Private Infrastructures: perspectives and added value through active management

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1. Introduction

In an economic environment marked by a future outlook in which interest rates and inflation may be higher and more volatile, investments in private infrastructure assets are an attractive alternative for investors seeking stability of returns, a good risk-adjusted return trade-off, and diversification of their overall portfolios. This report examines how active management in private infrastructure can enhance the value generated by this asset class.

The report is structured in six main sections.

In section 2, an introduction to real assets is given, highlighting the characteristics and benefits of private infrastructure within this framework.

Section 3 explores infrastructure as an asset class in detail, addressing its historical evolution and future trends, considering structural changes and market dynamics.

Section 4 explores active management as a key tool for maximising the value added in this type of investment, highlighting the levers available to managers to generate value.

Section 5 examines the sources of volatility affecting the valuation of these assets, particularly as they relate to interest rates and inflation.

Finally, section 6 presents a case study on the EDIF I fund, exemplifying how an actively managed strategy can achieve stable returns and positive, recurrent alpha generation.

This report and our analysis aims to provide investors with a comprehensive view of the opportunities and challenges presented by private infrastructure, particularly in the context of an economic scenario with the prospect of higher interest rates and more persistent inflation.

2. Introduction: Real Assets

2.1. Taxonomy of real assets

Real assets are physical assets, usually tangible, that have intrinsic value. In short, their nature and properties make them valuable in themselves, through their exploitation. This is one of the keys to differentiating them from financial assets, whose value, mostly economic, depends on their ability to be transferred. The different types of real assets that we can find in the markets are:

- **Infrastructure**. In finance, infrastructure is defined as assets and systems that are fundamental to the proper functioning of an economy and provide an essential service to the society or its users. The basic characteristics of infrastructure assets, which make them attractive to take positions in, are related to their monopolistic, high barriers to entry and essential nature, as well as the generation of recurrent cash flows with a high degree of visibility and long duration. Furthermore, infrastructure is not correlated with traditional securities and may be safer in market downturns.
- **Real estate**. Purchase of a real estate property, but transferable, with the aim of obtaining a return, not to benefit from its use. We can have residential real estate, offices, shopping centres, among others.
- **Natural resources**. Natural resources are real assets that are found undisturbed and in large quantities in nature. In this category we would include water, wind, as well as some raw materials, as long as it is undisturbed. Likewise, undeveloped land is included as a natural resource, as well as undeveloped forests.
- **Raw materials.** Raw materials are standardised goods that exist in abundance and are usually extracted from nature to construct or manufacture consumer goods. To differentiate them from natural resources, commodities are often understood to incorporate certain alterations by humans. To the extent that investors often take positions in these types of goods via futures or forwards, they are considered to be listed alternative assets.

2.2. Real assets: diversifying power in global portfolios

Recently, this group of assets has been receiving particular attention from investors seeking to diversify their portfolios beyond traditional assets. Some general characteristics of real assets, which present important advantages for investment portfolios, are as follows:

- **Negative correlation** with financial assets, which offers diversification to portfolios. As can be seen in the correlation matrix below, the correlation of global infrastructures is -0.1 with global fixed income and equities. In addition, they present correlations close to 0 with the rest of the alternative assets and unlisted assets.
- **Protection against inflation tail scenarios**, insofar as some of these real assets form a direct part of the price indicators. In the case of infrastructure, service tariffs are usually linked to a consumer price index on the basis of which they are revised annually.
- **Ability to offer a positive absolute return** from cash flow generation and asset appreciation. These advantages derive from some of the special characteristics of

real assets, which sometimes offer special risk premia, such as the illiquidity premium:

- **Less liquidity**. While traditional assets are highly liquid, real assets, with exceptions, can be more difficult to convert into cash. The markets in which they are transacted, usually private, are less liquid, efficient and accessible that traditional financial markets.
- **Long-term investment**. As a result of being less liquid, they will generally be longer-term investments that those in traditional securities.
- **Large investment volumes**. Large disbursement volumes will generally be required to the extent that non-divisible assets will be involved.

Correlation matrix of private and traditional market assets

	1	2	3	4	5	6	7	8	9	10	11	12
1 Global Fixed Income	1,0											
2 Global Equity	0,3	1,0										
3 Real Estate Core USA	-0,2	0,0	1,0									
4 Real Estate Core Europe	-0,3	0,2	0,8	1,0								
5 Real Estate Core APAC	-0,2	0,0	0,8	0,8	1,0							
6 Global Infrastructure	-0,1	-0,1	0,3	0,1	0,2	1,0						
7 Direct Lending	-0,1	0,7	0,3	0,4	0,3	0,1	1,0					
8 Venture Capital	0,0	0,5	0,3	0,5	0,3	0,1	0,5	1,0				
9 Private Equity	0,0	0,8	0,3	0,5	0,3	0,1	0,9	0,8	1,0			
10 Equity Long-Short (HF)	0,2	1,0	0,0	0,5	0,0	-0,1	0,7	0,6	0,9	1,0		
11 Relative Value (HF)	0,1	0,9	-0,1	0,2	0,0	-0,1	0,9	0,5	0,8	0,9	1,0	
12 Macro (HF)	0,4	0,4	0,2	0,1	-0,2	-0,1	0,1	0,2	0,2	0,4	0,3	1,0

Source: Afi, JPMorgan, MSCI, HFR, NCREIF

2.3. Real assets: investment leverage

When deciding to take positions in real assets, two main investment channels can be assumed, direct and indirect. Each of these investment vehicles is briefly discussed below:

- **Direct.** This involves the direct purchase of the asset, which requires a generally significant outlay apart from investor expertise in the private markets. It therefore requires a very large total investment volume to ensure a minimum level of diversification across several assets. It also requires a high level of knowledge of the sector, which results in high costs to carry out the investment. However, as it is a live investment, the fees associated with the delegation of the analysis and management of the investment funds are not borne. On the positive side, the possibilities of control over the investment (in terms of sector selection, geography, counterparty, management and subsequent sale) may be higher.
- **Indirect.** Indirect exposure will be through vehicles which, in turn, will invest in assets. In this case, costs tend to be lower compared to direct investment, albeit moderate and related to the analysis of shares (listed markets) or due diligence (closed-end or evergreen funds). Fees become more relevant, with structures that can be complex.
  - **Listed companies.** This consists of investing in companies listed on the financial markets. For example, in the case of infrastructure, a position in the capital of

Naturgy or an ETF of the S&P Infrastructures. Although these companies tend to have high dividend yields and high liquidity, it eliminates the advantages of private markets, as they have a high correlation with the stock market, as well as the assumption of risks not associated with the asset (business management risk, risk of contagion from other areas of the company not intrinsic to the asset to which exposure is sought, etc.). Additionally, investing in listed companies to seek exposure to infrastructure assets significantly limits the investable universe, as only a portion of the infrastructure assets are listed

- **Closed-end funds (closed-end funds).** A fund with a structure similar to private equity, in which the fund has a specific investment horizon, with three well-defined phases: investment period, management period and disinvestment period. The main feature of the closed-end fund is that there are no defined liquidity windows that can facilitate the withdrawal of the investment, so the investor's commitment to the fund and its managers is maximum (occasionally the manager facilitates liquidity events and the secondary market exists, but is still underdeveloped). This will avoid strong price volatility, insofar as there will be no selling pressure from mass redemptions, and the alignment of interests between the managers and the fund will be high.
- **Open-ended funds (evergreen funds).** An open-ended fund, unlike the former, will have frequent and regular entry and exit windows, allowing the investor to enter and exit the strategy from time to time, despite the very long-term nature of the underlying investment. Although this may seem, a priori, positive, insofar as it allows an exit route, it can become a disadvantage, unlike what we have seen in closed-end funds, massive redemptions could occur in concentrated periods of time that require the accelerated sale of underlying assets, and these liquidity windows (gates) could close. On the positive side, the fund's flexibility in raising funds allows it to take advantage of new investment opportunities in the sector and, above all, open-ended fund managers prefer longer investment horizons in asset holdings, and have a preference for assets that generate high stable cash flows

3. Infrastructures: characteristics, historical evolution and future trends

3.1. Main features

Infrastructure refers to essential assets that are necessary for the social well-being of a community by providing energy, telecommunication, transport, health, safety and security services, among others. The basic characteristics of these assets, as an investment asset and which are summarised in the table, are as follows:

- **Real assets** that generally require a significant outlay and are essential to the functioning of an economy. For example, within transport infrastructures, there are infrastructures such as roads, airports or ports, among others, but positions can also be taken in *utilities* (water treatment or electricity transmission systems), energy (solar and wind renewable, waste to energy facilities, biomass and biogas plants) or communications (data centres, satellites, fibre optic networks). In addition to these economic infrastructures, social infrastructures (aimed at improving the quality of life of a society, focusing on hospitals, correctional facilities, educational centres) are also often distinguished from assets very similar to real estate.
- The **high capital cost of** planning, construction and maintenance of infrastructure as well as the regulated nature of their contracts or the licensing required means that the **barriers to entry** are high and, on many occasions, monopolies arise. This may be the case with ports or airports, where there is generally only one within a region.
- The essential nature of infrastructure means that **demand tends to be more stable and independent of the cycle and can be forecasted more easily**. This will be the case, for example, with water treatment systems or power lines. This means that the risk associated with infrastructures tends to be lower than that of other assets, such as equities. This is what Rothballer and Kaserer (2012)[1] find in their studies, when analysing the risk premia of infrastructures compared to those of listed assets.
- The **useful life** of an infrastructure tends to be **long term**, with proper maintenance, which means that investments in this asset can have a long duration. Likewise, we can find infrastructures that are in different stages of their useful life: design or development of the project, construction or operation.
- An infrastructure that is in its last stage of life (operation) will have low operating and recurring costs and stable cash flows. Bitsch (2012) shows in his study how the volatility of infrastructure cash flows tends to be lower than other types of assets.
- **Revenues** are often **linked to inflation**, to the extent that the contracts on which the services are based contain such adjustment clauses. This is the case, for example, for utility tariffs, which are negotiated annually with regulators. However, this is not widespread in all infrastructures, so that protection against inflationary events may be partial (Bird et al. (2012)).
- **The correlation of this asset with traditional financial assets is low**, playing an important diversification role within portfolios.

Key characteristics of infrastructure as an investment asset

Key characteristics of infrastructure as an investment asset						
Position in core assets	Existence of barriers to entry	Inelastic demand	Long life cycle	Generation of stable recurring cashflows	Inflation-linked cashflows	Low correlation with other assets
Critical assets for the economy or society that have a central role in its operation (e.g. airports, data centers, electricity grid, renewables, hospitals, etc.)	On many occasions they present high entry costs or regulations that limit competition. High capex also a barrier of entry.	In many cases, assets with stable demand and reduced dependence on the volatility of the economic cycle (e.g. water sanitation networks, electricity networks)	Extended asset life, often several decades and including several phases (design, construction, operation)	Operating infrastructures generate predictable, stable, and recurring revenues. Long term contracts with reliable off-takers that protect the EBITDA of the project.	Income structure of projects generally linked to the evolution of inflation.	Low correlation of infrastructure returns with other types of financial assets.

Source: own elaboration based on CAIA Association and information from different SGIIC.

3.2. Classification of infrastructure

As can be seen in the table, we can classify infrastructure investment strategies according to three factors: risk profile, size of operations and geography.

Infrastructure classification factors

	Key factors	Lower Risk-Return ratio	→	Higher Risk-Return ratio
Risk profile		**Super Core / Core**	**Core + / Value Add**	**Opportunistic / Private Equity Like**
Undelying revenue/risk	Cycle sensitivity Demand factors	Regulated contracts Usually long-term contracts Leases By availability	Demand risk, contracts with offtakers tier1	Competitive & low specific regulation
Sector	Final use of the structure (essential service?) Barriers to entry	Utilities, regulated generation, availability transmission	Transportation, Social, Energy (generation), Monopolistic Comms	Energy transition
Management Strategy	Added value and active manage Generation of stable high cash multiples Time horizon Capex	Low room for improvement	Broader opportunity to add value	Very active and opportunistic management Business Focus
Development Status	Permitting Risk Construction Risk Usage History Availability	Brownfield (built)	Brownfield with limited growth requirements	Greenfield (new project)
Size of operations	**Economies of scale Volume Access Capacity Usage History Availability**	**Large & Mega large**	**Mid Market**	**Small & Mid Market**
Geography	**Regulation Political risk Legal risk**	**Developed economies**	(regulation and policies supporting the business and the existence of a supply/demand business case)	**Emerging economies**

Source: own elaboration based on CAIA Association and information from different SGIIC.

There is no closed definition of Super Core, Core, Core+, Value add and Private Equity Like. These concepts refer to the risk-return profile of the strategy and are determined by several factors: type of contract, sectors, management strategy and stage of development. The risk profile must therefore be defined in terms of all the variables and not just one in isolation.

Thus, for example, investment in *utilities* will tend to be Core, but it could become a strategy with a high risk profile if it is an asset that requires heavy investment in technology and modernisation or when the strategy is to buy taking advantage of some extraordinary circumstance (bankruptcy of the owner, for example) and sell quickly in search of a strong revaluation.

The fund's manager strategy is the most difficult factor to quantify and it is therefore difficult to rank and compare investment funds with each other. Each manager/investor may have a different view of what active management and value creation means.

- **Super core and core:** This includes essential assets, with very low operational risk and recurring cash flow generation as the main source of profitability. This includes regulated contracts and sectors with inelastic demand (utilities). In this case, the active management of the fund will be very limited, as the aim is not to change (or improve) the nature of the infrastructure. They are generally located in developed countries and in environments with stable and transparent regulation, with a monopolistic position. The main risk in this strategy is regulatory risk, although it is usually limited.
- **Core+:** More sensitive to the cycle, exposed to changes in demand. Although they present significant barriers to entry and have risk-limiting factors (long-term contracts, long-term regulated prices). Core+ infrastructures do not enjoy the monopoly character of core and super core infrastructures. The main risk will be contract breakage or regulatory change, while the source of revenue will be mainly from recurring cash flows, with slight capital appreciation. In this case, some upgrading of the infrastructure itself may be possible, to improve access to demand, but without changing its nature.
- **Value add:** An investment which requires improvements in order to increase the demand for the good or service, which, unlike core+ strategies, will involve a change in the nature of the infrastructure. Technological projects, without market power, as well as projects in the greenfield and/or yellowfield phase, tend to become more relevant. Demand risks become more important, with a significant competition risk. The generation of rents becomes less important in the face of capital appreciation due to the improvement of infrastructure.
- **Opportunistic or private equity like:** Higher risk strategy insofar as they are assets that are generally in earlier stages of development and consequently, higher operational risks are assumed, with possible excessive levels of leverage and market risk. The profitability objective becomes almost entirely one of capital appreciation, as the infrastructure is unlikely to be in a position to generate cash flows.

Infrastructure classification by Risk Profile

	Equity			
	Super core / Core	Core +	Value-add	Oportunistic / Private Equity
Description	Essential assets, generally with very low operational risk and that generate returns. They are generally found in developed countries with transparent regulation and stable political environments.	Greater sensitivity to the cycle and exposed to changes in demand, although they have limiting risk factors (long-term contracts, long-term regulated prices, high barriers to entry for competitors).	Assets with moderate to high risk insofar as the investment is focused on projects that need certain improvements. They focus on asset enhancement to increase demand for the asset. It usually has a greenfield component and they tend to focus on technological development without market power.	A higher-risk strategy because they are assets that require a strategic change, sometimes with a greenfield component. The profitability objective would be less focused on the generation of stable cash flows and more on the potential for capital appreciation due to the value of the underlying asset. Investment in infrastructure with Private Equity techniques (objective of giving value, not generating flows).
Risks	Regulatory changes and failures in initial assumptions (unexpected disbursements).	Regulatory changes, breach of contracts	Demand risk and entry of competitors into the market	Improper operating assumptions and leverage levels. Market risk.
Opportunities	Monopoly position and stable environment that offers certainty about investment.	Risk control factors		Early entry with significant capital appreciation potential
Dominant Contract	Regulated	Demand	Competitive	Change of business model
Management type	Passive, with no relevant changes to the infrastructure beyond maintenance	Moderately active, possible improvements to expand the depth of demand	Active, improvements that tend to modify the nature of the infrastructure developed	Active, Developing, and Ready to Build Infrastructures
Return sources	Income	Income and Capital Appreciation	Income and Capital Appreciation	Capital Appreciation
Income certainty	High	Medium-high	Medium	Medium-Low
Cycle sensitivity	Low	Medium	Medium	High
Operational Complexity	Medium	Medium-high	Medium-high	High
Characteristics of the demand	Stable and constant	Variable	Growing	Nonexistent
Market power	Monopoly	Not monopoly status, but significant barriers to entry that offer some market power	Not at present, although they could have some pricing power	No

Source: own elaboration based on CAIA Association and information from different SGIIC.

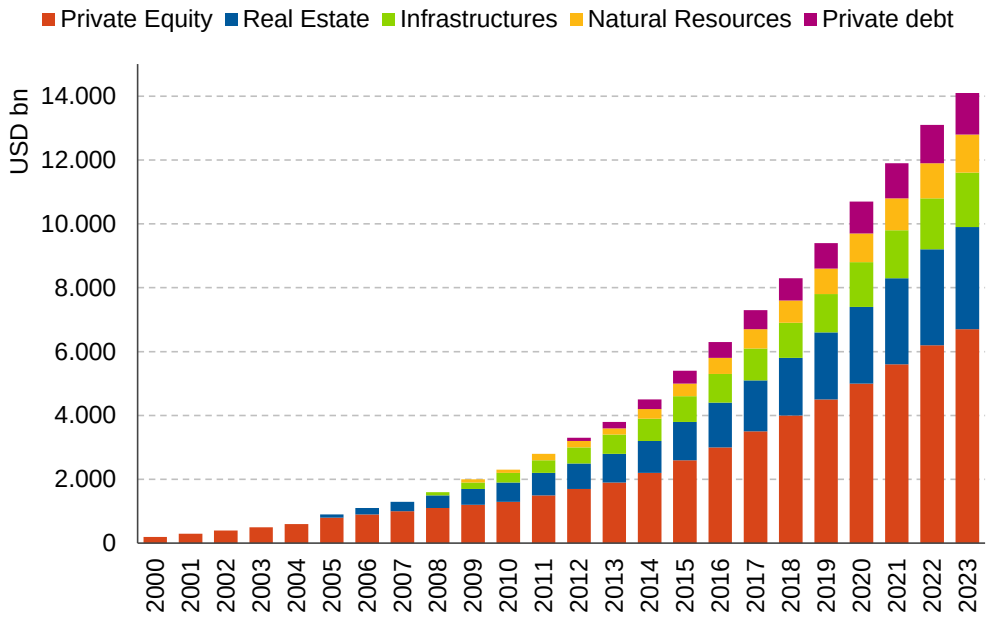
3.3. Historical developments in the infrastructure market

The infrastructure market has experienced profound development and growth over the last decades, particularly in advanced economies. This market, traditionally dominated by publicly financed projects, has seen an increasing participation of private capital and institutional investors. Economic liberalisation and fiscal constraints, together with the growing demand for infrastructure and the development of capital markets, opened the door to private sector participation, allowing governments to transfer part of the financial burden and operational risks. This resulted in structural changes that transformed the market from its early stages to the level of maturity and development it is today.

