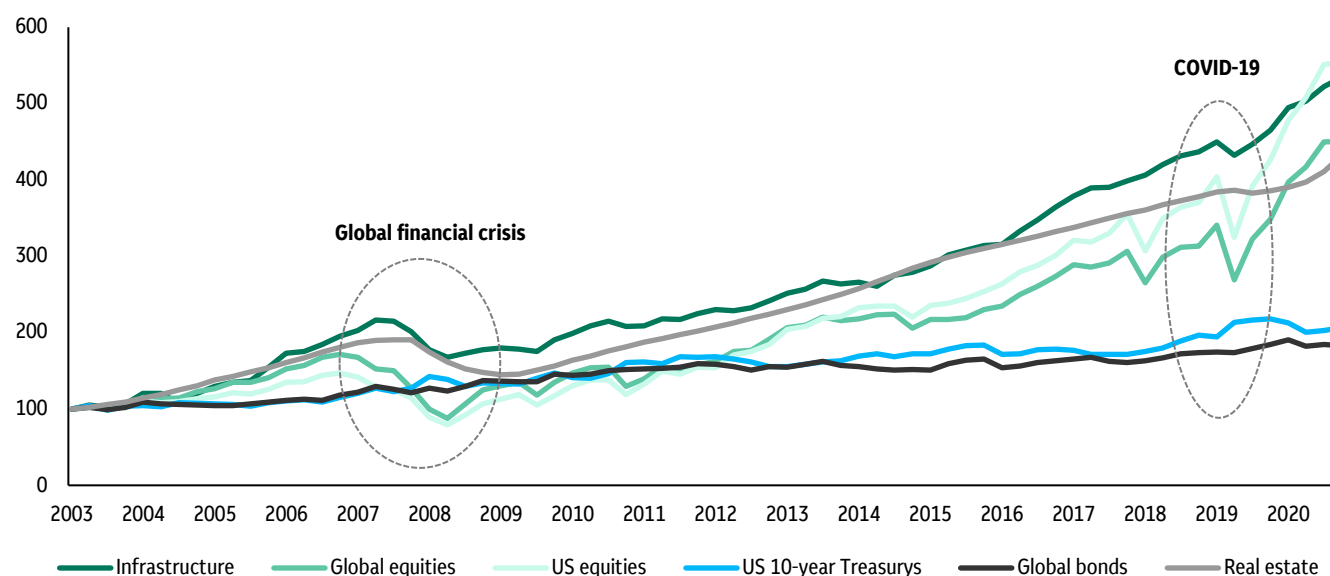
Consistent long-term performance

Infrastructure's performance has also been relatively consistent through the period of analysis, as can be seen in Figure 8. Of particular note is infrastructure's relative resilience during downturns. During the 2008-2009 downturn, infrastructure fell only 22.6% peak-to-trough compared with a loss of 46.6% for global equities.¹⁰ One explanation could be that infrastructure was far less exposed to the liquidity stresses so acutely felt by listed assets during this time. But it also has a far more defensive revenue line (i.e. one that is less sensitive to swings in demand) than listed equities.

In 2020, COVID-19 had an unprecedented impact on passenger transportation volumes; however, many infrastructure sectors such as utilities and digital infrastructure have proved resilient to the downturn. From a total return perspective, the asset class performed relatively well, falling just 4.1%, compared with a loss of 20.1% for global equities.¹¹

Figure 8:
Historical performance by asset class

Index, rebased, December 2003=100



Sources: Cambridge Associates, Macrobond, Bloomberg Finance LP. US equities: S&P 500 Index Total Return; Infrastructure: Cambridge Associate Private Infrastructure Index; Global equities: MSCI World Index; Global bonds: Bloomberg Global Aggregate Index; Real estate: Unlevered global real estate index, CoStar/PMA/JLL. Analysis conducted from 4Q03 to 3Q21. (March 2022).

