Kernel

Global Perspectives:

The Role of Infrastructure Assets within Investment Portfolios

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Introduction

Global markets have opened lower in 2022, given widespread concern around higher-than-expected inflation and the subsequent potential for multiple interest rate hikes throughout the year in many major economies. Two years into the pandemic, Covid-19 has continuously taken its surprising turns, disrupting nearly every aspect of the economy. Just as countries were recovering from the Delta variant's impact, the new Omicron variant emerged, resulting in record-high Covid-19 infection rates globally. While considerably milder than the previous strains, Omicron continues to restrain the global economic recovery. To top it off, the Russian invasion of Ukraine has resulted in a rapid rise in oil and gas prices driven by concerns of an emerging crisis in the European energy sector. As energy is a large component of any CPI basket, an upward surprise to inflation is imminent.

In January 2022, the IMF reassessed the global economic growth expectation from 5.9% for 2021 to 4.4% for 2022 – a half percentage point lower than the 4.9% prediction just months earlier at the World Economic Outlook (WEO) in October 2021. This was largely due to lower estimates for the two largest economies – (i) for the United States after a revised assumption removing the $1.75 trillion Build Back Better fiscal policy package and continued supply shortages, and (ii) for China after its prolonged financial distress among property developers and its zero-tolerance Covid-19 policy.

Concurrently, in November and December 2021, the global consumer price inflation reached 5.2% year on year – a level not seen since September 2008 and is expected to remain high for longer than previously envisioned at the October WEO. The ongoing supply chain disruptions, rising energy prices, labour shortages as well as localised wage pressures all mean high uncertainty around inflation and monetary policy paths.

With inflation emerging as a top economic and political challenge in 2022, listed real asset classes are getting a great deal of investors' attention as they provide exposure to various timely investment themes, including inflation protection, better diversification from broad global equities which some feel are expensive according to chosen valuation metrics, the transition to a lower-carbon world, and rising trends in digital infrastructure, renewable energy, and sustainable transportation.

This article is the second of Kernel's research series, considering how listed real asset classes are positioned in today's asset allocation challenges. In the first piece, we have examined the more well-known asset class - Global Listed REITs (Real Estate Investment Trusts). In this second piece, we focus on another "real asset" class, global listed infrastructure.

Understanding infrastructure

Think of toll roads, electric and gas grids, water utilities, airports, or railroads as typical assets that infrastructure companies own and operate. Unlike "real estate" assets such as commercial buildings, office buildings, industrial or residential buildings developed and managed by REITs, these infrastructure investments often share the following three characteristics. First, they are vital to the social and economic structure and growth of a country, and backbone type analogies. Second, they are long-lived tangible assets that require huge initial capital investments. Typically, governments have a central role in managing and financing such infrastructure. However, insufficient funding or modern cooperative models often leads to their partnerships with private sectors via Public Private Partnerships programmes. And third, infrastructure assets have low operating costs with solid and stable sources of inflation-linked earnings once established.

By its very nature, relative to other asset classes or sectors, the potential benefits of "infrastructure" can include (i) the highly inelastic demand for certain services such as water, energy, and highway access, (ii) limited competition or even monopolistic and protected position in the market – such as airports, and (iii) regulated prices, stable revenues, and long duration. At Kernel, we believe that such traits can potentially bring in the following desirable investment characteristics:

- Infrastructure can deliver reliable and recurring sources of income irrespective of economic conditions, thus, has better downside protection in times of market instability.
- Infrastructure has a strong inflation-linkage in its revenue model, negating some of the effect of an environment with rising inflation concerns.
- Infrastructure with strong historical returns and downside resilience can improve the risk-adjusted return profile of a mixed-asset portfolio.

With this in mind, we launched in 2020 our Kernel Global Infrastructure Fund, offering exposures to over 100 global companies, from 20 countries, which derive at least 70% of their cash flows from infrastructure line of business across **three major sectors**, including **transportation & industrials infrastructure** (own and operate physical assets that move people, freights such as airports, highways & rail tracks, toll roads, ports as well as assets supporting the transportation of other commodities such as oil and gas), **utilities infrastructure** (own and operate physical assets that produce, transport, process and stores water, electricity, gas), and **data infrastructure** (own and operate physical assets that enable the movement and storage of information such as telecommunications towers and data centres).