Assets under management in private markets grew at double-digit average annual rates across all regions and asset classes. In the case of infrastructure, the CAGR between 2013 and 2023 was around 11%, with a marked concentration of investments in the US and Europe (together, both regions account for more than 80% of assets under management). Major trends such as urbanisation, population growth, technological

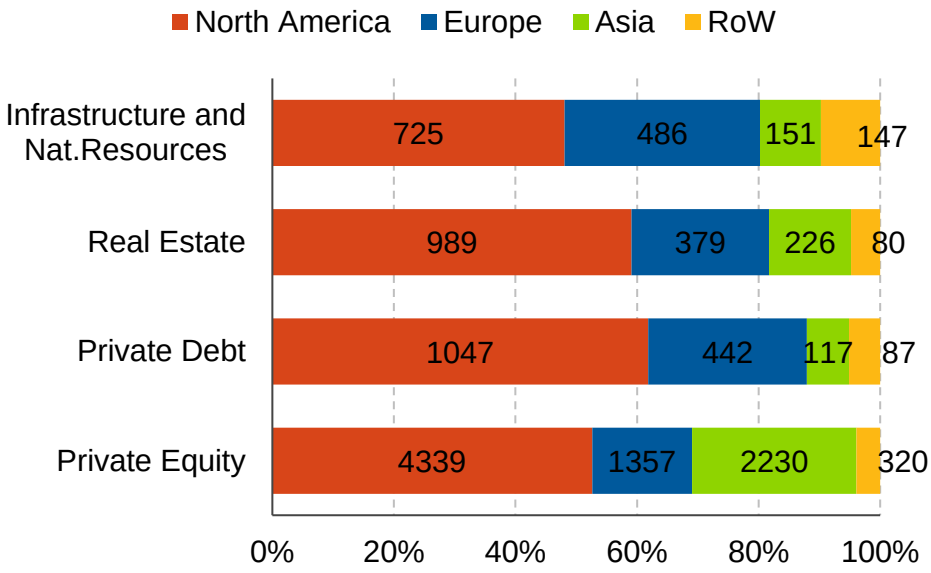
advances and environmental, social and governance (ESG) factors have been underpinning this growth, which in turn has been supported by factors such as public-private partnerships, privatisation of public assets and the development of capital markets.

Assets under management in private markets



Source: BlackRock

Private markets: assets under management by region (JUN23, USD bn and %)

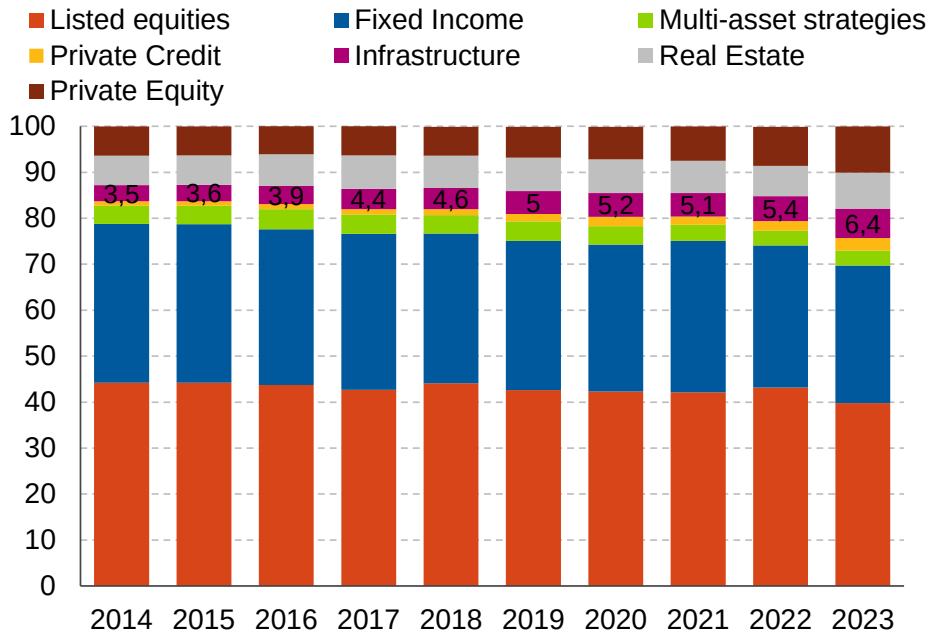


Source: Prequin

Consistent with the above, there has been an expansion in the allocation of institutional investors' portfolios to these assets. As a reference, in 2014 infrastructures and other real assets (excluding real estate) accounted for 3.5% of the *asset allocation* of these

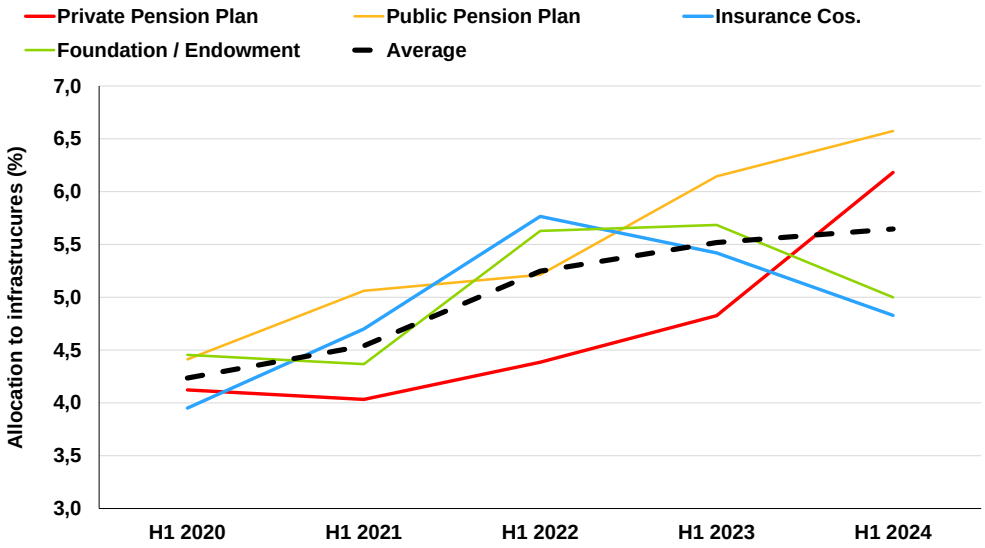
agents, a value that has almost doubled up to 2023, with a practically uninterrupted upward trend, except for the minimal setback experienced in 2021, in the midst of the pandemic hangover. The upward trend is also visible for other private assets such as Private Equity.

Distribution of weights by institutional investors by main listed and private asset classes in the global asset allocation (% of total)



Source: CEM Benchmarking

Historical average allocation (global) by type of institution (%), H1 2020 - H1 2024



Source: Infrastructure Investor

The sustained increase in the allocation to infrastructure is common among all major traditional asset investors. The average weight devoted to the asset in the overall asset allocation rises from 4% to 5.5% between 2020-2024. Public pension funds lead this growth, reaching almost 7% in the first half of 2024, which is likely to be related to their focus on stable returns and stable levels of cash yield over long horizons. Insurers, after

initial growth, slightly reduce their allocation after 2023, a move possibly associated with regulatory uncertainty or liquidity considerations (variable by jurisdiction), while foundations and *endowments* show a similar trend to the average. The widespread interest in infrastructure among long-term real money investors reflects a growing preference for an asset with stable and low volatile returns, especially in a context of high interest rates and higher inflation expectations relative to recent history.

We break down the last 20 years into four stages to better understand the structural development of the infrastructure market. In the decade 2000-2010, growth was steady, albeit relatively modest, in a phase of exploration of the asset class. From 2010 until the COVID-19 pandemic, there was a notable acceleration due to the increasing relevance of the trends identified as central to the development of the infrastructure market. While the pandemic abruptly slowed the global economy and asset growth, the subsequent recovery has been swift and marked by large infrastructure stimulus packages. For example, the *Infrastructure Investment and Jobs Act* in the US (2021) directed $1.2 trillion to infrastructure projects. Policies implemented during and after the pandemic appear to have accelerated infrastructure development in developed countries.

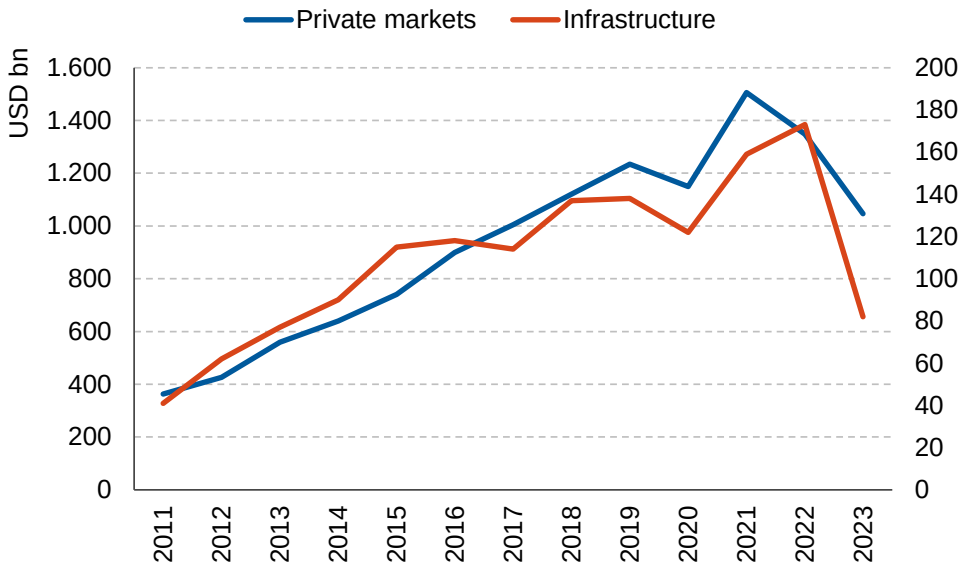
Taking a longer-term view, we believe that the broad drivers of the need for global infrastructure investment are clear. In general, governments are increasingly aware of the need to provide an appropriate level of infrastructure endowment (physical capital) to contribute to the growth potential of economies, while improving the security of supply of critical infrastructure, all at minimal cost to the end consumer. On the other hand, the so-called "4D" megatrends, referring to decarbonisation, digitalisation, deglobalisation and demographic change, represent medium and long-term tailwinds for the growth of global, listed and/or private infrastructure investment. The energy transition, increasingly present on global political agendas, is a clear driver for investment in renewable energy. The rise of digital infrastructure is another powerful infrastructure driver, such as data centres, fibre optic networks and 5G, and the tremendous deployment of artificial intelligence investment.

In 2022-2023, infrastructure investment faced challenges driven by rising inflation and interest rates. While these conditions can increase financing costs, many infrastructure projects are insulated from such pressures due to fixed or hedged debt structures. Additionally, infrastructure assets' inflation-linked revenues enhance their role as a long-term hedge, making them particularly attractive in periods of structurally higher inflation. However, a significant factor influencing allocation has been the denominator effect: as declining valuations in public equities and fixed income reduced overall portfolio sizes, institutional investors faced pressure to rebalance. This often led to a prioritization of credit and other fixed-income investments, which provided more immediate liquidity and income, over infrastructure projects that typically require longer-term capital commitments. Looking ahead, the anticipated pivot in monetary policy during 2024-2025 could ease these pressures, potentially improving relative valuations for infrastructure and enabling a rebalancing of portfolios in its favor. Infrastructure's capacity to generate stable, inflation-protected returns over the long term remains a critical consideration, even amid short-term shifts toward alternative asset classes like credit.

3.4. Private investment in infrastructure. Fundraising.

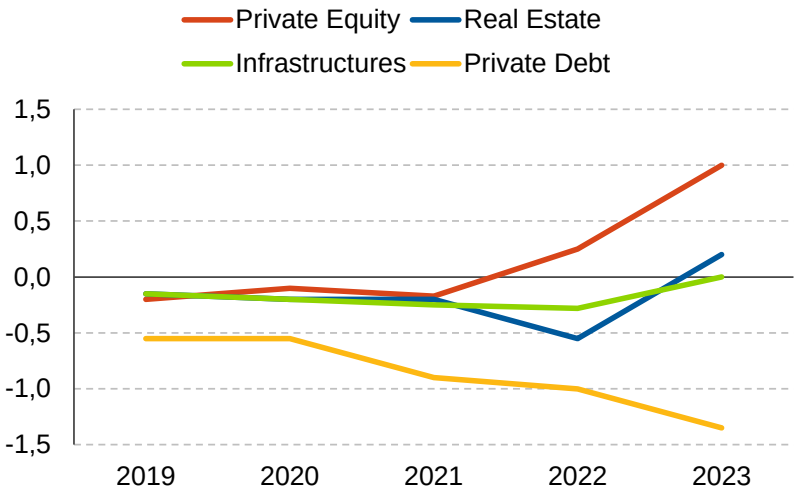
Fundraising data are still at depressed levels compared to 2022. In 2023, there has been a sharp fall in this variable across all private market asset classes, which is attributed to the high amounts of capital raised in 2022 and the tightening of financial conditions. Both factors, through a variety of effects such as discount and denominator effects, contributed to closing the gap between the actual allocations to these assets and the stipulated targets. Still, in the case of infrastructure, the exposure of the portfolios is now in line with the target, while in *private equity* and real estate it exceeds the targets, making them more vulnerable to a potential rebalancing of portfolios. On the other hand, the decrease in closed-end funds in 2023 is also relevant, a trend that extends to the first half of 2024.

Fundraising in private markets: Total vs. infrastructure and real assets (2011-23)



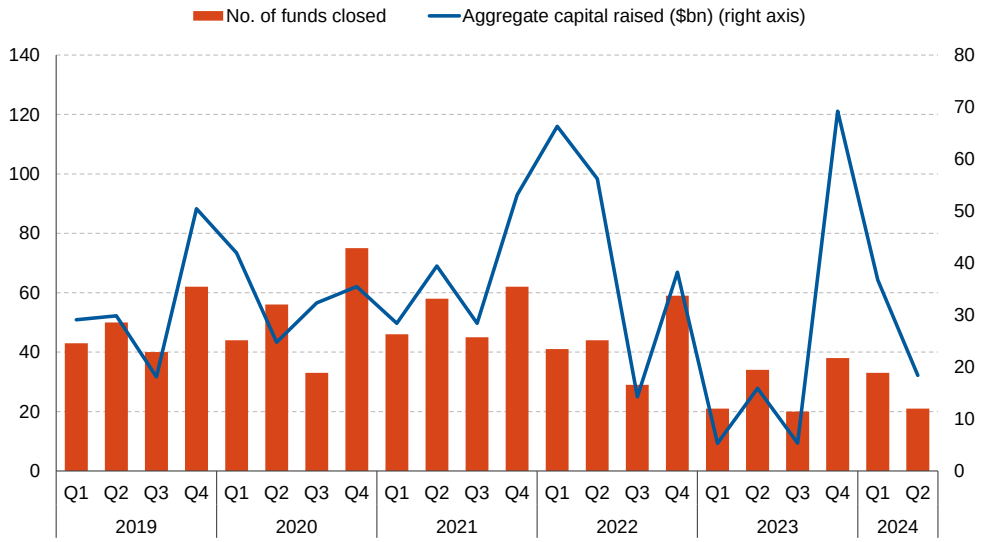
Source: Prequin

Actual and target asset class allocation in private markets (2023)



Source: CEM Benchmarking

Funds closed and capital raised, by quarters

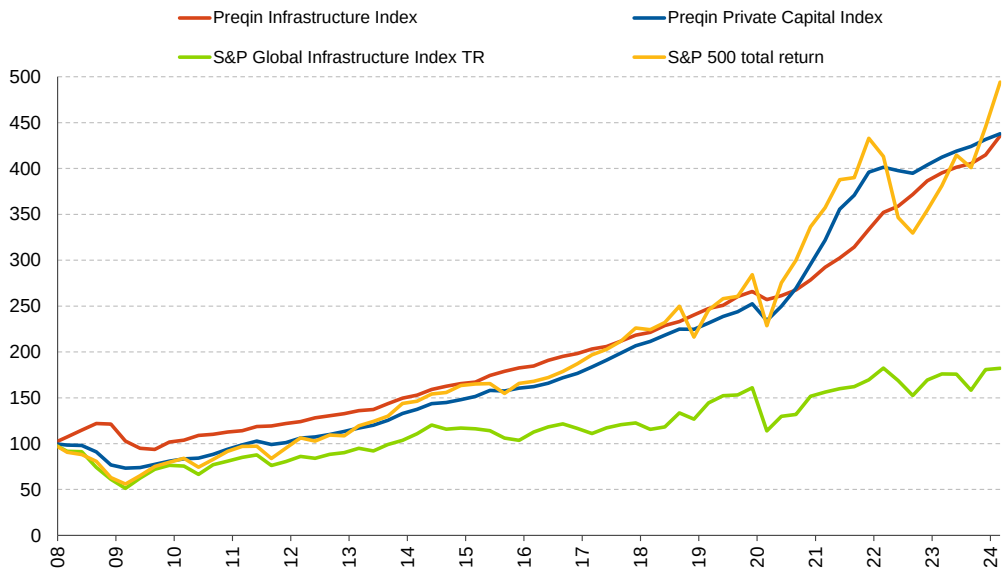


Source: Preqin

3.5. Private investment in infrastructure. Return and risk profile versus private and listed assets.

In terms of returns, private infrastructure investment has shown a compound annual growth rate (CAGR) of 9.5% since the end of 2007. This return is similar to that obtained by the aggregate of private markets and compares very positively with that generated in listed infrastructure (CAGR 3.8%). Over the same period, the return on infrastructure investment has been slightly lower than that of US listed equities (CAGR 10.3%) which since the pandemic has been driven by the rapid growth of a small number of sectors and companies, mainly large technology companies exposed to the artificial intelligence *boom*.

Evolution of private equity indices and listed market (DIC2007=100)



Source: Preqin

Despite this lower return, private infrastructure has delivered investors much lower volatility, with an annualised value of 6.4% in the period in question, lower than the 7.8% of private assets as a whole, thus providing a more favourable risk-return trade-off. Compared to listed infrastructure and US equities, the volatility of private infrastructure investment is approximately one third of that of the latter. In years of greater stress in the financial markets, this characteristic is especially attractive. We highlight periods such as 2008 (global financial crisis) and 2020 (COVID-19) in which private infrastructure withstood the stress with much lower returns than other asset classes. As an example, in 1Q2020 the Preqin infrastructure index fell 3.3%, which compares to -7.3% for the private markets index, -19.6% for the S&P 500 and -29.2% for listed infrastructure.

