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Towards better infrastructure investment products?

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In a new paper sponsored by the Global Infrastructure Hub (a G20 Initiative), EDHECinfra presents the results of the first in-depth survey of institutional investors' perceptions and expectations of infrastructure investment.

It documents the reasons for investing in infrastructure and whether currently available investment products or strategies are helping investors meet these objectives. The findings provide a first step towards integrating infrastructure in long-term investment solutions.

The survey reports the views of 184 individuals involved in infrastructure investment; half of them represent institutional investors or 'asset owners' (insurers, pension plans and sovereign wealth funds), one-third are infrastructure asset managers and the remainder are infrastructure investment specialists from multilateral development banks, rating agencies and consultancies. Respondents are mostly senior executives active in the top management (CEO, board members – 14.5%), strategic (CIO, head of ALM or asset mix – 25.5%), investment (head of infrastructure, investment director – 46.2%) or other (14.5%) functions of the organisations they represent.

Infrastructure is popular. Almost two-thirds of surveyed institutions declared that they wanted to increase their current holdings of infrastructure investments. Beyond that unsurprising point, the survey reveals some important evolutions and also important differences of perspectives, among investors and also between asset owners and managers.

In what follows, we summarise the findings of the survey and provide some elements for discussion and future research.

Investment beliefs

Key findings

The main findings on asset owners' and managers' investment beliefs are:

- There is wide disagreement among respondents about whether listed infrastructure equity or debt qualify as an asset class. However, unlisted infrastructure is widely considered to be a 'unique' asset class, both on the private debt and privately-held equity sides;
- Most respondents also believe that focusing on infrastructure investment only makes sense if it can be defined as an asset class, whereas a minority reports preferring to approach infrastructure as an investable bundle of factor exposures;
- Most respondents perceive infrastructure investment's unique feature to be either its potential for portfolio diversification or for harvesting risk premia, whereas it is less frequently believed that infrastructure has unique interest rate or inflation-hedging properties;
- Investors and managers define infrastructure in terms of long-term contractual arrangements and monopoly regulation and acknowledge that

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- The survey reports the views of 184 individuals involved in infrastructure investment; half of them represent institutional investors or 'asset owners' (insurers, pension plans and sovereign wealth funds), one-third are infrastructure asset managers and the remainder are infrastructure investment specialists from multilateral development banks, rating agencies and consultancies.
- Key findings are reported in the following areas: investment beliefs; products and objectives; benchmarking; and ESG (environmental, social and governance).

industrial sectors are a much less informative way to categorise such investments. In the same spirit, the stability of long-term contracts and the role of counterparty risk are perceived to be the most important and unique characteristics of infrastructure firms (compared to other firms). Finally, 'brownfield' (existing) and 'contracted' infrastructure is reported to be the most attractive to investors, closely followed by brownfield regulated utilities;

- Expected returns follow a clear pattern determined by the 'business model' (contracted, merchant or regulated) and the lifecycle (greenfield or brownfield) of infrastructure firms, with greenfield merchant investments requiring higher returns than brownfield regulated and contracted infrastructure;
- Despite viewing infrastructure as characterised by stable long-term contracts and being most attractive once it has been built, most investors and their managers expect relatively high returns. A majority considers that infrastructure assets should not be 'expensive' and requires equity returns ranging from the high single digits to the low teens. Asset managers systematically report higher expected returns than asset owners.
- More than half of participating asset owners declare that they are investing in emerging markets or wish to, and that they are willing to increase their current allocation. SWFs and pensions plans are the most involved and willing types of investors investing or aiming to invest in emerging market infrastructure;
- The main reported reasons for expanding into emerging market infrastructure are higher returns and country risk diversification, while the main concerns of investors are public policy

reversals and the enforceability of contractual claims.