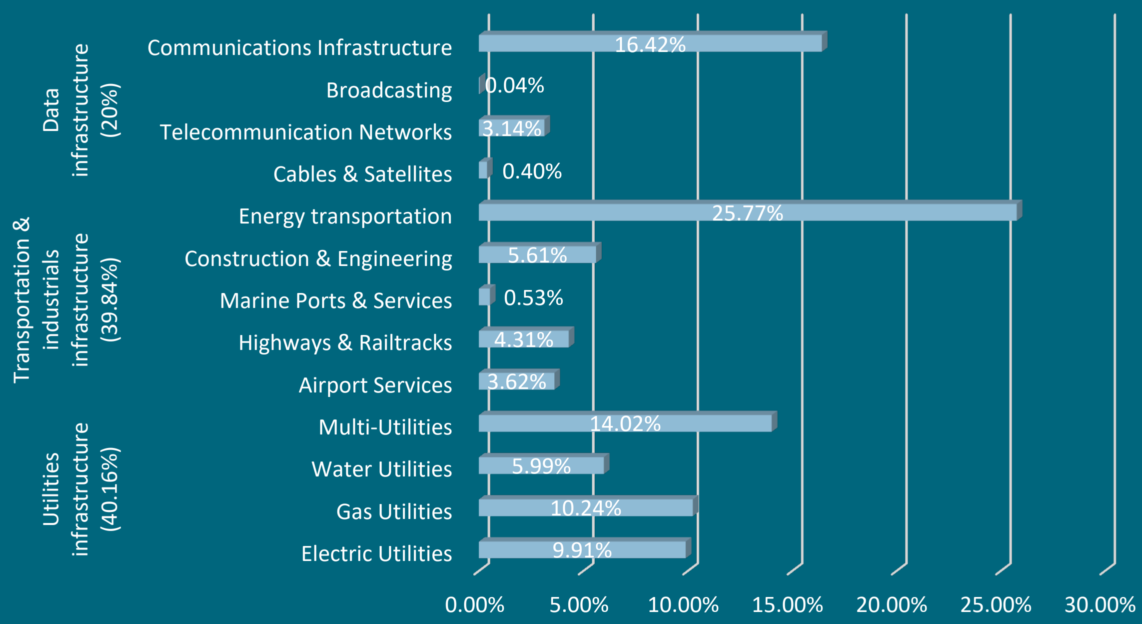


Figure 1: Sector breakdown of Dow Jones Brookfield Global Infrastructure Index on 28 Feb 2022. Source: Kernel Wealth.

Global listed infrastructure – A unique combination of investment attributes

Infrastructure and utility stocks have been around for a long time, yet it wasn't until the 1990s when the listed infrastructure asset class became broadly accessible to retail investors, often due to partial or full privatisation of government assets to list on share markets, such as occurred in New Zealand between 1987 and 1992. Over the past thirty years, it has shown to deliver the downside resilience in times of high market volatility as well as strong performance during periods of "higher-than-expected" inflation and slowing growth.

Looking into 2022, we believe global infrastructure stocks are well-positioned to potentially benefit from a macro environment with high inflation yet moderating economic growth, which is likely to persist this year.

1. Defensive and income-generating equities

When thinking of defensive assets, often cash and fixed income come to mind first. However, with nominal interest rates still kept fairly low even after governments' withdrawals of Covid-19 stimulus measures, and negative in 'real' (inflation adjusted) terms, the current high inflation period has been motivating widespread yield-hunting, especially for those with long-dated liabilities like insurers and pension funds. In this context, Global listed infrastructure is another defensive alternative that has been shown to offer higher returns over the long-term, on average, with relatively less risk than global equities. They can be considered 'defensive' equities, mostly because of its lower downside risk relative to other equity sectors, supported by its solid and stable cash flows no matter what economic conditions prevail.

To be more specific, the underlying assets that listed infrastructure companies own and operate can be categorised into two major buckets, including (i) regulated assets and (ii) user-pays assets. First, for regulated assets, such as electricity, water, gas transmission and distribution, though the demand for the utilities from these assets is steady, governments commonly have the right to fix the price or adjust the profit earned by the managing companies. For profit adjustment, if profit margins go beyond a certain limit, the company is required to return part of its revenue to consumers by lowering the future price. Similarly, if the company's profit is less than a certain rate, they are also allowed to increase their prices. For this reason, companies that own and operate regulated infrastructure assets often demonstrate stable earnings profile over time.

Second, for user-pays assets, such as railroads, airports, telecommunication towers, pricing is generally set by long-term contracts where revenue and profit depends on the demand for the assets. While the rapid spread of the Covid-19 pandemic has become a serious test of strength for the global transportation systems – causing not only the reduced traffic consumption but also significant supply-chain disruptions. The whole sector has kept moving forward with increasing adoption of digitalised infrastructure – for instance, autonomous transport by air and by road, promising a more resilient and sustainable future. At the same time, the global public health crisis has accelerated the ever-growing demand for data centre services. Data traffic exploded during the initial lockdowns, but rather than declining after restrictions were lifted, it has continued to grow, creating increasing demand for new infrastructure to distribute, process and store data.

All of these, in our view, can serve as a strong basis for the solid income sources and strong earnings growth of listed infrastructure as we move toward the end of the Covid-19 pandemic as well as its downside resilience amid negative market conditions.

Figure 2: 1-year rolling returns of major asset classes during the GFC. Source: Kernel Wealth. The indices used as representative for Global REITs, Global Infrastructure, Global Equities, NZ Equities include S&P Global REIT, Dow Jones Brookfield Global Infrastructure, S&P Global 100, and S&P NZX 50, respectively.

Figure 2 illustrates the 1-year rolling performance of four major asset classes during the Global Financial Crisis (2007-2009). All four asset classes experienced massive drawdowns, but for the Global Infrastructure, the magnitude of negative returns was smaller: -7.5% on average across the 2-year period, compared to -23.04%, -10.5% and -15.51%, respectively for Global REITs, Global Equities and NZ Equities (returns in NZD). As you can see, for most 1-year periods, Global Infrastructure was best performer relatively.