It is interesting, however, to broaden the comparison of private infrastructure with the rest of the private markets (private debt, Venture Capital, Private Equity, real estate and pure natural assets). The following graph shows the return and risk profile of the different assets in private markets, using the median net IRR as a measure of return and the standard deviation as an indicator of risk. As can be seen, infrastructure has a return-risk profile somewhere between private debt and private equity. Specifically:

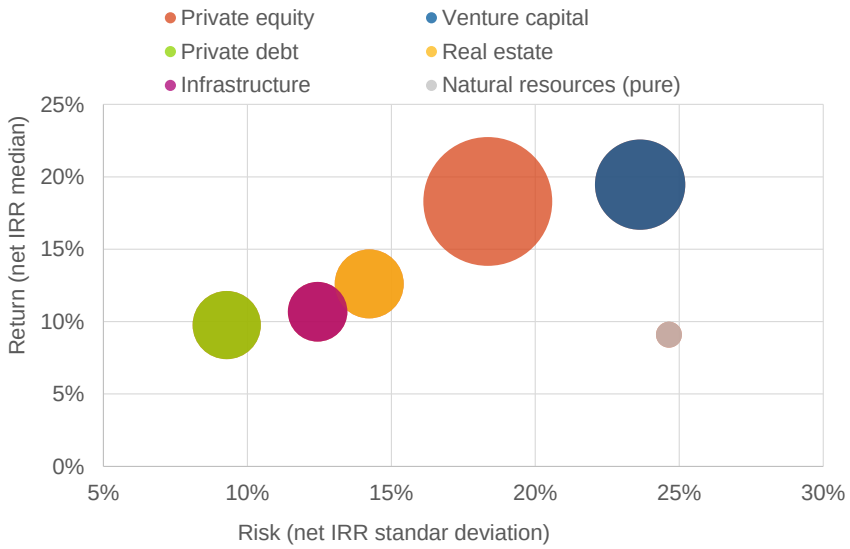
- Private debt has a lower level of risk (around 7-8%) and a more limited return (around 7-8%), reflecting its more conservative nature.
- Infrastructure offers a higher return (close to 10%) with a moderate level of risk (around 10-12%), reflecting a balance between stability and return potential.
- Venture capital is positioned at the more aggressive end, with high risk (above 20%) and significantly higher potential returns (close to 20-25%).

This intermediate positioning of infrastructure in the spectrum of private markets gives the asset an attractive profile for investors seeking diversification and a balanced profile between stability and growth in their private market exposure.

The target returns that investors demand when investing in infrastructure (on average) are similar to those of the asset over the last 10-15 years, and are in the range of 6-12%, with a bias towards the 8-12% range.

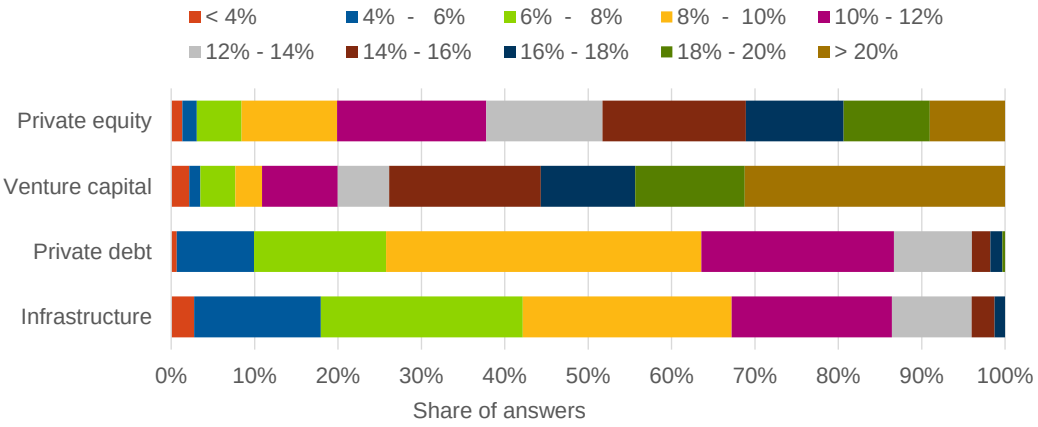
Investor sentiment consistently reflects these attributes of private infrastructure investment: after the diversification potential in global portfolios, the stability of incoming flows is what investors value most about private infrastructure investment. The visibility of flows is that they typically come from essential services with inelastic demand, while strong links to public institutions help mitigate risks. This duality is difficult to find in other investments and is one of the main attractions of infrastructure investment.

Return and risk profile of different assets in private markets (vintages 2011-2020)



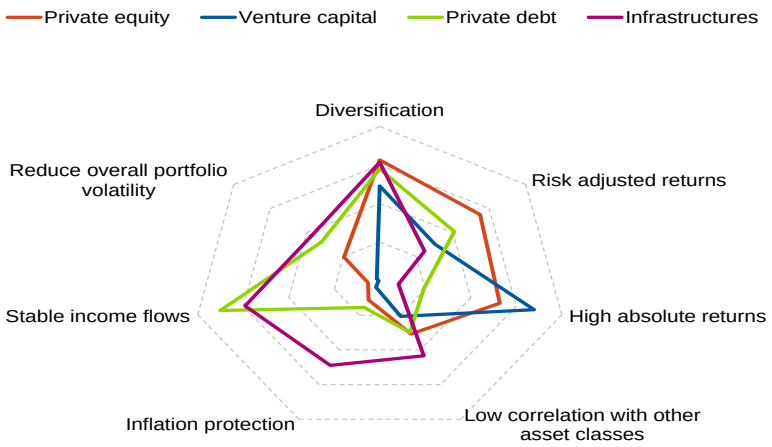
Source: Preqin (the size of the sphere denotes the volume of assets under management).

Investor return targets by type of investment in private markets



Source: Preqin (1Q24)

Main reasons for investing in the different assets in private markets

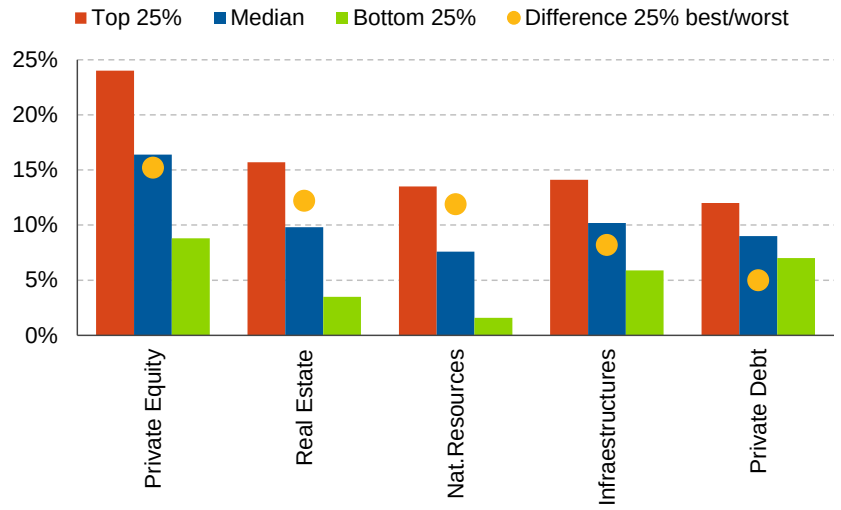


Source: Preqin (Investor Survey, 1Q2024)

If we take a closer look at the dispersion of returns within the different asset classes in the private markets, together with the analysis of the returns obtained, we draw similar conclusions to those already presented. With the second highest median net IRR (second only to *private equity*), infrastructure has one of the lowest dispersion of returns (second only to private debt in this respect). Again, a solid recurring risk-return profile over different years.

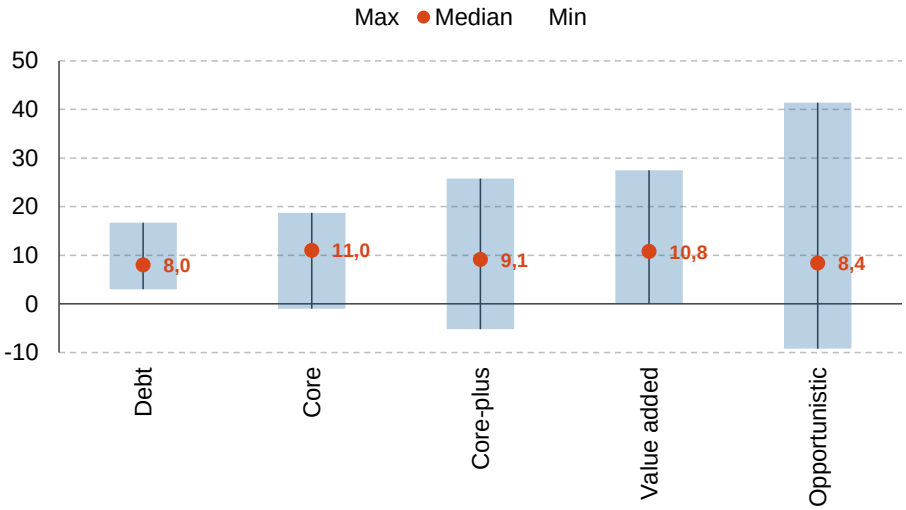
On the other hand, concentration risk is currently lower than that of the S&P 500, where the "Magnificent 7" already account for more than 30% of the index. The increase in the market value of these companies is largely based on expectations of strong future growth rates. While these companies have so far been able to meet market estimates, current valuations leave little room for error and in case of disappointment would drag the stock indices down. In this scenario, as in other negative market events we have reviewed, investment in unlisted infrastructure should serve as a safe harbour.

Return (net IRR) by quartiles (vintages 2011-2020)



Source: MSCI Private Capital Solutions

Dispersion of returns by strategy (vintages 2011-2020)



Source: Preqin

Of course, despite this lower systematic risk, also within private infrastructure investment investors can be exposed to different levels of risk depending on the risk-return trade-off they demand. *Debt* and *core* strategies have exhibited less dispersion of returns, with *opportunistic* and *core-plus* segments (and to a lesser extent, the *Value Added* segment) standing out.

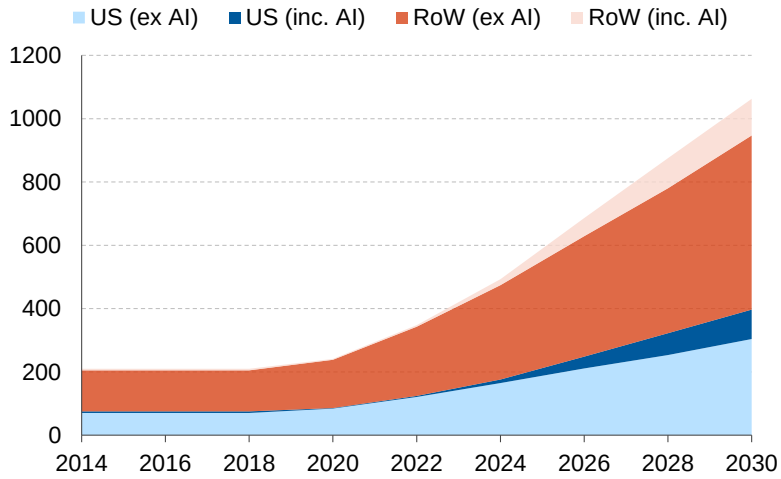
3.6. The outlook for infrastructure investment: driving factors

The COVID-19 pandemic caused unprecedented economic disruption, but it also accelerated government efforts to invest in infrastructure to stimulate growth. Governments are increasingly turning to public-private partnerships to finance critical infrastructure projects. All signs point to advanced economies experiencing moderate but steady growth in infrastructure investment as a key pillar of their development strategies, especially in the energy sector (with decarbonisation playing a key role), transport and digital infrastructure (with networks and *data centres* playing a key role in supporting the emerging artificial intelligence industry). Emerging markets, despite facing greater economic volatility and higher risks, present considerable opportunities for infrastructure investment due to their rapid urbanisation and industrialisation needs. For example, Asia and Africa require substantial investments in transport, energy and water infrastructure to accommodate population growth and economic expansion. Annual growth of approximately 5% in these regions is expected to drive demand for infrastructure, providing a strong impetus for private capital allocation.

An analysis of the drivers of structural growth in the infrastructure market in the medium to long term points to a mix of trends that we try to summarise in the following points:

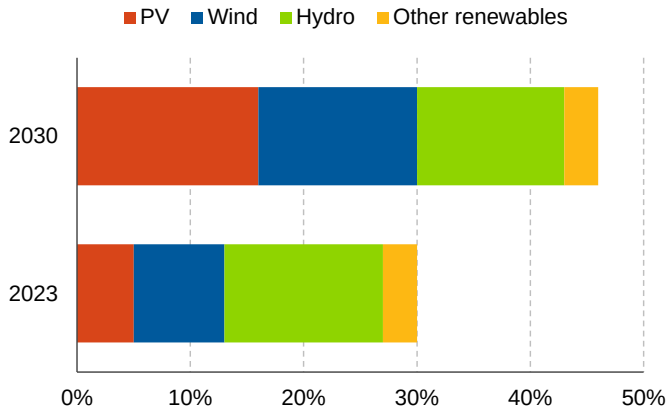
- **Technology Advances and Digital Transformation:** digital infrastructure, ranging from data centres to smart city technology, has become essential for economic competitiveness and technological and military leadership. The growing demand for these infrastructures, exacerbated by the development of Artificial Intelligence, means high financing needs, opening up opportunities for investors looking to gain exposure to high quality assets with stable and predictable returns.
- **Climate Change and Sustainability:** Climate change concerns are also driving infrastructure investment, with renewable energy, green transport and sustainable urban planning in the spotlight. Clean energy sources, such as solar, wind and hydropower, provide private investors with long-term growth opportunities aligned with environmental goals. As a benchmark of expected growth, the IEA estimates that by 2030 renewables will account for 46% of global electricity generation (30% in 2023).
- **Urbanisation and Population Growth:** Urban areas are expected to be home to two-thirds of the world's population by 2050 (UN estimate). Rapid urbanisation requires significant investments in infrastructure, including transport, water systems and housing. In developing regions, the demand for infrastructure to support urban expansion presents a high growth potential for private capital.

Energy demand estimates (TWh) for data centres



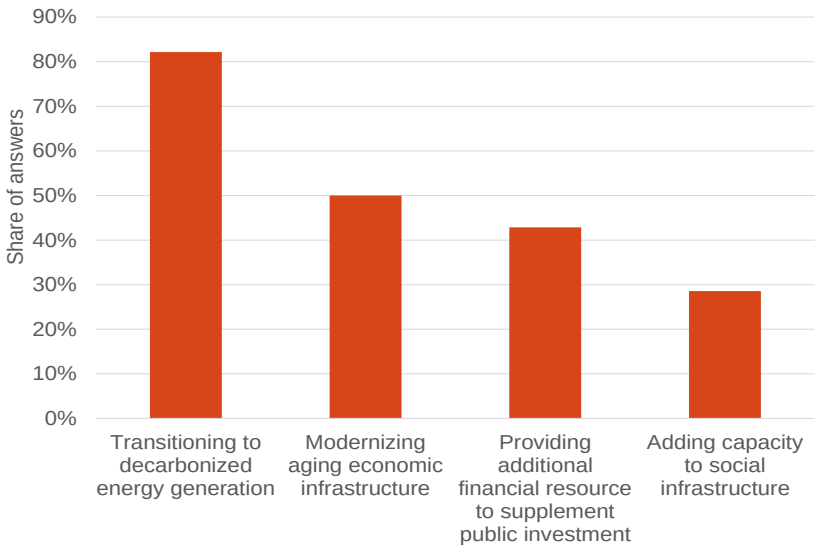
Source: Goldman Sachs Research

Global electricity generation by renewable energy technology



Source: IEA

Factors driving private infrastructure investment over the next decade

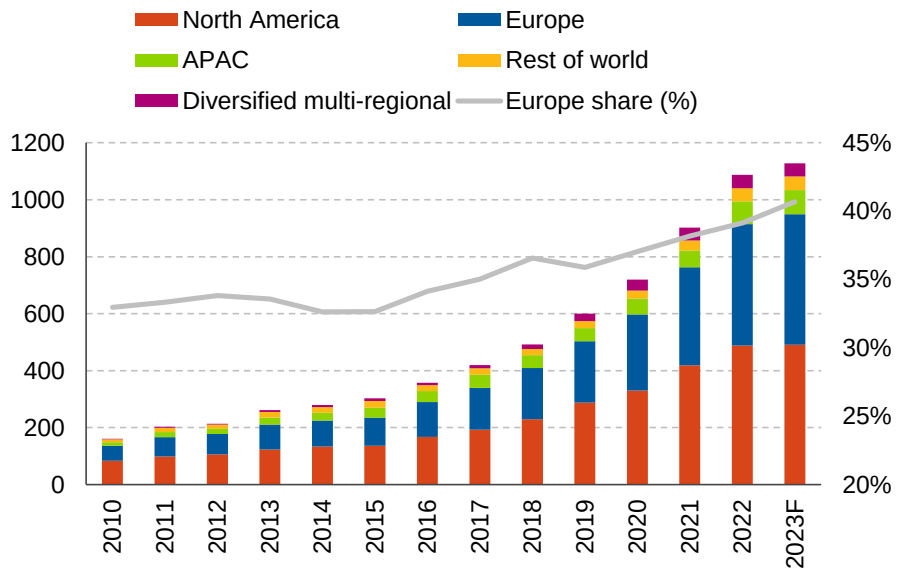


Source: Prequin and other sources (1Q24)

The most recent opinion of private infrastructure investors and managers confirms the above theses. The most recent comprehensive surveys point to the following factors as the key drivers and transformers of private infrastructure investment in the medium to long term:

- Energy transition: the global need to meet climate targets is the main driver, especially in projects related to decarbonised power generation and modernisation of energy infrastructure.
- Fiscal policy and public borrowing situation: Pressure on public finances is driving the need for public-private partnerships to finance essential projects, such as economic and social infrastructure, pointing to a structural shift towards a greater role for private capital.
- Technology advances: Technology, including big data and artificial intelligence, is identified as a key trend with significant impact (59%). These tools not only improve operational efficiency, but also enable asset optimisation and active management in infrastructure projects, including emerging sectors such as data centres.
- Growth of specific sectors, especially data centres: The rise of data centres, driven by digitisation and growth in data consumption, offers relevant opportunities, although it poses challenges related to energy consumption, water use and sustainability. These projects are differentiated within the asset class by their high-growth characteristics, but with specific operational risks.
- Market cycle and performance of public markets: Private infrastructure managers see where we are in the market cycle and the performance of listed markets as factors that will shift capital allocation towards private infrastructure, as investors seek stability and diversification from market volatility.
- Concentration of capital in alternative investments: The increasing allocation of resources towards alternative investments, including infrastructure, reflects a strategic approach to portfolio diversification. This is influenced by the search for risk-adjusted returns in an increasingly uncertain (due to rising) interest rate environment.