- Required returns in emerging markets are higher but otherwise follow the same patterns as in OECD markets. However, the emerging market premium on returns varies for different types of infrastructure projects: investments in the contracted and regulated categories command much higher spreads (above the OECD required returns), particularly at the brownfield stage, whereas emerging market merchant risk is perceived to be almost equivalent to OECD merchant risk.

From homogenous to heterogeneous beliefs

These results highlight the degree to which investors agree or disagree about what to expect from investing in infrastructure equity or debt.

Infrastructure has long been considered difficult to define as an investment proposition but a consensus view is emerging among market participants about the nature of infrastructure business, and what drives risk and performance in such investments. Hence, what qualifies or not as infrastructure is now better understood, as the recent debate around the definition of infrastructure investment in the context of the Solvency-II directive has shown.

As a result, investors express views about expected returns which are coherent with the risk matrix proposed in Blanc-Brude, Hasan, and Ismail (2014) and Blanc-Brude and Hasan (2015) for instance, by which systematic risk in infrastructure investment can in part be broken down according to a simple 3×2 matrix made up of three business models (contracted, merchant and regulated) and two key moments in the lifecycle of infrastructure projects (greenfield and brownfield).

A third dimension of the risk profile of infrastructure investments is country or jurisdiction risk, which is confirmed by the reported returns required by investors for emerging market infrastructure. Interestingly however, the 3×2 pattern described above is not changed by the addition of emerging market risk: relatively speaking, greenfield risk is still attracting higher returns than brownfield and contracted infrastructure but less than projects exposed to merchant risk.

However, the premium reported for taking emerging market risk is driven by considerations that are specific to these jurisdictions: the lower end of the risk spectrum in OECD infrastructure (brownfield contracted and regulated infrastructure) is what attracts the highest relative premium in emerging markets.

This validates the focus on contracts as the determinants of the risk profile of infrastructure investments: the higher risks found in emerging markets spring from – respondents report – the quality of the contracting framework and the ability to enforce contractual claims. ▶

◀ Hence, the more infrastructure investments rely on contracts (when it belongs to the ‘contracted’ business model and in the long-term – ie, at the brownfield stage) the more they attract relatively higher risk premia in emerging markets.

While the asset pricing implications make sense, these results are also striking from a public policy perspective: countries that have a bad track record at respecting and enforcing contractual claims pay a significant premium on their privately-financed infrastructure – one that, in all likelihood, renders uneconomic many potential private investment projects in these jurisdictions. Beyond the homogeneity of investors’ beliefs in terms of the risk and returns components of infrastructure investments, survey results also highlight the heterogeneity of views around these fundamental building blocks. Different types of asset owners tend to report different preferences and views are also highly heterogeneous between individual investors of the same type.

That investors require a range of returns for comparable risk profiles (ie, within one family of infrastructure investments) is congruent with the notion that in incomplete markets, the law of one price does not apply and large bid/ask spreads remain. In this survey, the reported range of expected returns is considerable, with similar risk profiles attracting return requirements ranging from less than 5% to more than 15%.

Finally, the fact that asset managers systematically report higher expected returns than asset owners can also be interpreted as a reflection of the agency issues found between investors (limited partners – LPs) and general partners (GPs) which we discuss at length below.

Products and objectives

Key findings

With respect to available investment options and the objectives pursued by asset owners investing in infrastructure, key findings of this survey include:

- ➔ The immense majority of asset owners are rather dissatisfied with existing infrastructure investment products;
- ➔ Fee levels is the first reason for this state of affairs and in second place is the absence of well-defined investment objectives of the various infrastructure funds and platforms;
- ➔ Even co-investment alongside managers or banks is considered by almost half of asset owners to be only a second best option, ie, they would rather have access to the investment products they need and want.
- ➔ The immense majority of asset owners consider the classic closed-ended private equity infrastructure fund model to be ‘outdated’ and ‘not adding value’;
- ➔ The majority of investors also declare that they are either ‘concerned’ or ‘very concerned’ about the accumulation of ‘dry powder’ in numerous infrastructure fund mandates, because it could lead to a deterioration of investment/underwriting standards, if not the creation of ‘Ponzi units’;
- ➔ Most respondents concur in saying that infrastructure investment only really makes sense as a long-term strategy (beyond 10 years), and a majority declares itself willing to buy and hold infrastructure investments until maturity. Logically, but perhaps surprisingly, most investors report not being particularly concerned by the absence of liquidity of such investments;
- ➔ Most investors declare that they prefer to invest in privately-held infrastructure debt or equity – as opposed to public stocks or bonds –