Furthermore, thanks to the relatively stable earnings derived from the underlying assets, the infrastructure companies can, therefore, provide predictable income distributions. Figure 3 below shows that in 2021, Global Infrastructure has delivered to investors a higher dividend yield than most asset classes.

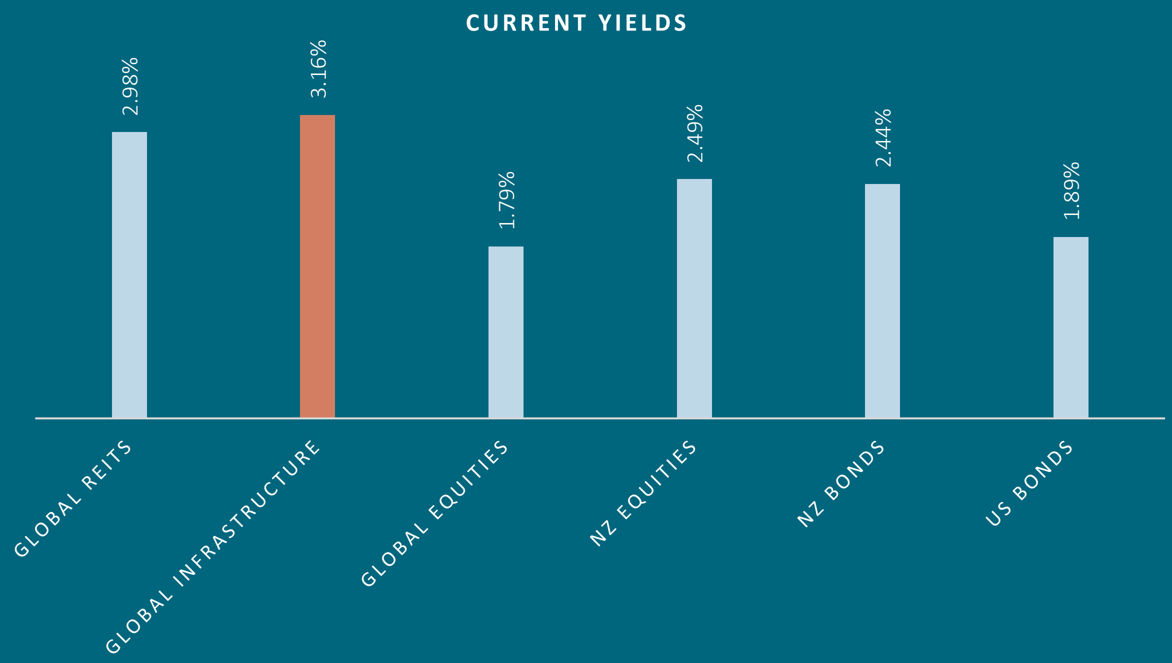
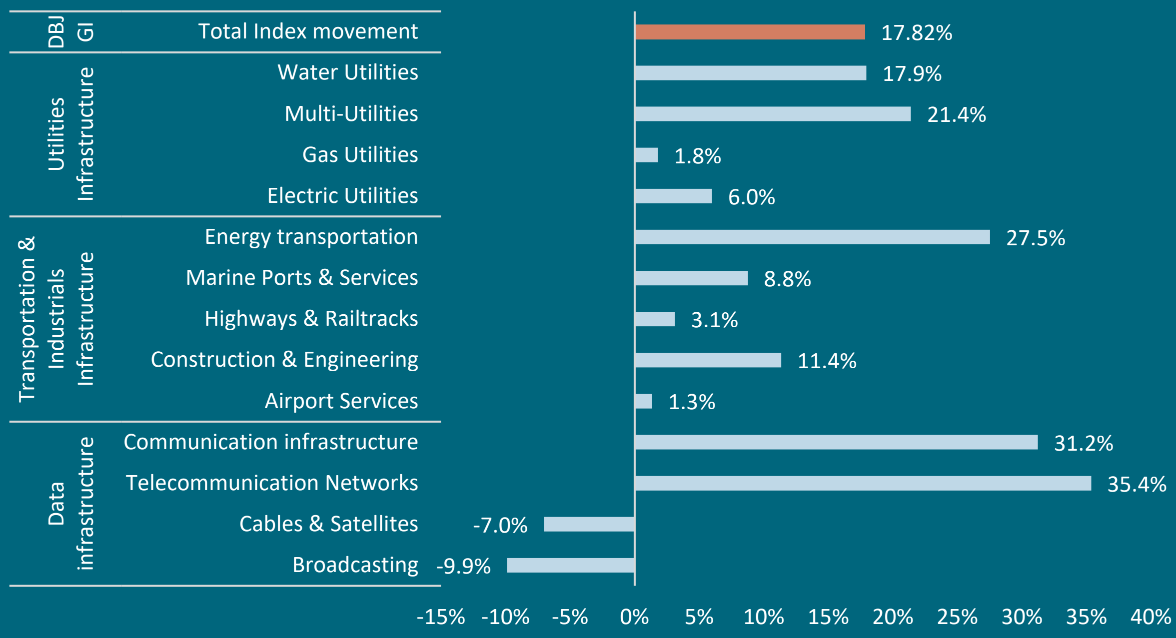


Figure 3: Current yields of various asset classes. Source: Kernel Wealth. Global REITs, Global Infrastructure, Global and NZ Equities represent current dividend yield, Bonds represent yield to maturity, as of 31 December 2021. The indices used as representative for Global REITs, Global Infrastructure, Global Equities, NZ Equities, US Bonds and NZ Bonds include S&P Global REIT, Dow Jones Brookfield Global Infrastructure, S&P Global 100, S&P NZX 50, S&P US Aggregate Bond and S&P NZ Aggregate Bond, respectively.