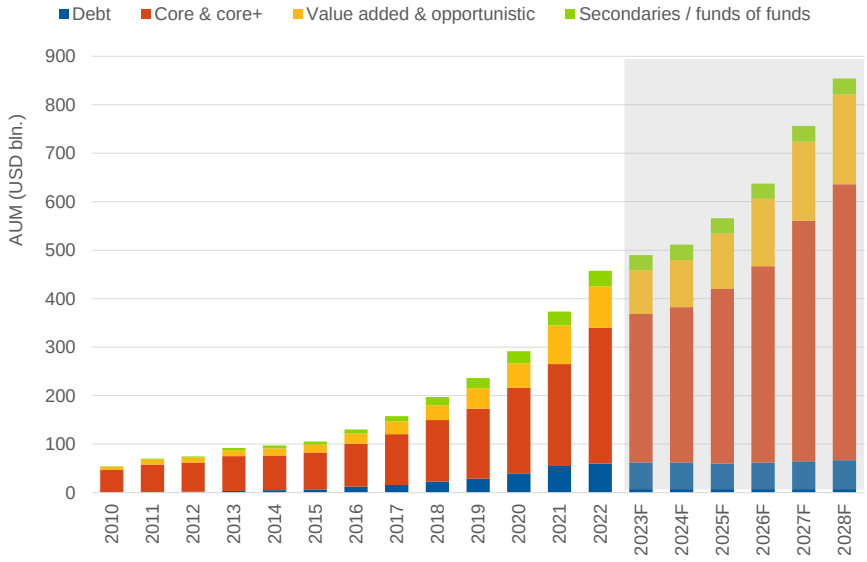
Volume of assets under management by region and European share of total (rhs. axis)



Source: Prequin (1Q24)

A clear reflection of the growing importance of the energy transition factor (decarbonisation) is the growth of assets under management in infrastructure investment vehicles with Europe as the main geographical area of interest, given that it is the area that leads by far in the world in investment in projects for the transition to decarbonised energy generation.

Assets under management in infrastructure with a focus on Europe, by type of strategy



Source: Prequin (1Q24)

The strong growth prospects for *core* and *core+* infrastructure investment in Europe over 2024-28 reflect precisely this trend towards investment in decarbonisation projects. The market outlook is for Europe to overtake North America and consolidate its position as the leading and fastest growing private infrastructure investment market in the coming years (compound annual growth of over 12% in 2024-28 compared to less than 5% in North America and 8% for the world as a whole).

We cannot end this analysis without referring to the risks that investors will have to face in this trend of strong growth in infrastructure investment. We believe that there are three factors to manage in this regard:

- **Geopolitical Risks and Trade Barriers:** Geopolitical tensions pose risks to infrastructure projects. Political instability and trade conflicts could disrupt supply chains and lead to project delays or increased costs. In this regard, it is also of utmost importance to consider dependence on raw materials from third countries.
- **Regulatory and Environmental Risks:** While government policies are generally favourable, regulatory risks remain, which may affect the viability of projects and the respective timelines.
- **Inflation:** although infrastructure is characterised by a stable real return profile derived from its inherent linkage of income to the evolution of inflation in general terms, a scenario -plausible but with a medium-low probability of occurrence- of intense upward evolution and volatility of inflation could call into question the viability of certain projects, especially if it were to occur in parallel with a sharp increase in financing costs, both in their base (risk-free rates) and in the spread or risk premium required for the projects.

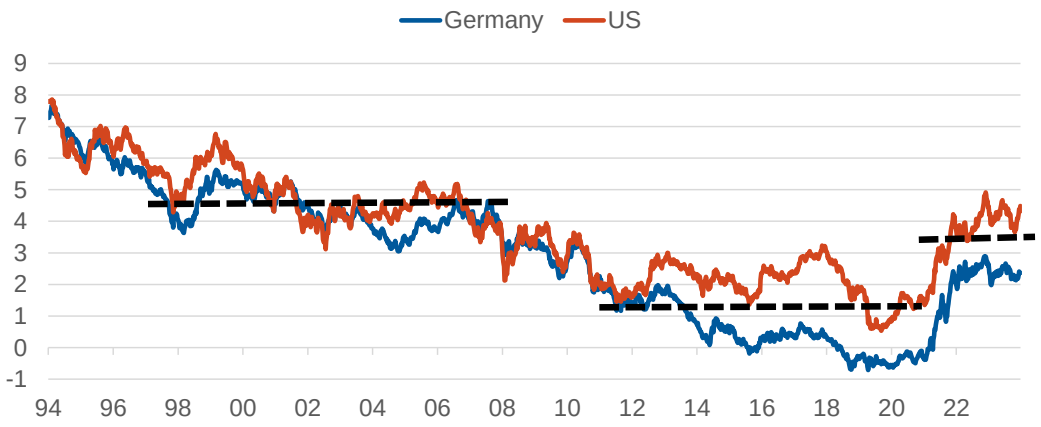
3.7. Interest rate environment and inflation in the medium to long term: Afi's view

Prior to the pandemic, and as a result of a situation of excess savings over investment at the global level and too low inflation, central banks implemented monetary policies of maximum stimulation, with zero or negative rates and a strong expansion of balance sheets (to buy debt assets issued by states and companies). As a result, interest rates - both intervention rates and the long maturities of sovereign curves - were at historically low levels.

This situation was reversed with the emergence of Covid and accelerated by Russia's invasion of Ukraine. These two events mark a turning point in the evolution of interest rates, as they act as accelerators of geopolitical and macroeconomic changes which, although they had already been brewing since the end of the Global Financial Crisis of 2008 (and of sovereign debt in the EMU during 2010-12), now come to the forefront. The fiscal response to first the pandemic and then the energy crisis by the governments of most developed economies generated an unprecedented rise (at least since the 1970s and 1980s) in global inflation.

With some delay, but with full justification, the monetary authorities embarked from the end of 2021 on a path of strong interest rate tightening and a gradual reversal of the massive balance sheet expansion and liquidity injection policies implemented in 2020-21. Hikes of 450-550 bps in ECB and Fed intervention rates, respectively, were transmitted along the curve to bring long-term debt rates to the 4.5%-5.0% zone in the US and close to 3% in Germany by mid-2023.

US and German 10-year sovereign bond interest rates (%)



Source: Bloomberg

Fears regarding the impact of sharp interest rate hikes have dominated the conversation for much of the second half of 2023 and all of 2024, but for now, the resilience of private balance sheets (household and corporate leverage at low levels, together with high excess savings stemming from the stimulus measures during the pandemic) and the continuity of expansionary fiscal policies (persistently high fiscal deficits on both sides of the Atlantic, especially in the US), have allowed economic recession to be avoided. The US economy continues to expand at rates close to 2.5% and, although at a much slower pace and with a high degree of heterogeneity between countries in the north and south, the euro zone continues to expand.

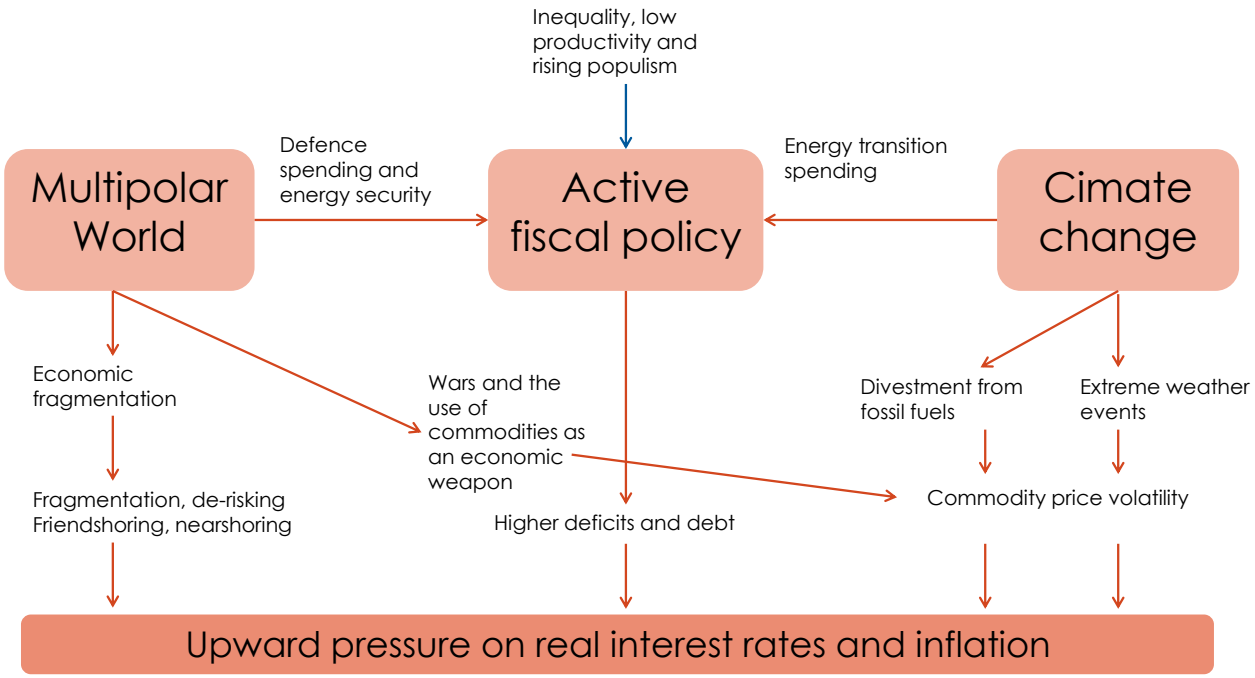
It is therefore logical that, a few weeks before the end of 2024, the markets are pricing in a scenario of continued rate cuts, yes, but with a higher terminal level than that

discounted a few months ago, when uncertainty about the possibility of a recession was higher.

In any case, we need to get out of the economic climate, as we are discerning the medium and long-term interest rate environment and its impact on returns on private infrastructure investment. With a medium to long term, or "long term" focus, the so-called seven "D's" are the global geo, macro and financial trend drivers that will shape the decades: demographics (longer-lived societies that put pressure on the sustainability of welfare states; migratory movements that, although necessary, strain and fracture our societies); the need to invest in defence (a more fragmented world, with greater risks of war); the decarbonisation of our production system (resulting in a massive need for investment in energy transition and mitigation of the effects of climate change); democracies in crisis (internal questioning, polarisation of electorates and the threat of autocracies as an alternative); excessive public debt (which increases the difficulties of refinancing and raises the risk of serious episodes of discontinuity); de-globalisation (or fragmentation of trade, international relations, financial flows, etc.); and finally, digitalisation (or fragmentation of trade, international relations, financial flows, etc.).), and finally, digitalisation (which presents a hope of potential productivity gains, but with a potential negative flip side in the form of damage to labour markets and the social fabric, as well as risks of techno-authoritarianism).

In our view, if we put all of the above together and extrapolate forward, the chances of facing a scenario in which real interest rates and inflation may be higher (than those prevailing in the last ten years prior to 2020) are high. This is illustrated in the diagram below:

Diagram of forces shaping a future of rising real interest rates and inflation

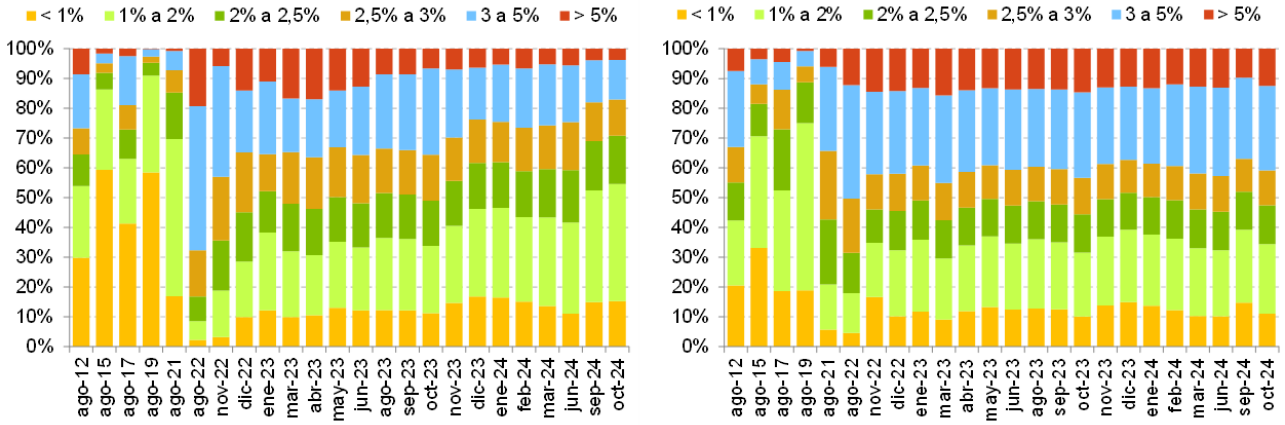


Source: Afi

At the end of 2024, the financial markets are pricing in an environment that is largely consistent with this potential medium and long-term scenario, to which Afi gives a medium-high probability of occurrence. On the one hand, and despite the sharp rises in intervention interest rates (and along the entire yield curve), there is a non-negligible

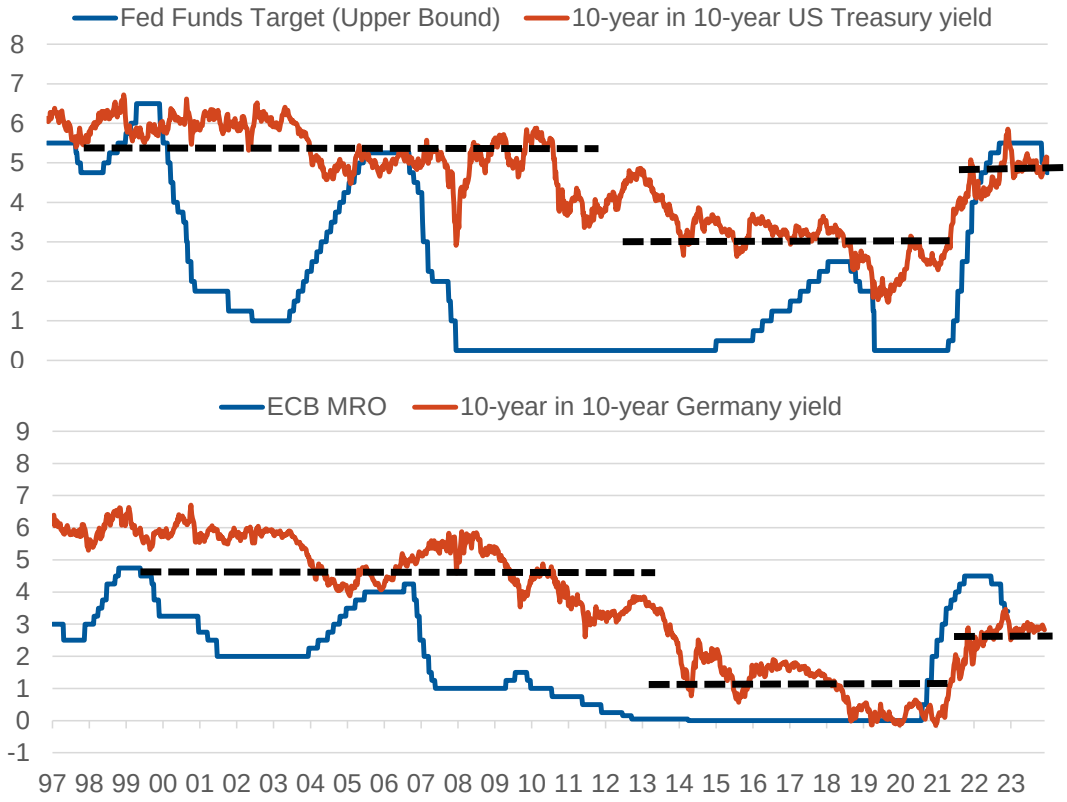
probability in the euro zone and a medium-high probability in the US that inflation over a five-year horizon will be at levels well above the current targets of the Federal Reserve and the ECB. Central banks have incorporated into their monetary policy discourse the potential impact on medium-term inflation (likely to be more volatile and higher) of the occurrence of supply *shocks* as a consequence of a more convulsive geopolitical world in which the supply-demand adjustment is not as elastic as it has been in past decades. The consequence is clear: it is possible that the 2% level for inflation in the medium term, the monetary policy target, is now a floor and not a ceiling, as it was before the pandemic. And it follows, almost necessarily, that terminal or steady-state equilibrium rates will be higher than in the years before the pandemic.

Probability distribution for the 5-year inflation swap (EUR and USD)



Fuente: Afi, Bloomberg

Fed and ECB intervention rates and 10Y implied IRR in 10Y in the US and Germany (%)



Source: Bloomberg

Interest rates on long-term sovereign debt (10 years) have stabilised at levels of 4%-4.5% in the US and around 2%-2.5% in Germany. These rates coexist with a market discount for the Fed's and ECB's short-term intervention rates reflecting yields to benchmarks in the order of 3.75%-4.0% for the Fed and 1.75%-2.0% for the ECB over a 24-36 month horizon (our own forecasts are not far from these levels, although they are somewhat higher for the ECB). Further ahead, over 5-10 years, intervention rates stabilise at around 4% for the Fed and 2.25%-2.5% for the ECB.

In short, the market is pricing in a scenario in which the level of intervention rates will not be as high as that prevailing in the first decade of the 2000s, but will certainly be at levels higher than those of the 2012-2020 period. And a similar discount exists for long-term rates: implied or forward rates for 10-year debt over a 10-year horizon, which have stabilised at around 5% for the US and close to 3% for Germany.