10. Cambridge Associates, Macrobond. Analysis conducted from 4Q03 to 3Q21.

11. Cambridge Associates, Macrobond. Analysis conducted from 4Q03 to 3Q21.

The case for infrastructure

Revisiting the strategy in a period of high inflation and rising rates

Strong tailwinds for infrastructure demand

The growth in demand for infrastructure is underpinned by long-term structural trends including decarbonisation, digitalisation, and demographics. At the same time, existing infrastructure continues to age, with estimates suggesting the world may need \$US94 trillion of infrastructure investment by 2040 to keep pace with economic growth.¹² In the US, for example, underfunding of roadway maintenance resulted in a \$US786 billion backlog of road and bridge capital needs, while the total cumulative funding gap to 2030 is estimated at \$US2.5 trillion.¹³

Beyond the need to upgrade existing infrastructure, substantial investments are required to limit global warming and achieve net zero carbon emissions by 2050. According to the Bloomberg New Energy Finance (BNEF), total investments required in the energy infrastructure could be between \$US92 trillion and \$US173 trillion, or between \$US3.2 trillion and \$US6 trillion per year.¹⁴

At the same time, increasing fiscal pressures on post-pandemic government budgets suggest that financing of infrastructure may increasingly move towards private investment and public-private partnerships. For infrastructure investors, these tailwinds could represent an opportunity to invest in real assets underpinned by strong structural trends over the coming decades.

Demand drivers for infrastructure

 9.7 billion	 \$US94 trillion	 2.3 billion	 \$US92-173 trillion	 2.1 billion
global population in 2050, up from 7.7 billion in 2019	infrastructure needs to keep pace with economic growth	additional people living in urban areas by 2050 ¹⁵	energy infrastructure investment needs by 2050 in order to achieve net zero	people age 60 and older by 2050, up from 1 billion in 2020

Source: UN World Population Prospects (2019), Global Infrastructure Outlook, UN World Urbanisation Prospects (2018), Bloomberg New Energy Finance NEO (July 2021), World Health Organisation, "Ageing and health" (October 2021).

Infrastructure is expected to play a crucial role in transitioning to a net zero world

 ~50%	 90-95%	 53,622 TWh	 112,886 TWh
electricity share in final energy demand by 2050, up from ~20% in 2019	of all passenger vehicles are electric by 2050	expected electricity demand in 2050 ¹⁶ , up from 22,372 terawatt hours (TWh) in 2019	electricity demand in 2050 ¹⁷ , if green hydrogen becomes viable

Source: Bloomberg New Energy Finance "NEO 2021" (July 2021).

12. Global Infrastructure Outlook (A G20 Initiative).

13. American Society of Civil Engineers, Report Card for America's Infrastructure (2021).

14. BNEF New Energy Outlook (NEO) (June 2021).

15. According to UN World Urbanisation Prospects (2018), by 2050, about 6.7 billion people could live in cities by 2050, up from around 4.4 billion in 2020.

16. Refers to direct electrification of transport, industry, and buildings in a net zero scenario.

17. Includes indirect electrification under BNEF's Green scenario in which hydrogen is manufactured via water electrolysis powered by wind and solar.

The case for infrastructure

Revisiting the strategy in a period of high inflation and rising rates

Infrastructure as an asset class

While there is no generally agreed-upon, precise definition of what constitutes an infrastructure asset, it is usually considered to be one that has key infrastructure attributes:

- **Essential nature of services.** Infrastructure assets provide basic services to ensure the everyday functioning of society while also supporting economic growth and quality of life.
- **Inelastic demand.** Demand for infrastructure services is relatively stable throughout the cycle, even during economic downturns.
- **High barriers to entry.** Infrastructure assets have limited competition due to monopolistic or duopolistic market position and very high fixed investment costs to enter the market.
- **Regulation.** Infrastructure assets are often monopolies that are regulated by authorities which may fix prices or provide minimum payment guarantees.
- **Stable and predictable cash flows.** Due to regulated or long-term contracted revenues with a direct or indirect inflation link, an infrastructure asset tends to have a predictable cash flows profile.

Sectors that are generally considered to be infrastructure include: utilities (generation, transmission and distribution); renewables; water and waste; transport assets such as airports, roads, ports, rail and tunnels; digital infrastructure (towers, data centres, and fibre networks); and social infrastructure such as schools and hospitals.