2. Beneficial inflation characteristics

Global Infrastructure stocks had a total return of 17.82% (in USD) in 2021 as measured by the Dow Jones Brookfield Global Infrastructure Index.

Sector performance varied widely within the infrastructure. Energy transportation, for instance, rose 27.52% in the year amid strong energy market fundamentals. By contrast, other transportation services, such as airport, highways & rail-tracks, increased slightly by less than 3% in 2021 due to the continuing uncertainty of the Covid-19 pandemic. Data infrastructure was the top performers, gaining 30.84% in the year, thanks to the great demand for telecommunication networks.



Total Index movement breakdown	Data infrastructure	Transportation & Industrials infrastructure	Utilities Infrastructure
Sector returns	30.84%	17.82%	11.18%
Sector weights	22.16%	34.42%	43.42%
Weighted average returns	6.84%	6.13%	4.85%

Figure 4: Sector performance breakdown of Dow Jones Brookfield Global Infrastructure Index from 31/12/2020 to 31/12/2021. Source: Kernel Wealth.

Moving forward in 2022, we see the potential for infrastructure to deliver another year of strong performance since the asset class has shown to outperform global equities during periods of higher inflation yet slowing growth, which is expected by many for this year.

Inflation-linked revenues and low operating costs

While not all infrastructure assets are equally inflation-proof, a well-diversified listed infrastructure index often provides significant exposure to sectors whose revenues are indexed to inflation. For example, our licensed index, Dow Jones Brookfield Global Infrastructure offers over 60% exposure to Utilities (e.g., electricity, water, or gas utilities) and Transportation (e.g., toll roads, airports, freight rails or marine ports). These sectors either achieve the inflation pass-through in their tariff negotiations with regulators or have the CPI-linked rates permitted via the concession agreements.

Moreover, as infrastructure assets typically have low operating costs once established, infrastructure companies can maintain their margins and mitigate the impact of inflationary cost environments. Capital structure also matters when it comes to inflation-hedging. As such, many infrastructure companies are replacing floating-rate borrowings for fixed-rate debt instruments to cut exposure to potential rising short-term interest rates. Additionally, the long-term nature of fixed-rate infrastructure debt adds extra layer of protection to businesses over the rising inflation and rates.

For these reasons, we believe that listed infrastructure stands to benefit in the aftermath of Covid-19 pandemic.

Inflation beta

To test our hypothesis on the outperformance of Global infrastructure, relative to other asset classes, during environments with higher-than-expected inflation, we conducted a study examining the inflation beta (quantified in Table 1 as $\beta_{inflation}$) of major asset classes- which shows the correlation between the real returns of an asset class and the "unexpected inflation", being the difference between the year-over-year (y/y) realised U.S. inflation rate and lagged 1-year expected U.S. inflation. We used the United States data as it is readily accessible and naturally a large influence on New Zealand and global economies.

A positive inflation beta means that the asset class provided an inflation hedge in periods with unexpected inflation – i.e., a positive difference between realised inflation rate and lagged 1-year expected inflation. By contrast, a negative inflation beta implies that the asset class performs poorly when there is an inflation surprise or unexpected inflation. Results from our regression model show that Global Infrastructure has the highest inflation beta (3.02) among the four major asset classes, outperforming both Global REITs (2.71) and Global Equities (1.65). Not surprisingly to conventional economic theory, bonds had a negative inflation beta indicating its poor performance in inflationary environments.