Forward or implied rates for the €STR (EUR) OIS curve as of 15NOV24

		Forwards										
Tenors	Coupon	3Mo	6Mo	9Mo	1Yr	15Mo	18Mo	21Mo	2Yr	3Yr	5Yr	7Yr	10Yr
1Mo	3.1565	2.4482	1.9625	1.7963	1.7491	1.7490	1.8325	1.8353	1.9552	2.0470	2.1904	2.3094	2.4617
1Yr	2.2170	1.9200	1.8017	1.7891	1.8073	1.8607	1.9128	1.9448	1.9765	2.0755	2.2154	2.3363	2.4915
2Yr	2.0140	1.8907	1.8567	1.8662	1.8911	1.9306	1.9686	1.9974	2.0256	2.1043	2.2452	2.3734	2.5105
5Yr	2.0416	2.0025	2.0000	2.0156	2.0376	2.0637	2.0890	2.1106	2.1321	2.2044	2.3345	2.4410	2.5051
7Yr	2.0967	2.0723	2.0744	2.0899	2.1101	2.1338	2.1565	2.1768	2.1973	2.2649	2.3817	2.4571	2.4033
10Yr	2.1800	2.1659	2.1709	2.1856	2.2037	2.2235	2.2428	2.2602	2.2776	2.3316	2.4146	2.4015	2.3265

Source: Bloomberg (15NOV24)

Forward or implied rates for the SOFR OIS curve (USD) at 15NOV24

		Forwards										
Tenors	Coupon	3Mo	6Mo	9Mo	1Yr	15Mo	18Mo	21Mo	2Yr	3Yr	5Yr	7Yr	10Yr
1Mo	4.6032	4.3923	4.1655	4.0055	3.9000	3.8995	3.8586	3.8557	3.8349	3.7911	3.8193	3.8742	4.0040
1Yr	4.2975	4.1384	4.0411	3.9796	3.9483	3.9307	3.9134	3.9070	3.9009	3.8532	3.8902	3.9470	4.0834
2Yr	4.1264	4.0366	3.9785	3.9440	3.9250	3.9103	3.8957	3.8866	3.8774	3.8532	3.9017	3.9637	4.0837
5Yr	3.9783	3.9396	3.9144	3.8991	3.8904	3.8870	3.8837	3.8827	3.8818	3.8896	3.9474	4.0195	4.0905
7Yr	3.9585	3.9316	3.9148	3.9053	3.9007	3.9004	3.8999	3.9014	3.9030	3.9178	3.9825	4.0390	4.0372
10Yr	3.9643	3.9474	3.9378	3.9337	3.9332	3.9352	3.9372	3.9405	3.9439	3.9618	4.0118	4.0179	3.9971

Source: Bloomberg (15NOV24)

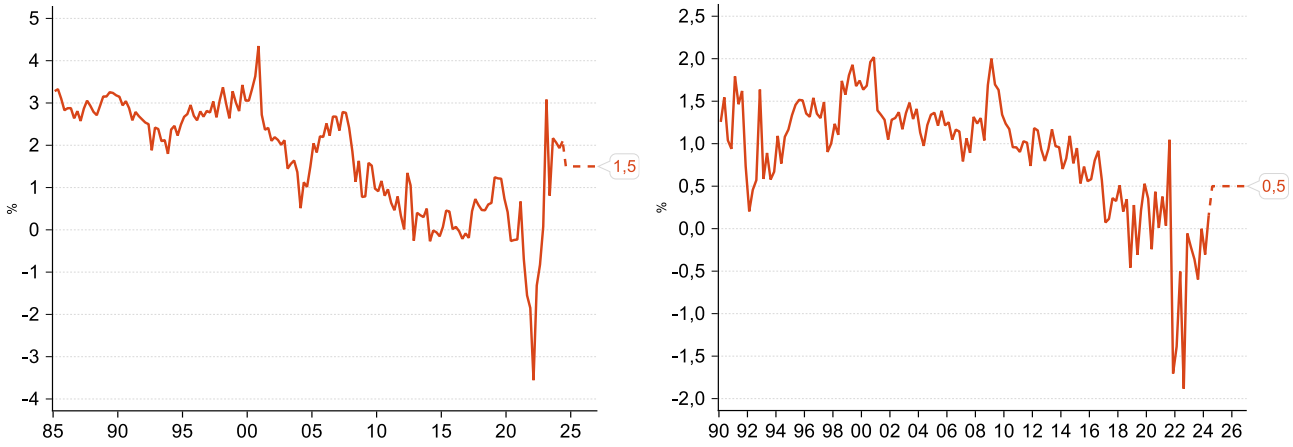
Afi EUR and USD interest rate forecasts (24-month horizon)

	MRO, DFR & EURIBOR 12m			Germany (YTM, %)			Fed Funds	US Treasuries (YTM, %)		
%	ECB	DFR	12m	2y	5y	10y	Fed	2y	5y	10y
20-nov.	**3,40**	**3,25**	**2,48**	**2,14**	**2,19**	**2,37**	**5,00**	**4,40**	**4,40**	**4,53**
4T24	3,15	3,00	2,65	2,25	2,30	2,40	4,50	4,25	4,30	4,50
1T25	2,65	2,50	2,60	2,20	2,25	2,45	4,25	4,15	4,25	4,50
2T25	2,40	2,25	2,50	2,15	2,25	2,50	3,75	4,05	4,20	4,50
3T25	2,40	2,25	2,50	2,15	2,25	2,50	3,75	4,00	4,10	4,50
4T25	2,40	2,25	2,50	2,15	2,25	2,50	3,75	3,90	4,05	4,50
1T26	2,40	2,25	2,50	2,15	2,25	2,50	3,75	3,90	4,05	4,50
2T26	2,40	2,25	2,50	2,15	2,25	2,50	3,75	3,90	4,05	4,50
3T26	2,40	2,25	2,50	2,15	2,25	2,50	3,75	3,90	4,05	4,50
4T26	2,40	2,25	2,50	2,15	2,25	2,50	3,75	3,90	4,05	4,50

Source: Afi, Bloomberg

Our current rate forecasts, especially as regards the arrival level for intervention rates (which are key to defining the equilibrium level of long-term rates) are based on a relatively bullish view of equilibrium or neutral short-term real rates (also known as r*). These equilibrium rates would have left the Covid lows and would be around 1.5% for the US and 0.5% for the euro area, levels clearly higher than those of the years preceding the pandemic, marked by an environment known as "secular stagnation" in which such low equilibrium interest rates reflected a situation of excess savings over investment and very low inflation (below the central banks' target) and bordering on deflation.

Afi expectations for the long-term neutral or equilibrium real interest rate (r*)



Source: Afi, Macrobond

The impact of this medium-term interest rate and inflation scenario on infrastructure investment is key to assessing the future prospects for the asset class. Infrastructure is actively sought after by investors due to its ability to act as an inflation hedge, thanks to the indexation of contracts to price movements and its role in core sectors. However, rising interest rates create pressures that affect relative performance with other assets and expected cash flows (higher rates imply lower discount factors).

Rising financing costs particularly affect projects that require heavy upfront investments, which are largely financed with debt or combinations of debt and equity. And while infrastructure has traditionally proven to be resilient in high inflation scenarios (as much of its revenues are indexed to the CPI or include adjustment clauses in regulated tariffs), not all infrastructure is equally protected: assets in early stages of development (greenfield) or exposed to competitive dynamics could suffer more from episodes of higher and more persistent inflation.

A scenario of higher interest rates and inflation forces investors to balance the impact of these higher capital costs with the defensive characteristics of infrastructure. Any increase in interest rates will have a negative impact on discount rates, especially in longer duration assets where the value of future cash flows is more relevant. Strategies focused on *core* assets, with stable cash flows and protected by indexed rates, will continue to attract institutional investment, while assets more exposed to economic cycles (*core*+ and value add) may face greater challenges. It is in these projects where the added value provided by the manager will become much more relevant.

In a context of high interest rates and inflation, infrastructure will remain attractive as a diversifier in global portfolios. Their historically low correlation with traditional markets

and their ability to generate stable income position them as a solid option versus other more volatile asset classes. In any case, a detailed assessment of each investment will be crucial. Sectors with strong links to trends such as decarbonisation, digitalisation and energy security, which are likely to receive sustained political and financial support, are a very attractive option.

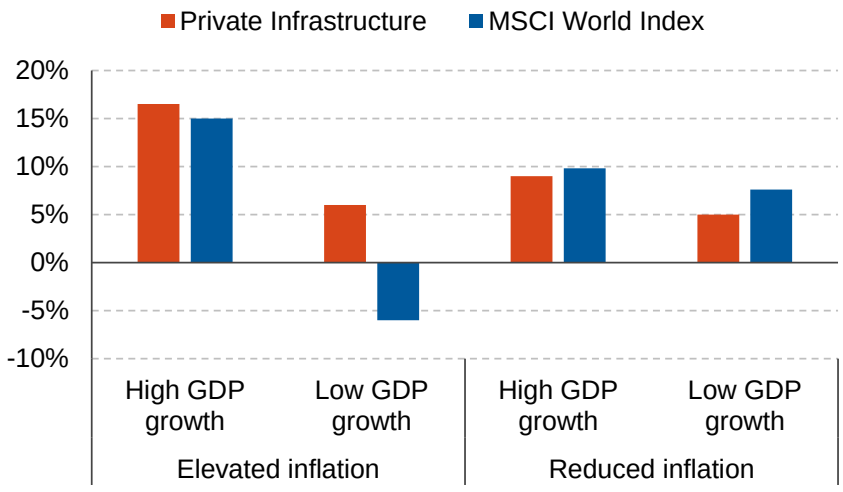
A historical analysis should be made at this point. Infrastructure has historically shown a very positive relative performance (compared to other listed and unlisted assets) in high-inflation environments due to its ability to pass on price movements to its revenues. In any case, given the varied typology of strategies and sectors, inflation can affect in different ways depending on the profile of the project:

- Assets with long-term contracts, usually framed in Super Core / Core strategies, often implement automatic (or quasi-automatic) pass-through mechanisms for increases in consumer price indices.
- Regulated assets tend to implement similar mechanisms, although updates are often not immediate: government contracts may not be reviewed for extended periods of time.
- In infrastructures with revenues that are not pre-fixed, the ability of *pricing* to update their revenues with inflation will be key. Infrastructures with a monopoly profile will have no difficulty in updating their revenue stream, although they may be constrained by regional regulations.

In an environment such as the current one, where we are witnessing moderate interest rate cuts, Value-Add or Private Equity-Like infrastructures, usually valued by multiples or quoted comparables, would not be as affected by the interest rate environment.

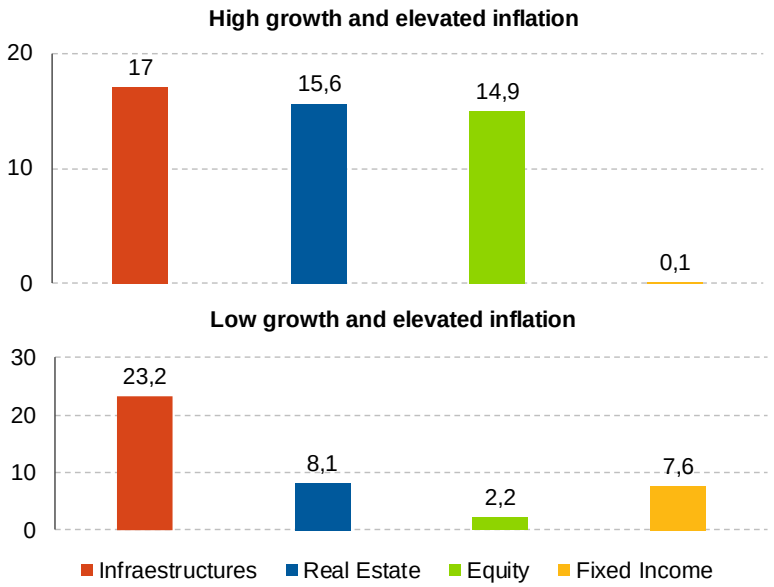
A historical analysis shows that infrastructure performs better than equities in an environment of somewhat higher inflation, relatively high rates (compared to the recent historical average) and moderate to low GDP expansion with a slow downward trend in inflation towards higher levels than in recent history.

Return on private infrastructure vs. listed equities under different GDP and inflation scenarios (2005-2023)



Source: Afi, Bloomberg, LSEG

Return on private infrastructure vs. other assets in periods of high growth and inflation (top) and low growth with high inflation (bottom)



Source: Afi, Bloomberg, LSEG

4. Active management as a lever for generating value in infrastructure

Active management in private markets is about implementing strategic levers that enhance asset performance, reduce risk and maximise returns over the life cycle of investments. Private infrastructure fund managers have a number of levers at their disposal to try to generate value from their investments. These include the following: continuous monitoring and active optimisation of operations; the adequacy or improvement of financial structures; the design and implementation of risk mitigation strategies; the use of local market knowledge by managers; and the prioritisation of environmental, social and governance (ESG) aspects.

Among all these levers, we consider the proximity and local experience of the manager in each operation to be a necessary (although not sufficient) key condition for the successful management of infrastructure assets. Given that infrastructure assets are key parts of local communities and economies, their management requires an approach adapted to the particularities of the population, an expert knowledge of the regulatory environment that determines their activity, and a complete alignment of expectations among stakeholders. The local knowledge and specific experience of the manager is a fundamental aspect in determining the success of an infrastructure investment.

The correct implementation of a *mix* of these levers allows the manager to ensure a greater likelihood of success in growing asset value and, therefore, meeting the return targets set for investors. Given that the environment in which asset management takes place is constantly (and increasingly rapidly) evolving, the alignment of the *mix* of value generation levers with technological innovation and sustainability is imperative.

In the following pages we give a brief descriptive overview of the main value creation levers available to infrastructure investment managers, providing simple examples adapted to "real life" cases to understand how each of the levers can contribute to value creation.

4.1. Operational improvement and optimisation

Operational improvement and optimisation involves increasing the efficiency and productivity of assets. This can include processes such as modernising facilities, optimising the use of resources, reducing waste and integrating digital solutions. These improvements increase the operational performance of the asset, reduce costs and ultimately increase profitability.

Example of operational improvement and optimisation	
Project: Expansion and upgrading of a water treatment plant to increase efficiency and reduce costs **Active:** Water treatment plant **Sector:** Water resources management	**Risks:** The main risks are the correct implementation of advanced technology without disrupting operations and ensuring adequate staff training. If the technology does not meet expectations, the projected cost reduction may not be achieved.
Investment thesis:	

This project aims to optimise the operations of a water treatment plant to reduce costs and maximise efficiency. The current plant, although operational, uses processes and technology that are several years old, which increases its operating costs. A comprehensive modernisation plan will be carried out, including:

- Process automation and digitalisation: implementation of advanced sensors and real-time monitoring systems to reduce water and energy consumption, optimising chemical dosing.
- Improved waste management: revision of the waste management system to reduce waste through recycling techniques and composting of organic waste.
- Maintenance optimisation: the introduction of a predictive maintenance system will reduce downtime and repair costs.

Value Lever:

Operational optimisation reduces costs through improvements in energy and water consumption, and new monitoring systems help to respond to potential incidents more efficiently. These cost reductions and efficiency improvements enable the plant to process a greater volume of water, thereby increasing revenues without significantly raising costs. In addition, the modernisation improves the plant's competitive position, attracting new contracts and customers.

4.2. Optimisation of the financial structure

This lever is based on the strategic management of an asset's capital structure. An optimal financial structure will, with a high degree of probability, result in improved cash flow, lower financial risk and increased returns. It may involve debt restructuring, refinancing on more favourable terms or the introduction of tax efficient structures.

Example of optimising the financial structure	
Project: Toll road with increased traffic and toll revenues **Active:** Toll road **Sector:** Transport infrastructure	**Risks:** There is a risk that tariff adjustment will reduce demand if they are perceived as too high. In addition, the issuance of bonds will depend on favourable market conditions, and the implementation of automated technology should ensure continuity of service and avoid technical failures.

Investment thesis:

The investment seeks to capitalise on the growth in traffic volume on a high traffic toll road, located in a high economic growth area. The toll road, with considerable debt at variable rates, presents an opportunity for refinancing through the issuance of infrastructure bonds, taking advantage of the increase in its credit rating due to the operating track record. A strategic review of tariffs is also foreseen, considering the sustained increase in traffic and an elasticity study to find the balance between prices and demand. The additional revenues will allow investment in automation and modernisation infrastructure, improving vehicle flow and reducing costs.

Value Lever:

Refinancing debt through infrastructure bonds at lower rates reduces the cost of highway capital, improving operating cash flow. This frees up resources to invest in automated tolling

systems, speeding up collection times and reducing staff operating costs. The revised tariffs also allow revenue to be maximised with an appropriate pricing structure, thereby increasing the value of the asset.

4.3. Risk mitigation strategies and platform effect

These strategies seek to minimise potential risks through various methods, such as diversification, hedging and contractual protections. The platform effect, in particular, refers to the consolidation of a number of similar assets under a single management structure, generating economies of scale and reducing operational risk. This approach can improve bargaining power, enable the sharing of resources and optimise the performance of productive assets.

Example of platform effect	
Project: Consolidation of a network of regional airports **Active:** Airports **Sector:** Airport infrastructure	**Risks:** Centralised management of several airports requires high efficiency and coordination, and a mistake could affect the operation of the entire network. In addition, variation in flight demand at the regional level could negatively impact the profitability of some airports.
Investment thesis: This project envisages the acquisition and consolidation of regional airports to create a network that allows for operational synergies and greater stability in revenue flows. Through a common management platform, airports can share resources, expertise and commercial arrangements, achieving economies of scale. The network of airports will attract airlines that value a single point of contact and centralised contracts, which increases bargaining power. In addition, geographic diversification dilutes the risk of impact from regional economic factors. **Value Lever:** Consolidating airports under a single structure reduces costs through common arrangements for logistics and supply services. The platform strategy allows individual risks to be managed, as each airport's performance complements the other, allowing overall profitability to be more stable. At the end of the investment horizon, the consolidated network can be attractive to an institutional investor with a low cost of capital, maximising return on multiples.	

4.4. Expansion of multiples

Multiples expansion occurs when the value of an asset increases relative to its fundamentals, i.e. the increase in value is due to increased demand for the asset rather than deriving from operational improvements. This can be achieved by improving the perceived quality or strategic relevance of the asset, such as through branding, market positioning or industry consolidation.

A regional airport could expand its operations to include additional commercial services, such as retail space and logistics centres, enhancing its value proposition. As a result,

buyers might be willing to pay a higher multiple due to the various revenue streams, making the airport a more attractive acquisition target with a higher valuation.

Example of expansion of multiples	
Project: Modernisation of a cargo port and extension of infrastructures **Active:** Charging port **Sector:** Logistics and transport	**Risks:** Risks include that projected demand will not materialise, which would reduce the positive impact on the valuation of the asset. There is also risk in permitting and construction costs.
Investment thesis: This project seeks to convert a medium-sized port into a logistics centre of reference by modernising and expanding its facilities. The investment focuses on the construction of a new quay and the purchase of automated loading equipment to streamline operations, thereby increasing processing capacity and reducing waiting times for customers. By improving the infrastructure, the port will be able to serve new international customers and logistics operators who currently do not consider the port due to lack of capacity. **Value Lever:** By expanding the port and optimising its infrastructure, the market value of the asset is improved, thereby increasing its valuation on the secondary market. The increased cargo capacity generates revenue growth, which allows for a significant revaluation of the asset. This improvement in EBITDA and revenues, together with an optimised capital structure, increases the valuation multiple.	

4.5. Experience and knowledge of the specificities of the assets, industry and region of operation

Local expertise and in-depth market knowledge are crucial to navigate regulatory environments, understand consumer behaviour and make strategic decisions that align with local needs. Specialised industry managers bring sector knowledge that enables tailored management strategies, thereby improving return on investment.

When managing a water utility infrastructure in a Southeast Asian country, having a management team with expertise in local water regulation, consumer demand patterns and environmental requirements can significantly improve operational efficiency. This team could use advanced techniques to manage water supply during seasonal fluctuations, ensuring consistent service and increased customer satisfaction, resulting in a better value proposition.