but they are evenly divided between those who prefer direct investment and those who would rather delegate to a manager.

➔ Overall, the objectives pursued through infrastructure by the majority of investors are linked to improving diversification and achieving higher performance. Other objectives that are intuitively associated with infrastructure investing such as hedging inflation or interest risk are less present in the series of objectives currently being pursued. However they are among the highest-ranked objectives that investors would like to be able to achieve through infrastructure investing (along with stable cash flows and illiquidity premia).

Market failure?

Combined with the most recent reports on infrastructure fund raising – which is at historic heights – these results reveal something like a quandary: at least half of investors would like to invest through a manager but the immense majority of them complain that existing products are too expensive and not designed to help them achieve their goals. As we report in the next section, more than half of them do not even trust the performance metrics reported by infrastructure asset managers.

The market to provide access to infrastructure investment through investment funds is large and growing, and the number of asset managers active in this space is also significant. It can be surprising that competition between GPs for the attention of LPs does not lead to a more aggressive levelling of fees or the design of different types of infrastructure funds. In effect, a small number of asset managers do offer longer, less aggressive and less expensive infrastructure funds than the mainstream infrastructure PE funds, but they represent a minority of the total fundraising.

Why do asset owners continue to invest in infrastructure funds that 80% of them consider to be ‘outdated and not adding value’?

When institutions allowing market participants to trade without restriction on prices or volumes are in place and the expected benefits of competition fail to materialise, the market mechanism can be considered to be failing. In effect, it can be argued that the market for delegated investment management in the infrastructure sector is at least partly failing to create the kind of products that investors need, let alone at a fair price.

Next, we discuss why a market can be stuck in a suboptimal equilibrium, in which investors only have access to inadequate and expensive products.

Say a market for investment management services is characterised by different types of service providers (in this case, infrastructure asset managers): these managers can be more or less capable – that is, more or less able to select and manage infrastructure debt and equity investments to build a portfolio that has certain characteristics of interest to asset owners.

The different types of managers can also be distributed more or less evenly: for instance there could be a few capable managers and many less capable ones.

Asset owners who need to choose an infrastructure asset manager are then faced with a simple problem: they do not know which ones are the capable ones and which ones are not. They are said to be facing the problem of adverse selection.

Next, say that asset managers also have the

option of making a certain effort to create the kind of infrastructure investment product that investors would prefer. This effort is costly to the manager but it leads to the creation of better products, eg, better-defined duration and risk factor exposures. Hence, investors are also faced with a case of moral hazard: they need to create incentives to induce asset managers to exert a costly effort to deliver the kind of products that best utilise the characteristics of infrastructure assets to achieve their investment objectives.

If the capable managers do make this effort and propose better investment products, investors can choose the products they need and maximise their long-term utility. If the less capable asset managers made the same costly effort, they would go out of business and be forced to exit the market.

With perfect information about manager type and what investment products can be created by investing in infrastructure, competition would work as expected: investors would require the products that are best suited to their needs and the capable managers would provide them, and competition in the market would be limited to the capable types.

The difficulty arises from the absence of information (eg, benchmarking) for asset owners, who do not know exactly what infrastructure investing can do for them and cannot easily discriminate between different types of managers.