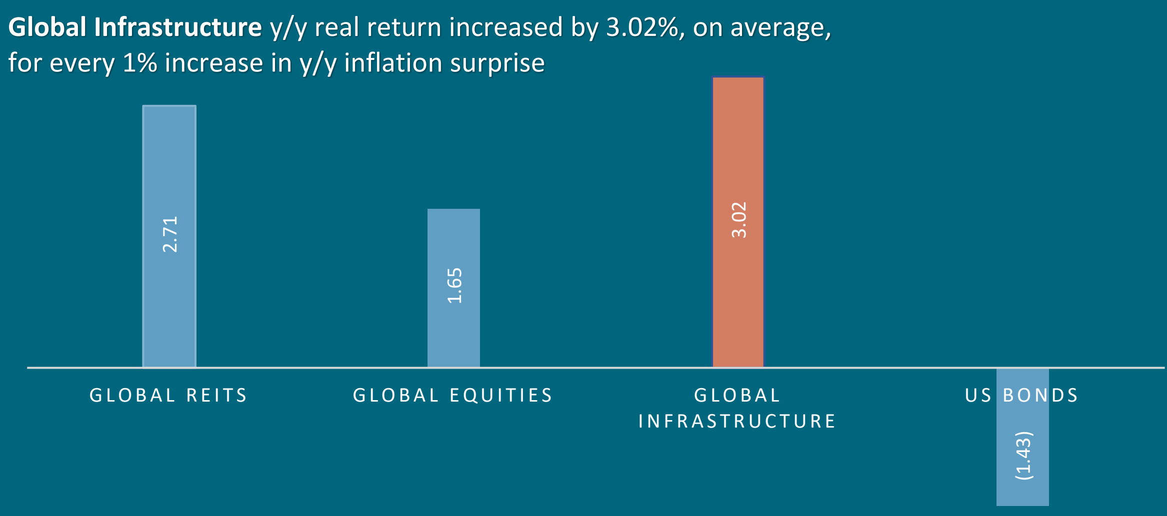


Figure 5: Inflation beta, January 2003-December 2021. Source: Kernel Wealth. Inflation beta is the linear regression beta (equation shown in Table 1) of 1-year real returns to the difference between the y/y realised inflation rate and lagged 1-year-ahead expected inflation rate (unexpected inflation or inflation surprise) and the level of the lagged 1-year-ahead expected inflation rate. The indices used as representative for Global REITs, Global Infrastructure, Global Equities, and US Bonds include S&P Global REIT, Dow Jones Brookfield Global Infrastructure, S&P Global 100, and S&P US Aggregate Bond, respectively.

Asset class	Aver. y/y return (USD)	Aver. y/y return, Real (USD)	Equation: $R_t=\alpha+\lambda*\mathbf{exp.inf}_{(t-1)}+\beta_{inflation}*\mathbf{unexp.inf}_t+\varepsilon_t$					
			α	t-Stat	λ	t-Stat	$\beta_{inflation}$	t-Stat
Global REITs	11.57%	9.39%	0.37	4.15	-8.58	-2.75	2.71^{**}	2.72
Global Equities	10.53%	8.35%	0.38	6.32	-9.47	-4.53	1.65^{*}	2.46
Global Infrastructure	13.18%	10.99%	0.20	2.95	-2.09	-0.90	3.02^{***}	4.06
US Bonds	3.94%	1.75%	0.03	1.93	-0.67	- 1.42	-1.43^{***}	-9.39

Table 1: Inflation beta of major asset classes. Source: Kernel Wealth proprietary analysis. Past performance is no indicator of future performance. Notes: The y/y returns are the year-over-year returns with monthly frequency. α represents the intercept of the equation, λ and βinflation represents the coefficients on the lagged 1-year-ahead expected inflation and unexpected inflation, respectively. Lagged 1-year-ahead expected inflation is the 1-year lagged value of the median expected price change next 12 months (from Surveys of Consumers, University of Michigan, University of Michigan: Inflation expectation [MICH], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/MICH). Unexpected inflation is the difference between the year over year (y/y) realised inflation rate (U.S. CPI) and lagged 1-year expected inflation. The y/y realised inflation rate is measured by the y/y change in Consumer Price Index, all items for all urban consumers, published by the U.S. Bureau of Labour Statistics. Rt is the real y/y return in month t (in USD) of the four asset classes. The monthly y/y returns (in USD) of the S&P Global REIT, S&P Global 100, Dow Jones Brookfield Global Infrastructure, S&P US Aggregate Bond during period from 31/01/2003 to 31/12/2021 are used to track the performance of Global REITs, Global Equities, Global Infrastructure and US Bonds, respectively. *, **, *** means statistically significant at the 10% level, the 5% level and the 1% level, respectively.

Infrastructure has historically outperformed in inflationary environments

In addition to its relative performance, Global Infrastructure has shown to deliver more attractive absolute returns than Global REITs, Global Equities and Bonds in periods of rising inflation and inflation surprise.

In particular, since 2003 in rising inflation periods, i.e., periods with positive difference between the y/y realised inflation rate and its 1-year lagged value, Global Infrastructure has earned, on average, 14.15% y/y real return, surpassing Global REITs and Global Equities significantly by 1.15% and 3.43%, respectively.

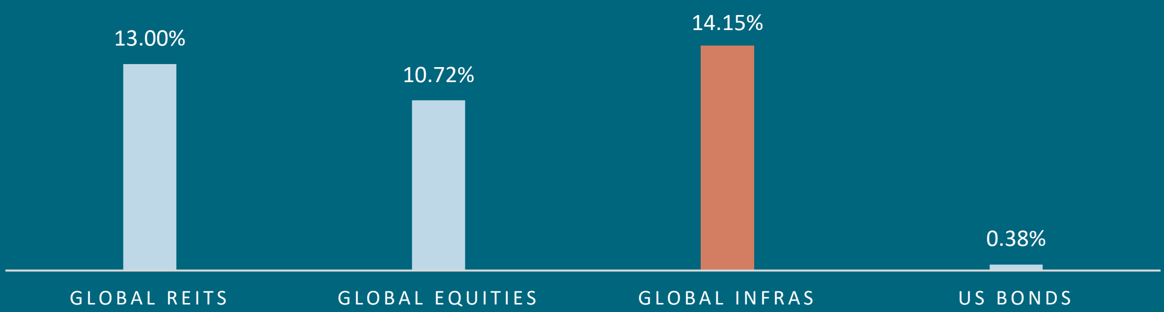


Figure 6: Average y/y real return (USD, frequency: monthly) in periods of rising inflation since 2003. Source: Kernel Wealth. Notes: The y/y returns (USD, frequency: monthly) of the S&P Global REIT, S&P Global 100, Dow Jones Brookfield Global Infrastructure, S&P US Aggregate Bond during period from 31/01/2003 to 31/12/2021 are used to track the performance of Global REITs, Global Equities, Global Infrastructure and US Bonds. Periods of rising inflation are periods with positive difference between the y/y realised inflation rate (measured by the y/y change in U.S. CPI) and the 1-year lagged value of the realised inflation rate.