Example of experience and expertise in the specificities of assets, industry and region of operation	
Project: Construction of a wind farm in a region with complex environmental regulations **Active:** Wind farm **Sector:** Renewable energy	**Risks:** The main risk is that, despite best efforts, environmental or regulatory barriers may be faced that limit production. There may also be risk in the cost of construction if specific materials or technology are not readily available.

Investment thesis:

This project involves the construction of a wind farm in a region with stringent environmental regulations and a complex licensing process. The region offers great opportunities due to its wind potential, but the success of the project depends on compliance with specific environmental impact regulations. Experience in local regulations allows us to reduce licensing times and anticipate potential obstacles, while knowledge of the industry allows us to design a wind farm that maximises production.

Value Lever:

Expertise in local regulations and wind technology allows the wind farm to be developed in less time, reducing upfront costs and risks of delay. In addition, with an optimised design that makes the most of the wind resources in the area, the farm is able to increase its annual output and improve long-term profitability.

4.6. ESG factors as a competitive advantage

Environmental, Social and Governance (ESG) factors have become a central focus in infrastructure investments. By integrating ESG considerations, investors not only align with regulatory requirements and societal expectations, but can also create value. Assets with strong ESG profiles can attract premium valuations from ESG-focused investors, benefit from government support and avoid regulatory discontinuation.

A public transport system operator can invest in electric buses to reduce emissions, thereby contributing to environmental sustainability. This move not only attracts ESG-conscious investor flows, but also positions the operator to benefit from government incentives for green transport, enhancing both its reputation and financial performance.

Example of ESG factors as a competitive advantage	
Project: Sustainable office building **Asset:** Commercial real estate infrastructure **Sector:** Real Estate	**Risks:** Regulatory risk that required ESG standards may change, as well as potential cost overruns in construction due to sustainable materials and advanced technology.

Investment thesis:

The development of an office building with high energy and sustainability certification offers a competitive advantage in an increasingly regulated market with high demand for green space.

Value Lever:

Applying ESG factors allows access to green financing sources and attracts tenants who value sustainability, potentially increasing occupancy rates and the profitability of the asset. The use of sustainable materials and systems also reduces operating costs and improves the building's valuation by being aligned with future regulations.

4.7. Adaptability to market changes through management flexibility and diversification

Management flexibility and diversification allow infrastructure investment managers to adapt to market dynamics, such as regulatory changes, economic cycles and technological developments. By diversifying portfolios and maintaining flexible strategies, infrastructure fund managers can reduce exposure to individual asset risks and respond quickly to emerging trends.

A diversified portfolio of digital infrastructure assets, including data centres, telecom towers and fibre optic networks, allows managers to adapt to the growing demand for digital connectivity. If demand for data centres increases, the management team can allocate more capital to data infrastructure, capitalising on the trend while spreading risk across various digital asset classes.

An example of adaptability to market changes through management flexibility and diversification.	
Project: Modular parking network in high urban growth areas **Active:** Urban parking network **Sector:** Urban infrastructure	**Risks:** The main risk is the speed with which the urban environment evolves, potentially affecting demand in certain locations. In addition, there is a risk of cost overruns if changes to modules are made inefficiently or if they do not adapt quickly to emerging demand.
Investment thesis: This project consists of the expansion of a network of modular car parks in cities with high urban growth. Modular car parks allow spaces to be adapted for different uses according to demand, such as parking for electric vehicles or bicycle rentals. This flexibility is essential in an ever-changing urban environment with increasing regulation on mobility and emissions. Diversification of services also allows for diversification of revenue streams, offsetting drops in demand for one type of service with others. **Value Lever:** The flexible structure of the car parks allows them to adapt quickly to changes in demand, maximising revenues and avoiding losses in periods of low demand. In addition, the diversified approach allows to capture new revenue opportunities, such as partnerships with mobility companies or charging stations for electric cars.	

Following this analysis of the value levers available to the infrastructure fund manager, we can conclude that infrastructure investment in private markets presents very significant opportunities for generating value, the return on which can be enhanced through the adoption of active management by the fund manager:

- Expertise and in-depth knowledge of the sector, region and specific assets are essential to convert opportunities into sustainable and meaningful returns.
- Operational and financial optimisation maximises efficiency and reduces costs.
- Diversification and flexibility that offer resilience in the face of market changes.

- The ability to proactively mitigate risks and adapt to new requirements - whether regulatory, technological or environmental - is critical to preserving and maximising the value of these investments.
- Capitalising on emerging factors such as ESG and technological innovation, in addition to contributing to financial return, strengthens the asset's value proposition over long-term horizons.
- Multiples expansion and platform consolidation strategies, supported by the creation of synergies and scalability, are a key aspect -- in general in private markets - for their potential revaluation effect on investments.

Overall, the effective implementation of these levers positions infrastructure investment as a highly competitive alternative, provided it is approached with an active management capable of anticipating and adapting to market dynamism and its particularities.

5. Sources of volatility in private infrastructure valuation

The valuation of private infrastructure faces unique challenges due to the nature of these assets and their dependence on macroeconomic, regulatory, operational and project-specific factors. Given their capital-intensive nature, analysis of these sources is essential to understand how discounted cash flows are determined and how they are affected by the economic environment. This section examines these sources of volatility, with a special focus on interest rates and their impact on investment strategies such as core, core+ and value added, complemented by relevant references and examples.

5.1. Sources of NAV volatility (market risk)

Net Present Value (NAV) is a central metric for the valuation of infrastructure assets, based primarily on the discounted cash flow (DCF) technique. This method, although robust, is extremely sensitive to certain key parameters critical to the traditional DCF model:

- Risk-free rate: The risk-free rate, usually linked to sovereign bond yields, is the basis for calculating the cost of capital. Its changes directly affect the discount factor. For example, an increase in the yield on 10-year US Treasury bonds (from 2% to 4%) could reduce the NAV of an infrastructure project by up to 20% depending on its duration. Studies such as Bird et al. (2012) have analysed how infrastructures with long-term cash flows are particularly sensitive to such movements.
- Technology risk: Projects incorporating emerging technologies face risks associated with technical feasibility and potential implementation cost overruns. Practical example: An offshore wind farm relying on new generation turbines could face delays or cost overruns if initial testing reveals unexpected technical problems.
- Revenue model risk: Revenue projections are subject to uncertainty in demand, competition or regulatory changes. For example, a toll road may estimate revenues based on 5% annual traffic growth, but an economic slowdown could reduce this growth to 2%, seriously affecting projected profitability.

In addition to these technical considerations, independent valuations of infrastructure assets frequently incorporate references to comparable transactions in the market. These benchmarks provide an additional layer of insight, recognizing that market dynamics, such as scarcity of premium assets or the appetite of the investing community, can bias valuation fundamentals. Furthermore, for investors with shorter investment horizons, terminal value often becomes a critical component of the valuation, reflecting confidence in the company's ability to deliver its business plan over the long term.

Given this complexity, managing infrastructure investments requires an expert fund manager. Such professionals can navigate the interplay of technical, market, and macroeconomic factors to optimize asset performance and valuation.

On the other hand, among the components that have the greatest influence on market risk (or volatility of the NAV), we highlight the following:

- Demand factors: Changes in demographics, consumption habits or regulation can affect infrastructure utilisation. For example, a desalination plant whose demand depends on water scarcity in a region may face lower revenues if the government introduces water saving measures or builds competing plants.

- Cost factors: Inflation and budget slippages are key risks. For example, in an environment of high and rising inflation, the cost of building a rail network may exceed the initial budget, reducing projected margins.
- Market competition and regulatory changes: Projects in non-monopolistic sectors are exposed to new entrants or disruptive technological developments. Consider the case of an electric vehicle charging station company that faces very intense competition in regions with government subsidies for the installation of new infrastructure for electrification of the transport network. At the same time, regulatory changes can significantly alter the competitive landscape, creating not just added risks but also new opportunities. For example, incentives for green energy adoption or stricter emissions standards can drive demand for such infrastructure, potentially boosting profitability for well-positioned companies.
- Interest rates: The relationship between interest rates and infrastructure valuation is particularly critical, given their impact on both discounted cash flows and the cost of debt. This relationship is detailed in the next section.

5.2. The role of interest rates in the profitability and valuation of private infrastructure: impacts and possibility of mitigation.

The analysis of the outlook for interest rates and inflation in section 3.7. points to higher real rates and inflation in the medium to long term, driven by structural factors such as decarbonisation, geopolitical fragmentation, strong investment needs and demographics. This scenario has structural implications for valuation and investment strategy in private infrastructure, particularly via the cost of capital and financing of the asset or project:

- Effect on WACC: Interest rates affect both the cost of debt and the cost of equity, increasing the WACC. This reduces the present value of cash flows, especially in long-term projects. Example: solar power project relying on 70% leverage may see its net return reduced if interest rates on debt rise from 4% to 6%.
- Sensitivity by project phase: *greenfield* projects are more exposed to rate increases due to their high initial leverage, while operating projects are less sensitive, as they already have recurrent cash flows and contracts generally indexed to inflation.

The magnitude of these impacts can vary greatly depending on the investment strategy:

- Core: these are typically mature infrastructures with stable revenues and low operational risk, which are relatively protected against cost increases associated with rising interest rates by generating recurring cash flows and indexing contracts to inflation. For example, a water distribution network that adjusts its tariffs annually to the CPI could maintain its profitability in a high rate environment, even if interest rates rise in line with inflation.
- Core+: these are assets with greater sensitivity to the economic cycle and limited improvement options, therefore more vulnerable to rises in interest rates (their income depends on demand). For example, a motorway with revenues linked to traffic may suffer a drop in valuation if the cost of financing reduces the asset's net margins.
- Value Added: this type of investment requires significant improvements to generate value (including, on occasions, *greenfields*). The impact on profitability is produced by the combination of a scenario of high financing costs and a very long duration of

future flows, strongly affecting the NAV. Example: an expanding airport with high upfront costs and future cash flows concentrated in long-term horizons will face a significant drop in valuation.

Mitigating the risks associated with interest rate and other sources of volatility in the valuation of private infrastructure requires a strategic and proactive approach. The tools available include refinancing, optimisation of the financial structure, selection of assets with inflation-indexed flows and, especially, active and efficient management. We develop them below, providing simple examples of their use:

- Refinancing and debt optimisation: Infrastructure projects often require a large amount of debt financing, which makes them vulnerable to increases in interest rates. An effective refinancing strategy can soften the impact of these increases, for example, by concentrating fixed-rate debt issuance and extending maturities as a way to avoid short-term liquidity stress. The archetypical case is the manager who refinances a solar plant with a 20-year fixed-rate debt issue, ensuring stability in debt service regardless of rate fluctuations.
- Selecting inflation-protected assets: Inflation-indexed contracts are key to preserving the value of income in real terms. As discussed in section 3.7 of the report, our expectations of higher (and volatile) interest rates and inflation over the medium to long term reinforce the relevance of this strategy. Critical infrastructures, such as electricity grids or sewerage systems, often have regulated contracts adjusted to the CPI, which mitigate the impact of inflation and provide stability to the asset. For example, a gas distribution network has annual tariff revisions based on the evolution of the consumer price index, thus guaranteeing the preservation of the purchasing power of its cash flows. Traditional correlation between CPI and interest rates have usually led to the negative impact of raising rates being compensated by the value increase of higher inflation in these assets.
- Active management as a key tool: As detailed in section 4 of the report, active management is one of the main levers for value generation. In a high interest rate environment, it becomes indispensable to mitigate volatility and maximise profitability through, for example, (i) operational improvements that increase asset efficiency, reduce operating costs and optimise the use of resources; (ii) diversification by asset type and region to dilute specific risks; (iii) restructuring revenues, seeking new contracts or customers that offer better conditions, or tighter tariffs in exchange for the economic context. We return to the example of an airport, where the airport manager could introduce digital management technologies that increase operational efficiency and reduce waiting times as a way to improve revenues and customer experience.
- Adopting innovative strategies: in line with our outlook for infrastructure investment (see section 3 of the report), choosing opportunities in sectors or themes linked to decarbonisation and digitalisation could offer opportunities to mitigate the consequences of a higher interest rate and inflation scenario. The prioritisation of investments in renewable energy and data centre infrastructure, backed by supportive government policies, is a clear example. Optimising the management of certain investments through the use of AI-based technologies (predictive maintenance, real-time monitoring) is another strategic direction of potential mitigation.

6. Adding value in infrastructure management: a case study of the EDIF I fund

This section focuses on analyzing how the EDIF I fund has managed to generate added value in its investment strategy by optimizing the selection, operation, and divestment of the assets in its portfolio. It will detail how the management team has followed a diversified approach, focusing on mature and sustainable infrastructure, prioritizing assets with predictable and regulated income. In this context, the fund's performance will also be analysed through key return and volatility indicators, as well as compared to other infrastructure funds and listed equities. This analysis will provide a detailed view of how active management and the investment strategy have created value for investors, not only in terms of profitability but also in risk mitigation.

6.1. Description of the EDIF I fund

The EDIF I fund (European Diversified Infrastructure Fund I) began its trajectory at the end of 2009 when it made its first capital call, a process that continued well into 2016 and totalled EUR 2 billion. The life of the fund extends well beyond that, until 2024, when the last divestment takes place.

The fund has been constructed and developed on the basis of various selection criteria and risk-return objectives, including the following:

- **Mature infrastructure:** operational and mature assets with proven demand and predictable cash flows have been prioritised. This includes, for example, utilities such as Anglian Water (UK) and electricity grids such as Caruna (Finland).
- **Risk diversification:** the fund sought to diversify the portfolio by investing in different sectors and regions in Europe. This allowed the fund to mitigate the risks associated with any specific market or asset class.
- **Sustainability:** sustainability has been a key factor in the selection of assets, favouring infrastructures related to renewable energies, such as Finerge.
- **Economic relevance and asset quality:** the investments have focused on infrastructure essential to the functioning of the economy, which has increased the likelihood that the assets will continue to be needed in the long term in the environment in which they operate.

A total of 10 investee companies were acquired, concentrated in the sectors[1] of utilities (7), transport (2) and communications (1). The sectoral composition of the fund provides information on the risk-return profile of the strategies followed: 5 of the 7 utilities are core, the remaining 2 and the other investees, transport and communications, are classified as core+. Section 2 of this report defines each of these strategies.

As for the revenue risk profile, as investee companies with regulated and contractual revenues dominate, it is also relatively low and predictability is high. Thus, the main risks in terms of revenues are those of regulatory origin.

Geographically, all investments have been made in Europe, specifically in the following countries: the United Kingdom, Spain, Finland, Germany, France, Sweden and Portugal.

[1] Standard sectoral classification used by Afi

A summary of the fund's investments, their risk profile and a brief description of the assets is set out in the table below:

Investees in the EDIF I fund

Company	Sector	Sub-sector	Sector (Afi)	Country	Strategy	Revenues risk profile	Brief description of the company/asset
Anglian Water	Utilities	Water Utilities	Utilities	UK	Core	Regulated	Anglian Water is a major water utility company in the UK, primarily serving the east of England. It provides clean drinking water and wastewater treatment services to millions of customers, focusing on water conservation, sustainability, and environmental protection.
Electricity Northwest	Utilities	Electricity Distribution	Utilities	UK	Core	Regulated	Electricity Northwest is an electricity distribution network operator in the northwest of England, providing power to homes and businesses in the region. It manages and maintains the infrastructure that delivers electricity from the national grid to local customers.
Reganosa	Midstream	LNG Terminals	Utilities	SP	Core	Regulated	Reganosa is a Spanish energy infrastructure company specializing in natural gas transmission and LNG (liquefied natural gas) terminal operations. It operates an LNG terminal in Galicia and manages natural gas pipelines, supporting Spain's energy needs with a commitment to safety and sustainability.
Ferngas Group	Utilities	Gas Distribution	Utilities	DE	Core	Regulated	Ferngas is a natural gas distribution company based in Germany. It manages the infrastructure for natural gas distribution, delivering reliable energy to residential, commercial, and industrial customers, while working on initiatives to transition towards more sustainable energy sources.
Caruna	Utilities	Electricity Distribution	Utilities	FI	Core	Regulated	Caruna is Finland's largest electricity distribution company, serving over 700,000 customers. It manages the distribution network infrastructure, ensuring reliable electricity delivery and improving grid resilience against extreme weather.
Finerge	Renewables	Diversified Renewables	Utilities	PT	Core+	Contracted	Finerge is a leading renewable energy company in Portugal, specializing in wind and solar power generation. It operates a large portfolio of wind farms and solar plants, contributing significantly to the renewable energy sector in Portugal and Spain.
Coriance	Utilities	Heating & Cooling	Utilities	FR	Core+	Contracted	Coriance is a French company specializing in district heating and cooling solutions, often utilizing renewable energy sources. It designs, builds, and operates heating and cooling networks for urban areas, contributing to sustainable urban energy systems.
ForSea	Transport	Ferries	Transport	SWE	Core+	Volume	ForSea is a Swedish ferry operator that runs the Helsingør-Helsingborg route between Denmark and Sweden. Known for its eco-friendly initiatives, ForSea operates battery-electric ferries, aiming to reduce emissions and promote sustainable maritime transportation.
Parkia	Transport	Carpark	Transport	SP	Core+	Volume	Parkia is a Spanish company that operates car parks across Spain and Portugal. It provides parking solutions in urban areas, hospitals, and commercial centers, with a focus on customer convenience, digital solutions, and sustainability in parking management.
Digita	Communications	Towers	Telecom	FI	Core+	Contracted	Digita is a Finnish telecommunications infrastructure company that manages broadcast towers, digital infrastructure, and IoT networks. It supports the transmission of digital television, radio, and data across Finland, offering services to broadcasters, telecom operators, and enterprises.

Source: Afi, IGNEO

6.2. Fund return and volatility analysis

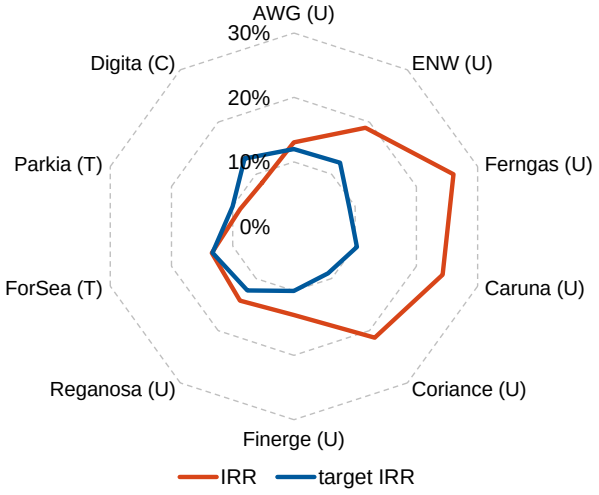
The return obtained (IRR) on the investments made amounted to 16.2% and is due, in particular, to the 18.4% obtained in the projects in the utilities sector, which are the furthest away (upwards) from the return objectives initially established (see graph below). Despite the higher risk profile of the transport and communications investees (all

of them with a core+ strategy compared to the core in almost all utilities), lower IRRs were achieved in these sectors: 11.6% and 8.4%, respectively.