Without perfect information however (the asset owners will have no knowledge of the managers’ type), capable managers can simply mimic the less capable ones, make no costly effort to design better investment products and provide the same ‘outdated’ products like any other providers. What drives up costs in this case is not the absence of competition, but the tendency for all managers to ‘pool together’ and behave like the least capable ones.

The presence of asymmetric information between buyers and sellers affects the functioning of markets and can lead to market failure: either the absence of trade (investors exit the market and decide to internalise infrastructure investment – ie, the so-called Canadian model) or a very suboptimal trade characterised by the pooling of manager types (all managers provide the same products). In the latter case, asset owners buy investment products that are not what they need and at a high price given the utility they derive from them, and even the more capable managers tend to offer standardised, relatively inadequate products, while they could achieve a greater market share by offering advanced investment solutions.

Next, we discuss both cases in more detail.

The costs of rejecting delegation

Faced with the kind of market failure described above, a first group of participants chooses to exit and address agency issues under asymmetric information by internalising the investment function, in this case by building up internal capability to source and execute infrastructure transactions, manage infrastructure firms throughout their lifecycle and receive the benefits of direct control, asset selection and transaction timing, including – as the majority of survey respondents declared – the option to hold investments to maturity.

Borrowing from the vocabulary of behavioural studies in the retail pension sector, these do-it-yourself investors also tend to be the most ‘engaged’ and sophisticated ones, whereas others, probably smaller investors, for whom infrastructure may be a much newer theme, can be described as ‘passive’.¹

For engaged investors to be better off fol-

1 Still, it is also possible for large direct investors in infrastructure to retreat from the DIY approach and to return to managed infrastructure mandates. The Victoria Fund Management Corporation is one such recent example.

lowing the DIY approach than delegating to a specialist manager, they must be able to deliver results which are at least as good as those products provided by the best managers in the market (net of costs).

The net benefits from choosing direct investment are thus determined by three factors:

➔ **Investment costs:** with limited effects of competition between managers on fees, some asset owners have come to the conclusion that internalising infrastructure investment can be worthwhile. Nevertheless, a fully-fledged infrastructure team is only available to large investors. Such teams may also encounter their 'lifecycle' issues as investors buy infrastructure firms (transaction structuring and execution) and operate them on a buy-to-hold basis (asset² management), the required skill-set must change over time. It is also possible that some agency issues that exist between asset owners and managers are simply re-created internally between the strategic asset allocation level and the investment level.

➔ **Diversification benefits:** building a direct portfolio of infrastructure assets is a long-term goal in itself. The recent experience of some Australian or Canadian investors suggests that it can take at least 10 to 15 years. Even so, the resulting portfolio of 20 to 25 investments is unlikely to be well diversified and may even include very concentrated exposures (ie, a few very large firms). Of course, the main diversification benefits of infrastructure investment accrue to the portfolio as a whole, as survey responses suggest, but less diversification of the infrastructure portfolio itself can be considered a straight loss. In principle, investors should be able to diversify better by investing across a range of infrastructure funds, themselves exposed to a range of infrastructure business models, lifecycle stages and jurisdictions. The extent of the failure of the market for delegated investment in infrastructure is highlighted by this fact: a growing number of large investors prefer forgoing diversification benefits in favour of a more concentrated, internally-managed portfolio.

➔ **Portfolio construction:** Against these costs (fees and lower diversification) investors expect benefits that are themselves dependent on what portfolio of infrastructure assets each one of them can build. Different investors have different objectives and liability profiles which cannot be answered *ex ante*. Full control over the investment process may allow asset owners to build infrastructure portfolios that are more in line with their objectives. However, if a well-functioning market for investment delegation led to the creation of better-defined investment products using infrastructure debt and equity to target a given set of financial metrics, the potential contribution of such products may outweigh the benefits of control on asset selection and infrastructure portfolio construction.