Notably, in periods with "higher-than-expected" inflation (inflation surprise) since 2003, Global Infrastructure has on average outperformed Global Equities by an even larger amount of over 4%.

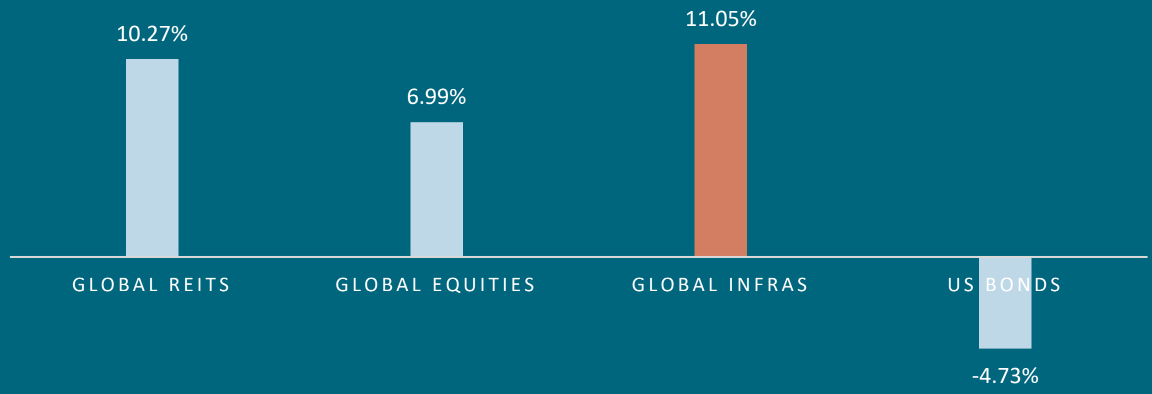


Figure 7: Average y/y real return (USD, frequency: monthly) in periods of inflation surprise since 2003. Source: Kernel Wealth. Notes: The y/y returns (USD, frequency: monthly) of the S&P Global REIT, S&P Global 100, Dow Jones Brookfield Global Infrastructure, S&P US Aggregate Bond during period from 31/01/2003 to 31/12/2021 are used to track the performance of Global REITs, Global Equities, Global Infrastructure and US Bonds. Periods of inflation surprise are periods with positive difference between the y/y realised inflation rate (measured by the y/y change in U.S. CPI) and the 1-year lagged value of the median expected price change next 12 months (from Surveys of Consumers, University of Michigan, University of Michigan: Inflation expectation [MICH], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/MICH).

Figure 8 below illustrates the 12-month rolling returns of Global Equities and Global Infrastructure since 2003. It is clearly seen that in periods with "higher-than-expected" inflation and moderating economic growth, for instance, (i) during 2005-2006 when global economic growth slowed noticeably from the strong expansion in 2004 coupled with the higher-than-expected inflation driven by higher oil prices or (ii) during 2010-2011 when world economy slowed down with high inflation surprise during the time of the European sovereign debt crisis, Global Infrastructure did show better performance relative to that of Global Equities. To be more specific, during these periods, while Global Equities was down -5%, on average, in terms of the y/y real return, Global Infrastructure yielded +7.01%. The period where we saw Global Infrastructure under-performed Global Equities was during the Covid-19 pandemic from 2020 to 2021. Due to the negative impact that the pandemic had on the global transportation, traffic consumptions reduced sharply, and supply-chains worldwide were congested. However, the demand for these assets has started to increase for the year 2021 and is expected to recover soon as the world starts to move again.