Only in two investees - Parkia and Digita - the IRR was (slightly) lower than target. In general, there was a greater dispersion of realised returns compared to the targets (which were on average around 11%) but favourable for the investor.

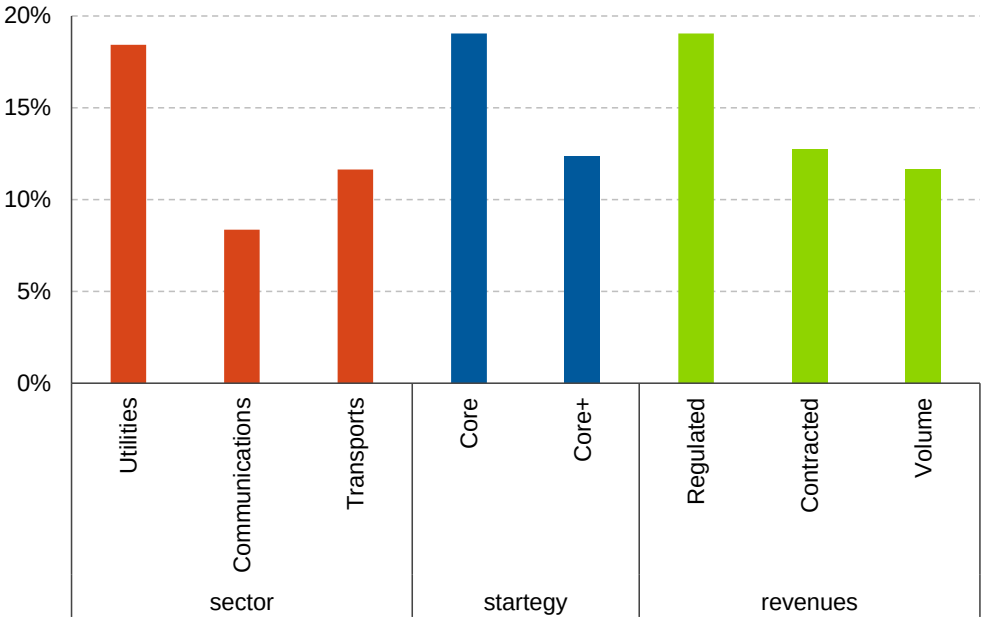
The return passed on to investors was somewhat lower than the return on investments: the fund's IRR was 12.5%. The 3.7pp difference is mainly due to fees charged and corresponding to the value contributed by the management team.

Dispersion of realised and target returns (gross IRR) in each of the investees



Source: Afi, IGNEO (sector key: U, utilities; T, transport; C, communications)

Return (gross IRR) by sector, return-risk profile of strategies and income risk profile



Source: Afi, IGNEO

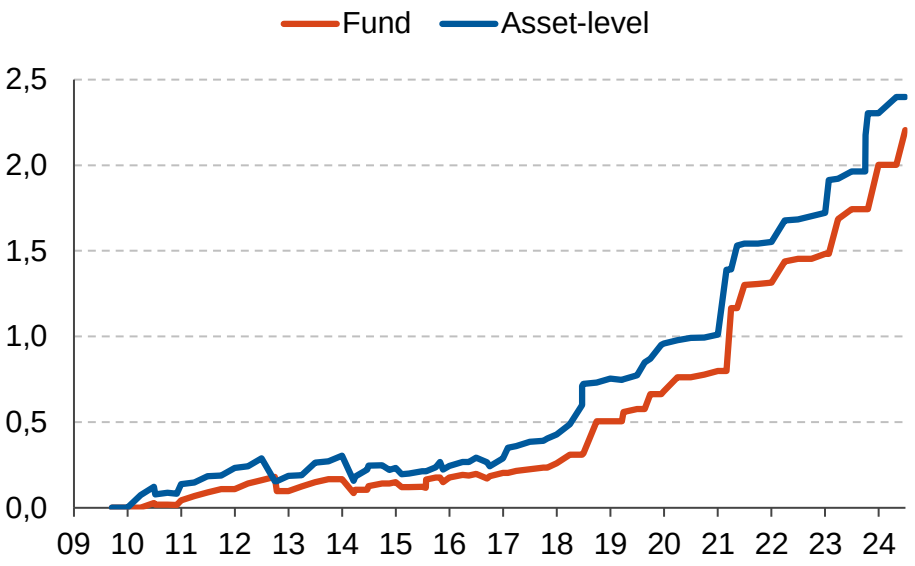
The evolution of multiples such as TVPI (*Total Value to Paid-In*) is another way of assessing the fund's *performance*. TVPI allows us to measure how much has been

returned to investors in relation to the capital they have invested in the fund. Thus, when the TVPI exceeds 1x, the fund has returned more than what has been invested.

In the case of EDIF I, the TVPI achieved was 2.21x, meaning that the fund has returned EUR 2.21 to participants for each currency unit invested. In addition, a TVPI of 1x was reached in early 2021, thus generating a total value in excess of the invested value as of 2021.

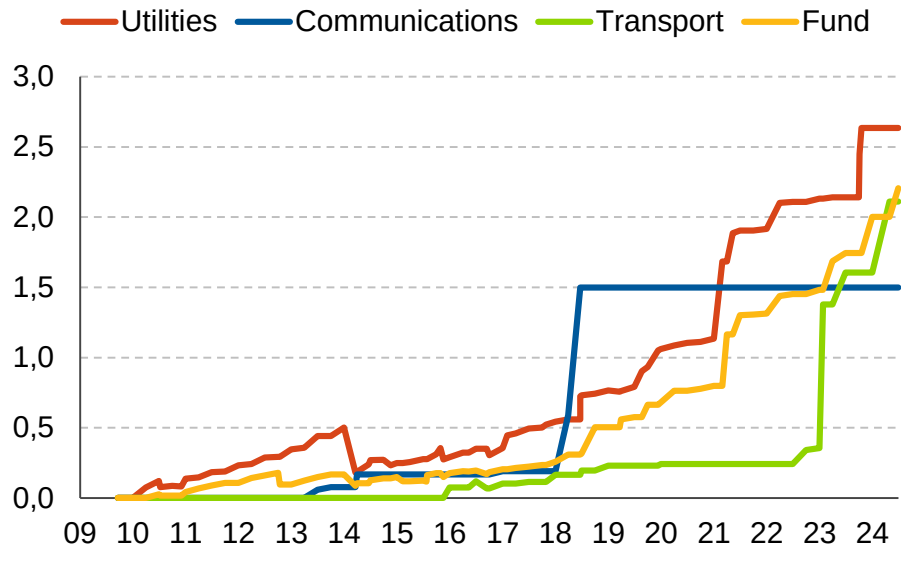
The calculation of the TVPI by sector shows, like the IRR, that it was the *utilities* investees that were the most profitable for investors. The TVPI of the transport sector was similar to that obtained by the fund, while that of communications was lower. In any case, the latter was also higher than 1x (1.5x) although the divestment in this sector took place earlier -2018-.

TVPI (*Total Value to Paid-In*) multiple - at fund level and at *asset level*



Source: Afi, IGNEO

TVPI (*Total Value to Paid-In*) - at fund and sector level



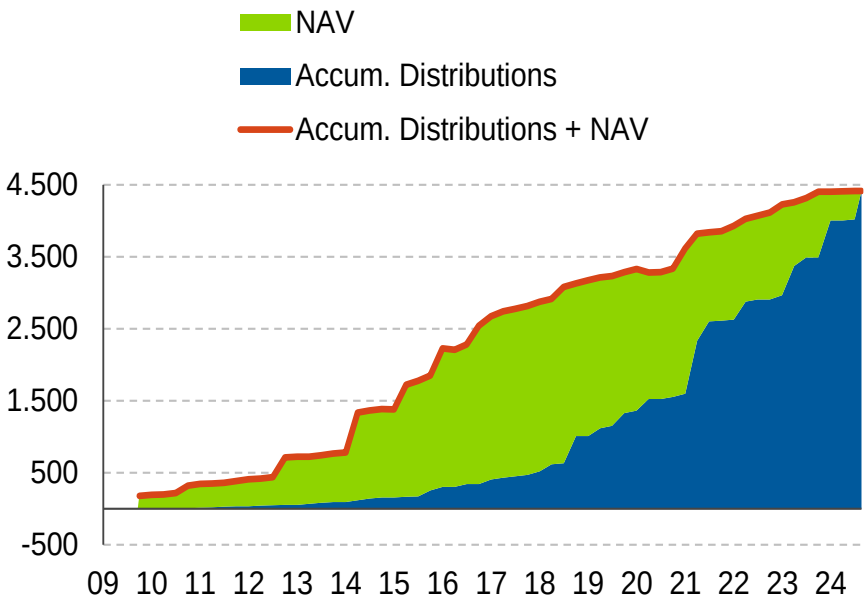
Source: Afi, IGNEO

6.3. Breakdown of fund returns and comparison with listed equity investment.

The analysis of the decomposition of the fund's value shows, as is usual in infrastructure investment, that in the early years it is the increase in the value of the NAV that drives the value of the fund, but as the life of the fund progresses the distributions increase exponentially. In other words, in the first phase it is the value of the investments that explains, to a large extent, the value of the fund, but subsequently significant profits begin to be generated on these investments.

In the specific case of EDIF I, cumulative distributions exceed the value of the NAV in 2021. The recurrence of distributions, present in EDIF I's return profile, is one of the factors most valued by investors in this type of investment (see comments on private asset investor surveys in section 3).

Decomposition of the fund value into cumulative distributions and NAV (EUR millions)



Source: Afi, IGNEO

As we have verified in section 3 of this report, during the life of EDIF I, listed equities, especially US equities, performed very positively, but with volatility also higher than that of infrastructure investments. However, much of the returns have been due to gains in a small number of sectors - especially those with a growth bias - *in* a favourable environment for companies with high earnings duration due to the secular trend of falling interest rates and, more recently, the enthusiasm related to the development of Artificial Intelligence - particularly relevant for the technology sector in these early stages of the new technology. Therefore, if we look at the performance of other listed equity baskets, more appropriate for *benchmarking* the EDIF I, such as the Stoxx 600 or the Global Infrastructure, then the conclusions are different.

To make a comparison beyond the fund's IRR versus other assets, we replicated the fund's investment flows on an investment in passively managed instruments (ETFs, so as to include the fees of this form of investment) on (i) US equities, (ii) equal-weighted US equities, (iii) European equities, and (iv) listed global infrastructures.

We use the series of *price return* ETFs and calculate the dividend yield of the ETFs separately in order to break down the returns between capital gains/losses and dividends. The ETFs chosen to carry out the exercise are listed below:

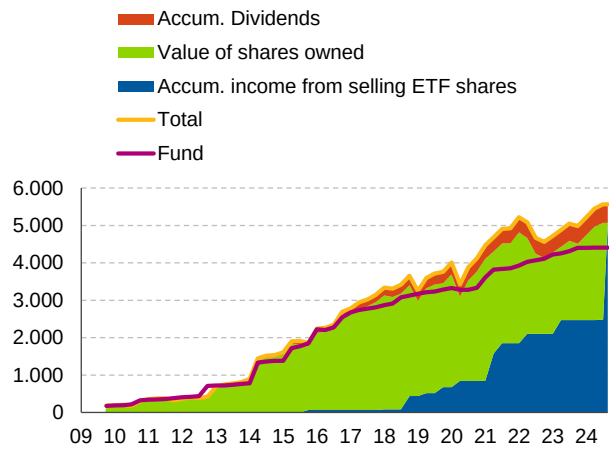
- US equities: SPDR S&P 500 ETF Trust
- US equities equal-weighted: Invesco S&P 500 Equal Weight ETF
- European equities: iShares STOXX EUROPE 600 UCITS ETF
- global listed infrastructure: iShares Global Infrastructure ETF

The exercise is developed on the basis of the following assumptions:

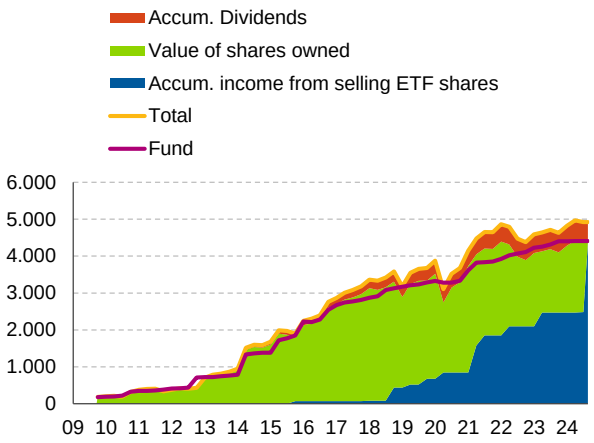
- Purchase of units: capital calls made are used to purchase units in the ETF. Thus, in each quarter, if capital calls occur, we assume the purchase of the number of units equal to the value of the capital call divided by the price of the ETF.
- Dividends: Dividend income paid by the ETF is taken into account for each quarter. Since we calculate on the basis of a *price return* ETF, in order to subsequently disaggregate returns, dividends are computed by multiplying the number of shares at quarter-end by the dividend yield of the benchmark.
- Sale of units: All distribution flows from the fund involving divestment (excluding gains realised on investments) are treated as sales of ETF units. Thus, each quarter the value of divestments in the fund is divided by the price of the ETF to calculate the number of units sold.
- Total value of the investment: at each point in time (quarters), the value of the investment will correspond to the sum of the value of the ETF's holdings in the portfolio, accumulated dividends and divestment proceeds (sales of holdings). This is the metric against which we then compare the performance of each ETF with that of the fund.

Replication of EDIF I flows on equity ETFs (EUR millions)

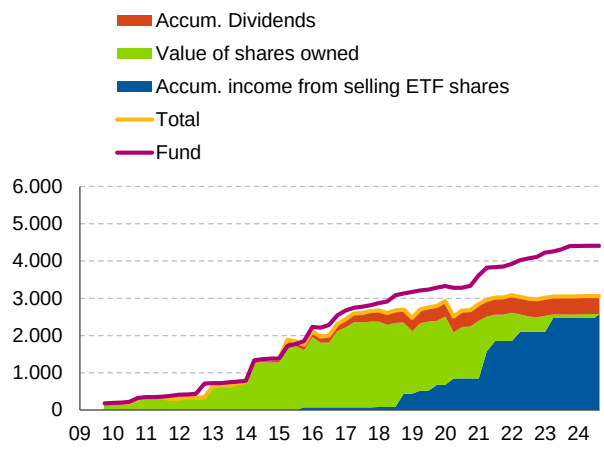
SPDR S&P 500 ETF Trust



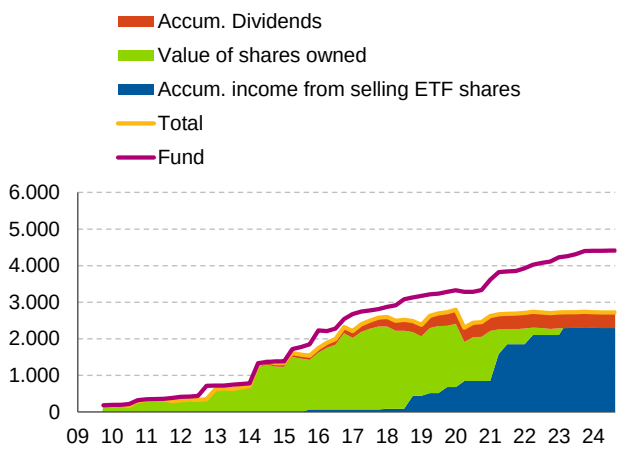
Invesco S&P 500 Equal Weight ETF



iShares STOXX EUROPE 600 UCITS ETF



iShares Global Infrastructure ETF

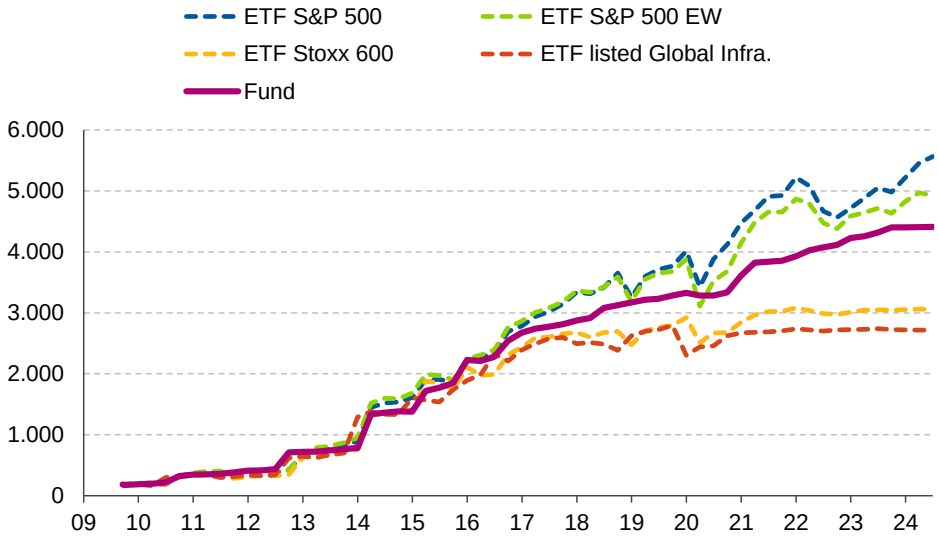


Source: Afi, IGNEO, Macrobond, FactSet

It can be seen how, with the same flow profile, the return obtained on European equities or listed infrastructure would have been much lower. Investing the same EUR 2 billion, the iShares STOXX EUROPE 600 UCITS ETF would have returned approximately EUR 1 billion (53%) and the iShares Global Infrastructure ETF EUR 700 million (36%). EDIF I generated capital gains of EUR 2.4 billion (121%). The performance differential compared to comparable instruments is therefore due not only to the characteristic premiums of private assets, such as illiquidity, but also to the alpha generated by active management, supported by the levers of value creation described in section 4 of this report.

EDIF I underperforms relative to US equities. In any case, given the sector and geographic composition of the fund, we believe the comparison with European equity *benchmarks* is the most appropriate. The graph below summarises the four return comparison alternatives constructed on listed equities against the return obtained by EDIF I.