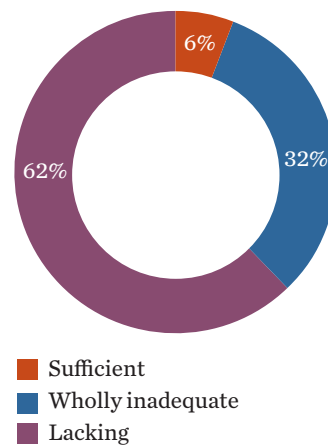
Thus, the net benefits of internalising long-term investment in infrastructure are not self-evident once the possibility to improve investment products is taken into account.

These issues hinge around the absence of sufficient information about what can be achieved through infrastructure investment and who can commit to achieving such goals.

Market solutions: benchmarking and signalling

Why are the more capable infrastructure asset managers not offering different products to the classic two-and-twenty, closed ended PE fund? In the classic adverse selection model, the more capable type of manager is simply better off in the short term mimicking the less capable type,

1. Current options to benchmark private investments in infrastructure are:



and making no costly effort to deliver a better service.

But it can also be the case that the most competent managers would be better off providing more advanced products (they would gain market share) but cannot effectively articulate and demonstrate the added-value they could create by designing different forms of infrastructure investment products.

If information asymmetry is too strong then what might be achievable through new forms of infrastructure investment products may be very challenging to communicate effectively to asset owners, who remain faced with the Scylla of DIY investing and the Charybdis of infrastructure PE funds.

There are however solutions to minimise the effect of information asymmetry in market dynamics. To avoid the pooling of managers, market participants can create 'sorting devices' (Spence [1973]; Rothschild and Stiglitz [1992]) or 'revelation mechanisms' (Laffont and Martimort [2002]) to facilitate the processing of information from uninformed to informed participants.³

The more capable asset managers may also try to signal their ability to create better products to asset owners through various devices (eg, certification schemes).

In economics, this problem is typically modelled as a market with adverse selection and competitive search, where some agents post terms of trade (contractual terms) and others aim to screen the other side of the trade by agent type (see for example, Guerrieri, Shimer, and Wright [2010]). In such models, the informed side of the trade (here the asset manager) can move first and signal to the market what terms they can offer, or the uninformed side can move first and request a bid for a given 'menu of contracts'.

In other words, either asset owners could request bids in an auction for a limited number of well-defined investment products, or asset managers could choose to highlight the different products that are available through the kind of performance reporting standard, valuation approaches and performance benchmarks that we discuss next.

Benchmarking

Key findings

On the topic of benchmarking the performance of infrastructure investments, the main findings of the survey are:

- ➔ Investors' current use of benchmarks for their infrastructure investments is as likely to be relative or absolute, nominal or real, or relative to a market or a macroeconomic index. There is no clear market practice;
- ➔ In fact, the immense majority of investors and managers agree that currently available benchmarks are inadequate and that proper infrastructure investment benchmarks just do not exist (figure 1);
- ➔ Survey respondents confirm that risk metrics in particular are not documented and that valuations are sufficiently problematic to cast doubt on any measure of returns as well. More than half of asset owners reckon that they either do not trust or do not know if they can trust the valuations reported by the infrastructure asset managers.

Towards better benchmarks

Roadmap and recent progress

In June 2014, Blanc-Brude (2014) put forward a roadmap for the creation of infrastructure investment benchmarks. This roadmap integrates the question of data collection upfront, including the requirement to collect information known to exist in a reasonably standardised format and limited to what is necessary to implement robust asset pricing and risk models. It puts forward the following steps:

- ➔ Defining the relevant instruments;
- ➔ Developing a relevant asset pricing framework;
- ➔ Defining the necessary data;
- ➔ Building a global database of cash flows and investment characteristics;
- ➔ Building reference portfolios of infrastructure equity and debt.

The implementation of this roadmap is described in detail in Blanc-Brude (2014) and recent progress in Blanc-Brude et al (2016).