Within infrastructure, subsectors are grouped by four main risk categories: core, core+, value add, and opportunistic. These are commonly accepted classifications used by investors to assist in portfolio construction and ensure appropriate diversification when allocating to the asset class.¹⁸ Our analysis in this note focuses on core and core+ infrastructure.

Infrastructure encompasses a diverse range of subsectors

	 Digital infrastructure	 Transport	 Utilities and Energy	 Power and renewables	 Social
Core sector	• Towers	• Network toll roads • Airport hubs	• Regulated utilities • District heating • Solar and wind (onshore/offshore) • Contracted pipelines	• Conventional generation • Pipelines • Solar • Onshore wind • Offshore wind	
Core+ sector	• Data centres • Distributed cells/antennas • Fiber networks	• Ports • Rail • Rolling stock • Supply chain infrastructure	• Conventional generation • Distributed infrastructure • Waste-to-energy and other renewable fuels	• Storage • LNG infrastructure • Biomass • Energy from waste • Batteries	• Hospitals and other healthcare infrastructure • Community assets • Public safety • Education

Core infrastructure

- Provides an essential service to the community
- Has high barriers to entry
- Has regulated revenue streams and/or strong contractual revenue streams
- Includes infrastructure that relies on proven technology and/or established regulatory environments (where relevant)

Core+ infrastructure

- Often contain higher degrees of market risk
- Have shorter dated contractual agreements in place compared to core infrastructure
- Can offer more attractive returns for the additional risk
- Includes material amounts of capex in core+ or development in opportunistic

Opportunistic infrastructure

18. Please note: The the risk profile of any given asset will depend upon individual traits and risks of that asset. This illustration is indicative only.

The case for infrastructure

Revisiting the strategy in a period of high inflation and rising rates

Conclusion

Infrastructure investment continues to gain interest among institutional investors, given its potential to generate attractive, inflation-hedged returns. In addition, unlisted infrastructure's long-term holding period and the regulated or contracted nature of its revenues can enable it to provide consistent and stable returns through a period of market volatility.

Long-term drivers such as decarbonisation and the energy transition will involve profound changes across a range of infrastructure sectors, offering attractive investment opportunities for investors, while supporting the transition to a net zero emissions world.

The case for infrastructure

Revisiting the strategy in a period of high inflation and rising rates

Investing involves risk, including the possible loss of principal.

Past performance is not indicative of future results.

Diversification neither guarantees a gain nor protects against a loss.

Index performance returns do not reflect any management fees, transaction costs or expenses. Indices are unmanaged and one cannot invest directly in an index.

A benchmark is a standard against which the performance of a security, mutual fund, or manager can be measured. It is usually an index of securities representing a particular market or a portion of it.

The Bloomberg Global Aggregate Index provides a broad-based measure of the global investment grade fixed-rate debt markets.

The Cambridge Associates Private Infrastructure Index is an index based on data compiled from 154 infrastructure funds, including fully liquidated partnerships, formed between 1994 and 2022. All returns are net of fees, expenses, and carried interest.

The MSCI World Index represents large- and mid-cap stocks across 23 developed market countries worldwide. The index covers approximately 85% of the free float-adjusted market capitalization in each country.

The S&P 500 Index measures the performance of 500 mostly large-cap stocks weighted by market value and is often used to represent performance of the US stock market.

Inflation is the rate at which the general level of prices for goods and services is rising, and, subsequently, purchasing power is falling. Central banks attempt to stop severe inflation, along with severe deflation, in an attempt to keep the excessive growth of prices to a minimum.

The disruptions caused by natural disasters, pandemics, or similar events could prevent a strategy from making advantageous investment decisions in a timely manner and could negatively impact the strategy's ability to achieve its investment objective and the value of its investments.

This market commentary has been prepared for general informational purposes by the MAM Thought Leadership Team, who are part of Macquarie Asset Management (MAM), the asset management business of Macquarie Group (Macquarie), and is not a product of the Macquarie Research Department. This market commentary reflects the views of the MAM Thought Leadership Team and statements in it may differ from the views of others in MAM or of other Macquarie divisions or groups, including Macquarie Research. This market commentary has not been prepared

to comply with requirements designed to promote the independence of investment research and is accordingly not subject to any prohibition on dealing ahead of the dissemination of investment research.