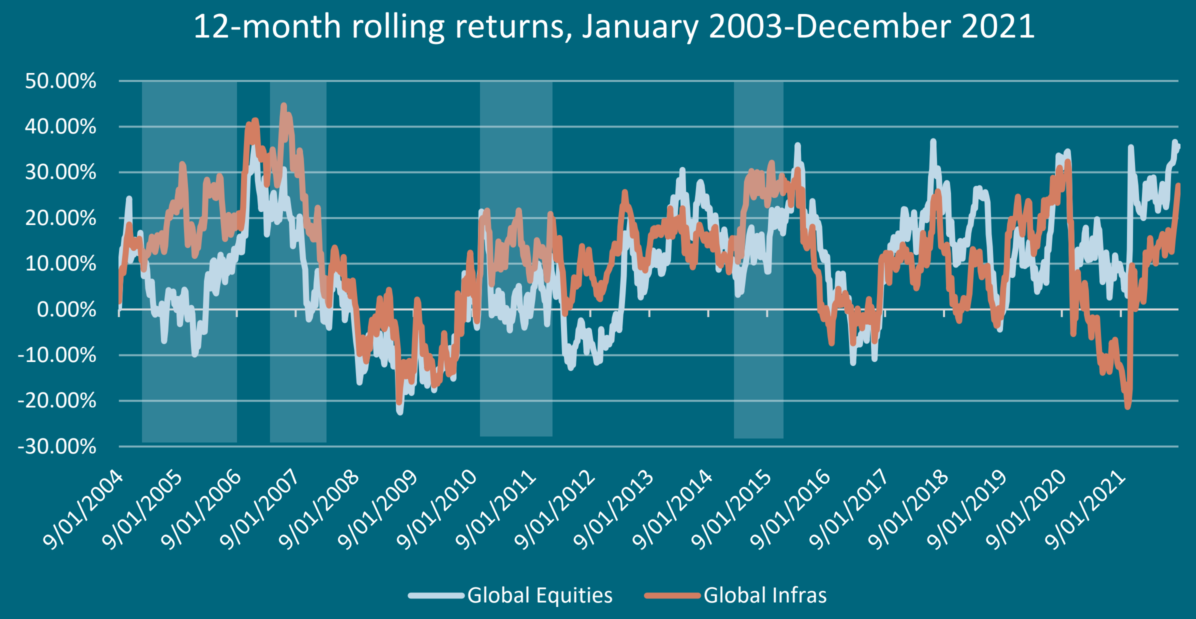


Figure 8: 12-month rolling returns of Global Equities and Global Infrastructure, Jan 2003-Dec 2021. Source: Kernel Wealth. Notes: **Shaded areas represent periods with inflation surprise** (higher-than-expected inflation) **and slowing economic growth**. Historical performance of the S&P Global 100 and Dow Jones Brookfield Global Infrastructure is used to track the performance of Global Equities and Global Infrastructure, respectively. Periods of inflation surprise are periods with positive difference between the y/y realised inflation rate (measured by the y/y change in U.S. CPI) and the 1-year lagged value of the median expected price change next 12 months (from Surveys of Consumers, University of Michigan, University of Michigan: Inflation expectation [MICH], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/MICH). Periods with slowing economic growth are periods with negative difference between the y/y realised GDP growth rate (measured by the y/y change in the normalised GDP index for the U.S., published by OECD) and its 1-year lagged value.

With countries injecting large amounts of cash into the economy through stimulus and other spending programs during the Covid-19 pandemic, in 2020, we observed the largest one-year debt surge[1] since World War II. As global economy enters in 2022, the record-high levels of public and private debts, rising energy prices and the ongoing demand-supply imbalances continues to impose inflationary pressures. Given this circumstance, we believe Global Infrastructure is well-positioned to meet the challenges in an environment of historic low yields, rising inflation concerns and heightened equity volatility risks.

3. Favourable relative valuations on listed infrastructure versus broad equities

Based on the Enterprise value to EBITDA multiple, global utilities and users-pay infrastructure has been traded below its long-term average (10x-12x EV/EBITDA range since 2012). After adjusting the earnings of transportation infrastructure companies, especially airports and railroads, for the Covid-19 pandemic impact, Infrastructure has lower EV/EBITDA than the MSCI World Index during 2020-2021 period. We speculate the following reasons for this. First, it is because the past decade has seen a significant decline in the cost of capital for utility and

[1] According to IMF, public (private) debt rose from around 70% (164%) of GDP in 2007 to 124%(178%) of the GDP in 2020.

infrastructure companies. Second, earnings growth potential is expected to increase as the industry evolves to seize the opportunities of rising trends in digital infrastructure, renewable energy, and sustainable transportation. With that in mind, we believe that listed infrastructure deserves increased investor attention in 2022.

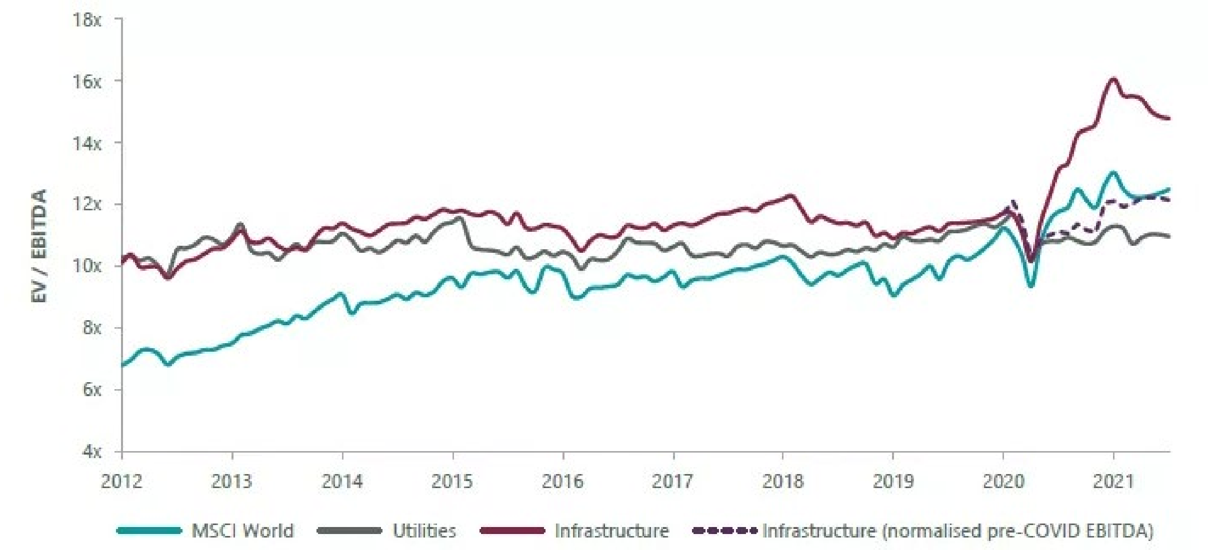


Figure 9: EV/EBITDA multiple of Utility and User-pays Infrastructure Source: ClearBridge Investments and FactSet Research Systems. The consensus EV/EBITDA is the arithmetic average across utility and user-pays infrastructure companies. The multiple is calculated by current EV divided by forward EBITDA.