Summary of simulations: EDIF I versus investment of equivalent flows in US and European stock indices. (EUR millions)

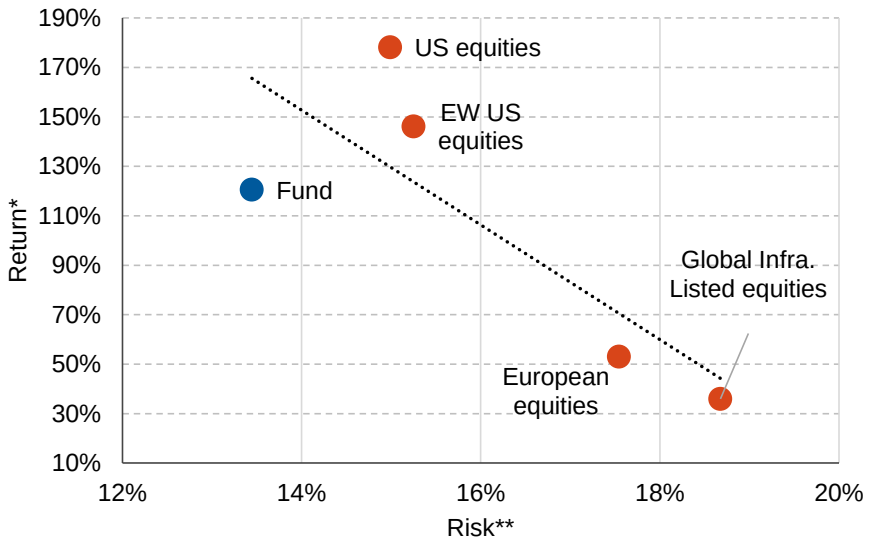


Source: Afi, IGNEO, Macrobond, FactSet

6.4. Comparison of the risk-return profile of EDIF I against other listed equity indices

It is also relevant to note the lower volatility of the quarterly value of the EDIF I fund compared to the volatility of the investments in the various equity ETFs selected. To arrive at a risk-return curve or profile, we calculated the standard deviation of the quarterly change in value (the return) of each of the investments. As can be seen in the graph below, the EDIF offers a much higher return mix than European listed equities and global infrastructure listed equities, with significantly lower risk (or return volatility).

Risk-return trade-off of EDIF I versus the alternatives considered in US, European and global infrastructure listed equities



Source: Afi, IGNEO, Macrobond, FactSet (*final investment value/total investment; **standard deviation of quarterly changes in total investment value).

Compared to other infrastructure funds, EDIF I has achieved an above-average (net) IRR for all strategies, even those with a higher level of risk such as *value-added* and *opportunistic*, even though the fund is in the middle ground between *core* and *core+* - on average EDIF I outperformed the latter two strategies by 245bp.

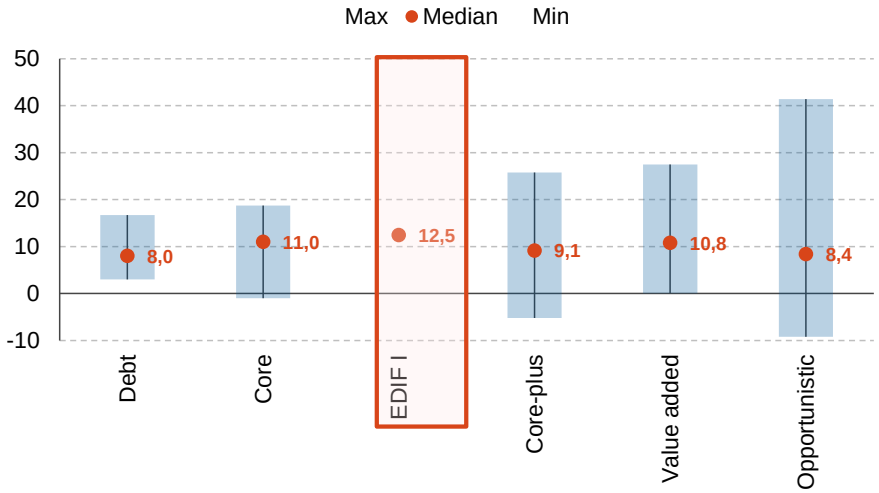
6.5. Comparison of EDIF I returns against infrastructure funds with a dedicated strategy profile and against funds with different sizes of assets under management.

The graph below shows how EDIF I, investing exclusively in *core* and *core+* assets, has managed to outperform the average returns of the different strategies of other funds with vintages between 2011 and 2020; even against riskier alternatives, such as *value-added* and *opportunistic* strategies. This outperformance is directly related to the management team's ability to generate alpha, which would have been supported by the following aspects:

- Selection of higher quality assets: through the identification of assets that, within their category (core and core+), offer an optimal combination of stability, appreciation potential and cash flow generation.

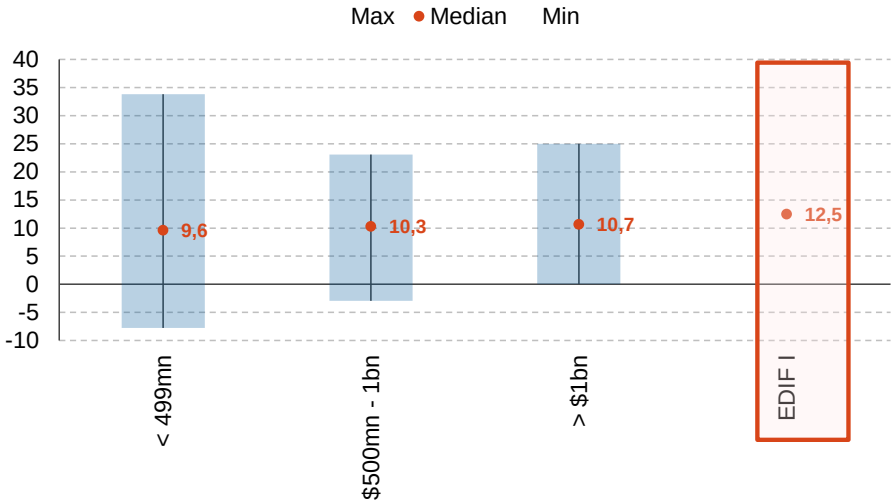
- Operational improvement strategies: by improving the operational performance of core+ assets without taking disproportionate risks.
- Market *timing*: requires entering and exiting investments at optimal times to capture additional returns, showing an exceptional ability to read the market.
- Discipline in risk management: respecting the limits inherent in core and core+ strategies, avoiding the temptation to take higher risks in pursuit of returns. This highlights a disciplined and consistent approach.

Dispersion of returns (net IRR) by strategy in infrastructure investment (years 2011-2020) and net IRR of EDIF I



Source: Afi, IGNEO, Preqin

Dispersion of returns (net IRR) by fund size (years 2011-2020)



Source: Afi, Preqin

EDIF I also outperformed funds of the same size range. In the 2011-2020 universe of infrastructure funds, funds of the same size (above USD 1 billion) have achieved an average IRR (net) of 10.67%, or 183bp less than EDIF I (see chart below). This shows

that the EDIF exhibits a high quality of strategic execution, which has much to do, under normal circumstances, with the ability of the management team to maximise return on capital. This result shows that, in addition to providing high beta to the asset, EDIF I has also provided significant alpha.

6.6. Afi's approach to the measurement of alpha generated by the EDIF I management team

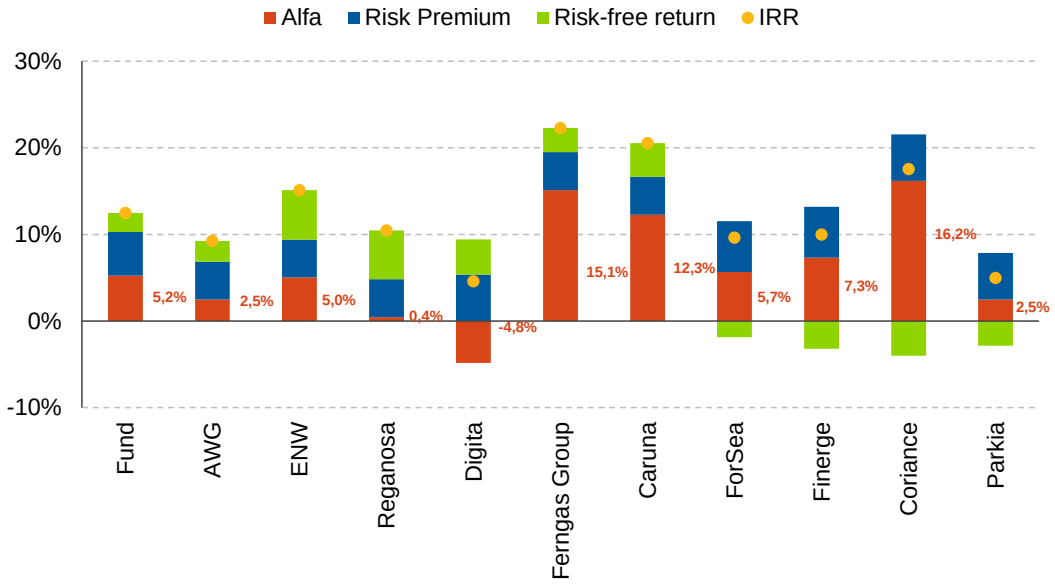
To estimate the excess return generated by the EDIF I management team's active management, we break down the fund's performance into its various components and then isolate the contribution of alpha to total return. To do so, we consider the following variables:

- Net IRR of the investment: for the fund the net IRR is 12.5% (378bp lower than the gross IRR). To estimate the net IRR of the investees, we subtract 37.8bp from the gross IRR of each investee, assuming an even distribution of management costs.
- Risk-free investment return: we consider the annualised return, obtained on the *ICE BofA 10-15 Year German Government Index*, over the period of investment in the fund and in each of the investees. For the Fund the value is 2.2%.
- Asset risk premium: we use as a benchmark for the risk premium on *core* strategy investments the difference between the annualised return, over the life of the EDIF I, of the *S&P Global Infrastructure Index TR* and the *ICE BofA 10-15 Year German Government Index.* In addition, we make an upward adjustment to this risk premium for investees or portfolio investments with a higher risk profile than *core*:
    - For *core*+ investees (Digita and Coriance): +100bp more premium.
    - For *core*+ investees in the transport and renewable energy sectors (ForSea, Parkia and Finerge): +150bp more premium

Following this methodology, the risk premium of the fund is calculated as the weighted average (based on the size of each investment) of the risk premium of each of the investees, resulting in a risk premium of 5% for EDIF I.

We calculated the excess return (or alpha) for EDIF I by taking the net IRR (12.5%) and subtracting the risk-free rate return (2.2%) and the risk premium applied to the fund's investments as a whole (5%). Our calculations yield a total excess return or alpha for the fund of +5.2%. Using the same calculations for the rest of the EDIF I investments, the average excess return of the *core* and *core*+ strategies would be 2.85%, slightly more than half of the total value of this variable for the fund as a whole.

Decomposition of fund and investee returns: IRR of the investment, risk-free return, risk premium and alpha or excess return



Source: Afi, IGNEO, Preqin, ICE

6.7. Relationship between the evolution of risk-free interest rates and the returns earned by the fund

As in any asset class, interest rates play a fundamental role in the profitability of infrastructure investment, but they are also crucial in determining the cost of financing investments, given the importance of debt in the capital structure of these projects. The impact of interest rates on expected profitability and on the cost of financing comes through the following channels:

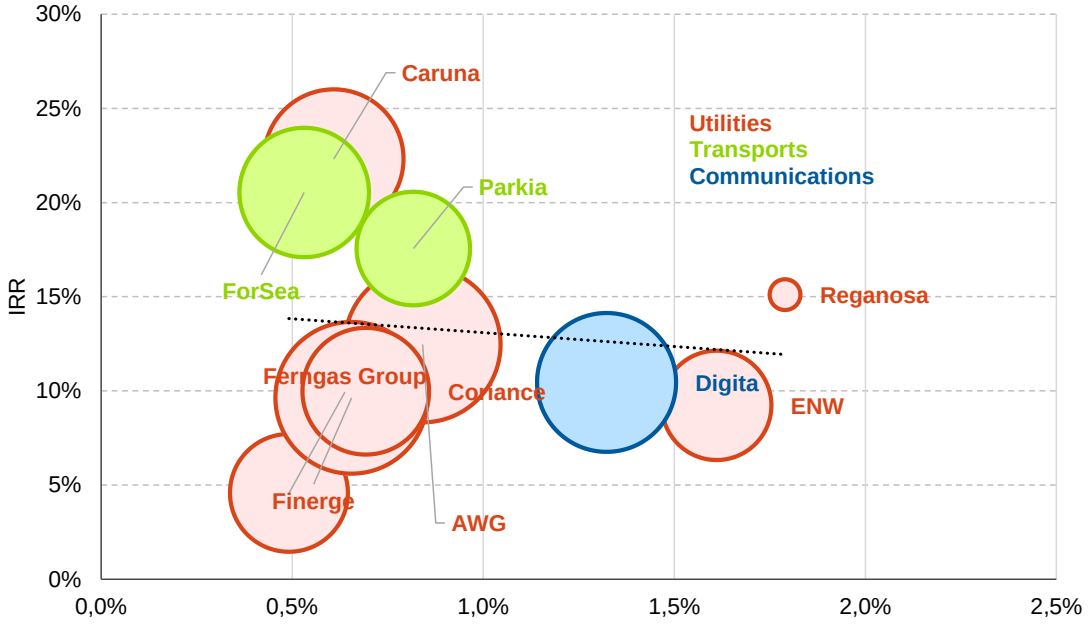
- Cost of debt: an increase in interest rates raises the cost of borrowing. This can reduce the cash flows available to investors and thus lower the fund's net IRR.
- Asset valuation: higher interest rates imply higher discount rates, which reduce the present value of projected cash flows.
- Risk premia: in a high rate environment, investors will tend to demand higher premia to compensate for the higher risk taken.
- Competition with risk-free assets: When interest rates rise, risk-free assets offer more attractive returns, making infrastructure investments relatively less competitive.

To try to identify whether such theoretical relationships have occurred in EDIF I investments, and thus determine the relationship between the fund and interest rates, we compare the (net) IRR obtained on each investee and subsequently the excess return, with the average risk-free rate (we use the IRR of the 15-year German sovereign bond as a benchmark).

The graph below shows a negative slope for the relationship between the net IRR of investments and the risk-free interest rate. As mentioned above, there are several effects

that play a role in this relationship and validate that it is inverse - for example, (i) higher project financing costs and (ii) more conservative valuations.

Ratio of net IRR of investments to interest rates (risk-free - IRR Bund 15 years)



Average GER 15y govt. bond yield during the investment period in each asset
*size is defined by the total value of the investment

Source: Afi, IGNEO, Preqin, ICE

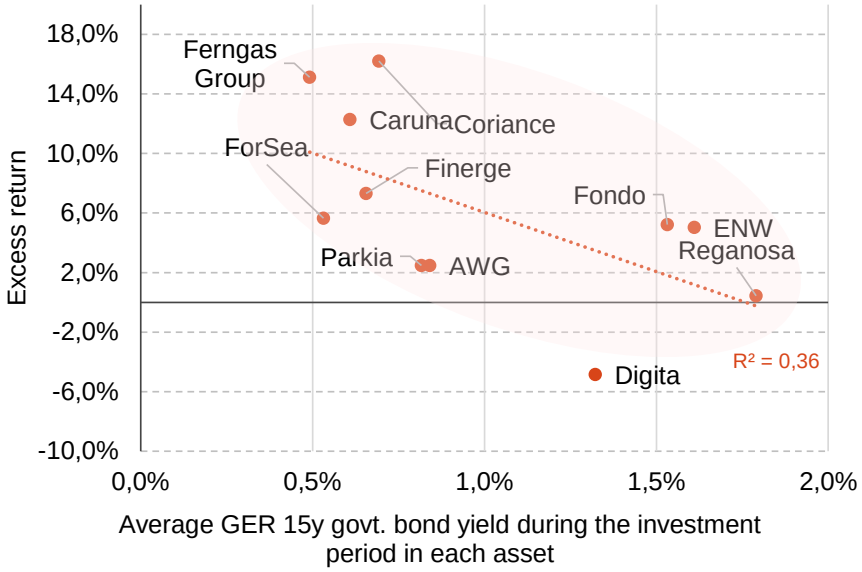
As regards the relationship between the risk-free rate and the excess return generated by management, as intuition would predict, the slope is also negative. Thus, as can be seen in the alpha achieved in the various EDIF I investees, higher interest rates correspond to lower alphas. The rationale for this inverse relationship is based on the following factors:

- Macroeconomic environment: higher interest rates and therefore tighter financial conditions result in a less dynamic economic environment, limiting the business expansion potential of infrastructure companies (in general for all sectors).
- Margin erosion: the rising cost of debt reduces the scope for cash flow generation, limiting the potential for value creation.
- Competition with other assets: with higher interest rates investors are more demanding, i.e. they generally demand higher risk-adjusted returns, which makes it more difficult to obtain returns significantly above market rates.

Ultimately, the negative slopes in both analyses reflect how a higher interest rate environment adversely affects both the absolute profitability and excess return of infrastructure investment, as it results in higher financing costs and creates barriers to the generation of added value.

This reinforces the thesis that, should a scenario of higher interest rates and inflation materialise, prioritising managers who make optimal use of levers to generate added value through active management as a way to generate alpha is imperative.

Ratio of excess return (or alpha) achieved by EDIF I on each investment to risk-free interest rates



Source: Afi, IGNEO, Preqin, ICE

7. Conclusions

This report has analysed how private infrastructure investment, particularly in an economic environment marked by inflation and interest rate uncertainty, can offer risk-adjusted returns with stability and diversification.

We summarise here the main conclusions of our analysis, organised in four blocks, highlighting the role of active management as an essential driver to maximise the added value and ensure the success of private infrastructure investment.

Infrastructure: characteristics, historical evolution and future trends

- Diversification and resilience: Private infrastructure stands out for its low correlation with traditional financial assets, bringing diversification and stability to global portfolios in uncertain environments.
- Risk-adjusted return: Private infrastructure offers an attractive return-volatility trade-off compared to other private and listed market assets, which is hedged against inflation and somehow more protected against interest rate risk, establishing itself as a competitive alternative.
- Strategic sectors: Sectors linked to decarbonisation and digital infrastructure represent key growth opportunities, driven by structural trends such as energy transition and digitalisation.
- Long-term outlook: In a structurally higher interest rate environment, private infrastructure will remain a solid option for investors seeking stability and consistent returns.

Active management as a lever for generating value in infrastructure

- Active management as a differentiator: The EDIF I case highlights how operational and financial optimisation can mitigate risks and generate positive alpha, maximising the value of infrastructure investments.
- Value added by the manager's experience: The experience and local knowledge of the managers have been decisive for the success of the strategies, allowing an adapted and efficient management.
- Strategy *mix*: The combination of Core, Core+ and Value Added strategies allows to capture diversified return opportunities, adjusting to different risk profiles.

Sources of volatility in private infrastructure valuation

- Adaptability to higher interest rates: Although the higher funding cost environment affects profitability, strategies focused on core assets with stable cash flows have shown greater resilience.

- Inflation protection: Price index-linked income provides a natural hedge against prolonged inflationary scenarios, although its effectiveness depends on the type of asset.

Adding value in infrastructure management: analysis of EDIF I

- Stability and positive alpha: EDIF I has demonstrated its ability to generate absolute and risk-adjusted returns on a consistent basis, having implemented a strong active management approach. Compared to other infrastructure funds,

- EDIF I has achieved an above-average (net) IRR for all strategies, even those with a higher level of risk such as value-added and opportunistic, even though the fund is in the middle ground between core and core+.

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