Nothing in this market commentary shall be construed as a solicitation to buy or sell any security or other product, or to engage in or refrain from engaging in any transaction. Macquarie conducts a global full-service, integrated investment banking, asset management, and brokerage business. Macquarie may do, and seek to do, business with any of the companies covered in this market commentary. Macquarie has investment banking and other business relationships with a significant number of companies, which may include companies that are discussed in this commentary, and may have positions in financial instruments or other financial interests in the subject matter of this market commentary. As a result, investors should be aware that Macquarie may have a conflict of interest that could affect the objectivity of this market commentary. In preparing this market commentary, we did not take into account the investment objectives, financial situation or needs of any particular client. You should not make an investment decision on the basis of this market commentary. Before making an investment decision you need to consider, with or without the assistance of an adviser, whether the investment is appropriate in light of your particular investment needs, objectives and financial circumstances.

Macquarie salespeople, traders and other professionals may provide oral or written market commentary, analysis, trading strategies or research products to Macquarie's clients that reflect opinions which are different from or contrary to the opinions expressed in this market commentary. Macquarie's asset management business (including MAM), principal trading desks and investing businesses may make investment decisions that are inconsistent with the views expressed in this commentary. There are risks involved in investing. The price of securities and other financial products can and does fluctuate, and an individual security or financial product may even become valueless. International investors are reminded of the additional risks inherent in international investments, such as currency fluctuations and international or local financial, market, economic, tax or regulatory conditions, which may adversely affect the value of the investment. This market commentary is based on information obtained from sources believed to be reliable, but we do not make any representation or warranty that it is accurate, complete or up to date. We accept no obligation to correct or update the information or opinions in this market commentary. Opinions, information, and data in this market commentary are as of the date

indicated on the cover and subject to change without notice. No member of the Macquarie Group accepts any liability whatsoever for any direct, indirect, consequential or other loss arising from any use of this market commentary and/or further communication in relation to this market commentary. Some of the data in this market commentary may be sourced from information and materials published by government or industry bodies or agencies, however this market commentary is neither endorsed or certified by any such bodies or agencies. This market commentary does not constitute legal, tax accounting or investment advice. Recipients should independently evaluate any specific investment in consultation with their legal, tax, accounting, and investment advisors. Past performance is not indicative of future results.

This market commentary may include forward-looking statements, forecasts, estimates, projections, opinions and investment theses, which may be identified by the use of terminology such as "anticipate", "believe", "estimate", "expect", "intend", "may", "can", "plan", "will", "would", "should", "seek", "project", "continue", "target" and similar expressions. No representation is made or will be made that any forward-looking statements will be achieved or will prove to be correct or that any assumptions on which such statements may be based are reasonable. A number of factors could cause actual future results and operations to vary materially and adversely from the forward-looking statements. Qualitative statements regarding political, regulatory, market and economic environments and opportunities are based on the MAM Thought Leadership Team's opinion, belief and judgment.

Other than Macquarie Bank Limited ABN 46 008 583 542 ("Macquarie Bank"), any Macquarie Group entity noted in this document is not an authorised deposit-taking institution for the purposes of the Banking Act 1959 (Commonwealth of Australia). The obligations of these other Macquarie Group entities do not represent deposits or other liabilities of Macquarie Bank. Macquarie Bank does not guarantee or otherwise provide assurance in respect of the obligations of these other Macquarie Group entities. In addition, if this document relates to an investment, (a) the investor is subject to investment risk including possible delays in repayment and loss of income and principal invested and (b) none of Macquarie Bank or any other Macquarie Group entity guarantees any particular rate of return on or the performance of the investment, nor do they guarantee repayment of capital in respect of the investment.

All third-party marks cited are the property of their respective owners.

© 2022 Macquarie Group Limited

macquarie.com

Contact us by region

Americas

Market Street
Philadelphia
215 255 1200
mim.americas@macquarie.com

EMEA

Ropemaker Place
London
44 20 303 72049
mim.emea@macquarie.com

Australia

Martin Place
Sydney
1 800 814 523
mim@macquarie.com

Asia

Harbour View Street
Hong Kong
852 3922 1256
macquarie.funds.hk@macquarie.com