Defining infrastructure investments from a financial perspective, the only relevant perspective to build investment benchmarks, is a necessary first step. As the results of this survey and the recently proposed definition put forward by the European regulator of pension plans and insurance companies suggest, defining infrastructure investment from an investment perspective has progressed considerably. The growing consensus reflected in this survey around the limited role of industrial sector categories in explaining and predicting performance, and the much more significant role played by contracts and by different infrastructure 'business models' such as 'merchant' or 'contracted' infrastructure, or various forms of utility regulation, is encouraging.

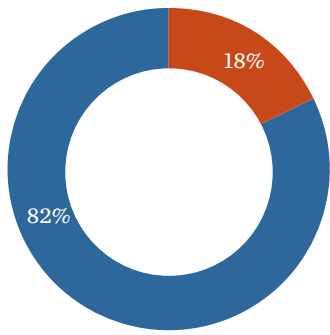
Once the financial instruments that correspond to infrastructure investment are usefully defined, the second necessary step is to design a performance and risk measurement framework that can provide robust answers to the questions identified above. Again, our survey responses confirm the urgent need to improve the current methodologies to evaluate private assets given the increasingly important they play in investors' portfolios.

Privately-held, infrastructure equity and debt instruments are not traded frequently and cannot be expected to be fully 'spanned' by a combination of public securities. Hence, they are unlikely to have unique prices that all investors concur with at one point in time. ▶

² The infrastructure asset.

³ For example, Hellwig (1987) discusses the role of deductibles in insurance contracts and how the choice of deductible can be used by insurers to infer the probability of accident of a given individual.

2. Is the classic closed-ended PE fund with fund-level leverage in addition to asset-level leverage:



- A perfectly justified way to approach infrastructure investment
- Outdated and not adding value

Asset owners only.

◀ A two-step approach to measuring performance is therefore necessary:

- ➔ Documenting cash flow distributions (debt service and dividends) to address the fundamental problem of unreliable or insufficiently reported NAVs or losses given default (LGDs);
- ➔ Estimating the relevant (term structure of) discount rates, and relevant rates of returns, and their evolution in time.

Here too, progress has been made and recent research provides a framework addressing both steps, taking into account the availability of data, while applying best-in-class models of financial performance measurement (see for example Blanc-Brude, Hasan and Ismail [2014]; Blanc-Brude and Hasan [2015] for applications to the private debt and equity case).

Based on this new asset pricing and risk measurement technology, a list of data items required to implement adequate methodologies can be drawn up that can be used to collect data and populate the necessary database but also to determine a minimal reporting framework for investors to require from infrastructure managers. These data collection requirements are described in Blanc-Brude et al (2016).

The active collection of the necessary data and publication of the relevant investment benchmarks has begun to be implemented with the creation of the EDHEC Infrastructure Institute in Singapore in February 2016 and is planned to take place incrementally until 2020 and beyond.

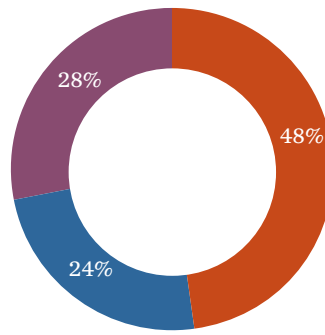
Benchmarking as signalling

In this survey and in others before, asset owners highlight high fees, insufficient performance reporting and inadequate valuation methods as some of the main issues found in delegated private investment.

In recent years, however, asset owners have begun to question the level of investment fees and to achieve substantial reductions in the overall level of investment management fees, through self-organisation as well as with the help of the regulator.

As we argued above, high fees are only the result of the information asymmetry that exists between asset owners and managers. The crux of the matter hinges around reported valuations. The valuation of private assets is the primary source of information asymmetry between managers and asset owners. Hence, with the

3. Do you trust the asset valuations reported by infrastructure managers?



- Yes
- Not sure
- No

Asset owners only.

argument to lower fees gradually being won by LPs, the next big issue to open for review is asset valuation (figure 3).