4. Global listed infrastructure in a mixed-asset portfolio

Due to the relatively solid and stable earnings profile even in times of high market volatility, Global Infrastructure generally has better downside protection compared to other asset classes. In addition to its downside resilience, the low correlation to NZ Equities and NZ Bonds as well as the less-than-perfect correlation to Global Equities (Table 2) signify a potential diversification benefit of Global Infrastructure in a mixed-asset portfolio.

	Global Infrastructure	Global Equities	Global REITs	NZ Equities	NZ Bonds	US Bonds
Global Infrastructure	1					
Global Equities	0.79	1				
Global REITs	0.70	0.65	1			
NZ Equities	0.41	0.40	0.39	1		
NZ Bonds	0.18	-0.01	0.13	-0.01	1	
US Bonds	0.25	0.20	0.05	-0.20	0.36	1

Table 2: Correlation of various asset classes (2003-2021). Source: Kernel Wealth. Returns are calculated based on the total return series of the following indices: S&P Global REIT, S&P Global 100, Dow Jones Brookfield Global Infrastructure, S&P NZX 50, S&P US Aggregate Bond and S&P NZ Aggregate Bond. Correlations are based on 939 weekly total returns from January 2003 to December 2021.

To test if adding Global Infrastructure to the portfolio can reduce the overall volatility while improving the risk-adjusted returns, we have conducted a study investigating performance of six asset classes over 939 one-year rolling periods from January 2003 to December 2021.

1-year rolling performance (Jan 2003-December 2021) - 939 weekly intervals	60% Stock /40% Bond		80% Stock /20% Bond		100% Stock /0% Bond	
	A1	A2	B1	B2	C1	C2
Global REITs	5%	5%	5%	5%	5%	5%
Global Infrastructure	**0%**	**5%**	**0%**	**5%**	**0%**	**5%**
Global Equities	**43%**	**38%**	**59%**	**54%**	**75%**	**70%**
NZ Equities	12%	12%	16%	16%	20%	20%
NZ Bonds	16%	16%	8%	8%	0%	0%
US Bonds	24%	24%	12%	12%	0%	0%
probability that adding Infrastructure reduces volatility		93.61%		94.25%		94.75%
probability that adding Infrastructure improves risk-adjusted returns		**69.22%**		**70.29%**		**70.61%**
Average annualized 1-year rolling portfolio volatility	8.80%	8.68%	10.61%	10.45%	12.76%	12.59%
Average annualized 1-year rolling portfolio returns	7.63%	7.76%	8.69%	8.82%	9.75%	9.88%
Average annualized 1-year rolling risk-adjusted returns	0.96	0.99	0.91	0.97	0.91	0.94

Table 3: Performance of various mixed-asset portfolios. Source: Kernel Wealth. Weekly returns series from January 2003 to December 2021 based on the Total Return series of the following indices: S&P Global REIT, S&P Global 100, Dow Jones Brookfield Global Infrastructure, S&P NZX 50, S&P US Aggregate Bond and S&P NZ Aggregate Bond. Average 1-year rolling standard deviation and returns of portfolios are calculated from 939 rolling periods.

Table 3 demonstrates the diversification benefits of Global Infrastructure to a mixed-asset portfolio. Specifically, substituting 5% of the portfolio in Global Equities for Global Infrastructure, on average, could bring the portfolio volatility down by 0.12%-0.18%, respectively for the stylized combination of 60% stock and 40% bond (portfolio A1 vs. A2), 80% stock and 20% bond (portfolio B1 vs. B2), and 100% stock (portfolio C1 vs. C2). Replacing a higher proportion (for instance, 10%) of Global Equities by Global Infrastructure can further reduce the volatility (by over 0.30%). More importantly, of all 939 one-year rolling periods, across all asset allocation plans, around 94% witnessed a reduction in portfolio volatility and 70% experienced an increase in risk-adjusted returns if Global Infrastructure is added into the portfolio.

Conclusion

With broad equities appearing expensive on some valuation metrics in late 2021, raising questions about potential downside risk and lower future return expectations compared to the past decade, the strong historic performance of listed infrastructure in inflationary environments as well as its defensive characteristics make the asset class appealing. Also, from a valuation perspective, global infrastructure appears attractive relative to that of broader equities. These indicators would signal potential for a period of outperformance by listed infrastructure. Overall, given its unique investment attributes and current favourable valuation, we believe that strong consideration should be given for listed infrastructure as part of creating a well-diversified asset portfolio.

Written By:

Chi Nguyen, PhD
Research Analyst

Raj Gooptu

Manager, Products & Relationships
Mobile: 027 266 1469
Email: raj@kernelwealth.co.nz

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