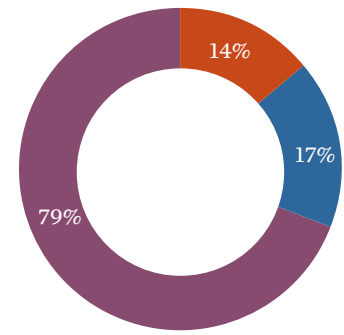
Private asset valuation has long suffered from numerous flaws, in particular the classic stale pricing problem and the corollary smoothing of asset returns (see Blanc-Brude and Hasan [2015] for a review of the literature on the subject applied to infrastructure). As we suggested above, a number of technical improvements are possible that allow better measurements of risk-adjusted performance in private infrastructure investments. In due course, further development in applied academic research will allow for even more robust and advanced methods to be implemented.

The matter of reporting adequate performance data and applying state-of-the-art valuation methodologies is also relevant to the ‘sorting mechanisms’ or ‘signalling’ that we discussed above when suggesting solutions to the market failures found in delegated investment management. When information asymmetries are so significant that asset owners cannot know which managers are the capable or the less capable ones, they could require managers to adopt a certain reporting framework and to implement advanced valuation methods to make the more competent managers ‘reveal their type’. Likewise, individual managers could offer to adopt an equivalent reporting and valuation framework to make asset owners aware of their type.

Once the more capable managers have agreed to reveal their type or have been identified by asset owners, it becomes possible for the latter to require that they exert the kind of effort that should lead to the creation of better investment products. Note that revealing their types for the better managers is not free and that – in the standard solution to the principal agent problem with adverse selection and moral hazard – the incentive compatible contract between the client and the service provider requires that a premium be paid to the agent of the desirable type. However, the net (after fee) benefits to asset owners should now be much higher (if not, then internalisation – the DIY option – remains the preferred route).

Beyond type revelation or discovery, the last missing element in the relationship between principal and agent is for asset owners to actually know what to ask the better managers to do

4. How principled is institutional investors’ stance on the ESG aspects of their infrastructure investments?



- ESG is unimportant in comparison with financial objectives
- ESG is a first-order problem, possibly at the expense of performance
- ESG is somewhat important but not an overriding consideration (a second-order problem)

Asset owners only.

for them through infrastructure investment.

Infrastructure investment benchmarks are at the heart of this issue: with fully-fledged benchmarks, what is achievable for investors through infrastructure investment can be known (eg, what combination of factor exposures infrastructure investment can create) and only then can asset owners request their managers to build infrastructure portfolios for them that are fully integrated into a long-term investment solution for them.

In effect, private infrastructure investment benchmarks can improve most issues of information asymmetry between investors and managers since they can be used both to determine what investors should require and to signal what managers can or cannot deliver.

ESG

Key findings

Regarding the environmental, social and governance impact of infrastructure investment, asset owners’ responses suggest that:

- ➔ Investors acknowledge the relevance of ESG considerations but a majority considers ESG to be a second-order problem – ie, one that does not trump first-order questions like strategic asset allocation (figure 4);
- ➔ Nevertheless, 17% of owners consider ESG to be a first-order question;
- ➔ Most respondents also expect ESG to be positively related to investment returns.

Does ESG mean more or less risk?

Institutional investors all have well-defined mandates to, for example, ensure the delivery of pension benefits, the solvency of insurance schemes or the preservation of national wealth. Respecting these different mandates means achieving a series of nominal or real wealth objectives at certain horizons and preserving the funding level (liabilities versus assets) of each institution at each point in time. In other words, it means focusing on risk-adjusted financial performance, which is, in turn, the result of strategic asset allocation decisions.

This is every asset owner’s first-order problem.

To the extent that investors also want to avoid investing in certain types of infrastructure projects (eg, coal-fired power plants) or ensure that the social consequences of new projects (eg, hydroelectric dams) are limited and well managed, the considerations must nevertheless remain subordinated to achieving long-term financial objectives.

It does not mean that investors 'do not care' about investing in less sustainable businesses or projects, but simply that they have to meet certain objectives first, and that ESG investing would be self-defeating if it undermined their ability to achieve these goals. In fact, being able to pay the pensions and life insurance policies of millions of individuals is nothing short of a very worthy social goal.

Still, in this survey, 17% of asset owners consider that ESG is nevertheless a first-order problem. Moreover, it is likely that this number has been increasing and that even more investors would give this answer in a future iteration of this survey.

ESG investing can be modelled as a form of 'guilt aversion' – a notion developed in behavioural economics – by which investors could be willing to forgo some level of performance or future income to avoid investing in certain types of assets. In this case, there is a mostly negative trade-off with performance and ensuring a minimal threshold of ESG quality in new investments can also be understood as a form of risk management: new infrastructure projects that are less likely to create environmental or social issues may also be less likely to experience regulatory or policy shocks in the future. If this is the case then higher ESG

criteria should be synonymous with lower expected returns.

Still, the majority of respondents believe that there is a positive link between returns and ESG quality, implying higher risk-taking in such projects. For instance, investing in renewable energy and reducing carbon emissions qualifies as having a positive environmental impact but also rests on publicly-sponsored tariff subsidy schemes that are prone to change over the decades that each wind or solar farm investment is supposed to last. Recent evidence of changes in wind farms' feed-in-tariff, sometimes retroactively, is plentiful in European markets for instance.

Another aspect of ESG in the context of infrastructure investments is job creation. While this can be considered a positive in regards to the social and political acceptance of private infrastructure investment (the so-called 'social licence to operate' of the private sector), committing to employing a certain workforce may create long-term issues regarding operational efficiency given the impact of technological change over several decades. The impact of containerisation in the port sector is a good example of a sector that had to let go most of its workforce over a couple of decades.

If investors expect higher returns from ESG compliant investments, it may be interpreted as an increase in risk aversion vis-à-vis an economic future which changing environmental and social issues make increasingly uncertain or, perhaps more simply, the recent drive towards ESG could be seen as part of a broader increase in investor risk appetite in a low yield environment.

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Looking for a listed infrastructure asset class

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In a new EDHECinfra paper, we ask the question: does focusing on listed infrastructure stocks create diversification benefits previously unavailable to large investors already active in public markets?

This question arises from what we call the "infrastructure investment narrative" (Blanc-Brude 2013), a set of investment beliefs commonly held by investors about the investment characteristics of infrastructure assets.

According to this narrative, the 'infrastructure asset class' is less exposed to the business cycle because of the low price-elasticity of infrastructure services. Furthermore, the value of these investments is expected to be mostly determined by income streams extending far into the future, and should thus be less impacted by current events.

According to this intuition, listed infrastructure may provide diversification benefits to investors since it is expected to exhibit low return covariance with other financial assets. In other words, listed infrastructure is expected to

- ➔ We ask whether focusing on listed infrastructure stocks creates diversification benefits previously unavailable to large investors that are already active in public markets. This would mean that listed infrastructure is expected to exhibit sufficiently unique characteristics to be considered an 'asset class' in its own right.
- ➔ We conclude that in general, what is typically referred to as listed infrastructure, defined by SIC code and industrial sector, is not an asset class or a unique combination of market factors, but instead cannot be persistently distinguished from existing exposures in investors' portfolios, and that expecting the emergence of a new or unique 'infrastructure asset class' by focusing on public equities selected on the basis of industrial sectors is misguided.
- ➔ Asset owners and managers who use the common 'listed infrastructure' proxies to benchmark private infrastructure investments are either misrepresenting (probably over-estimating) the beta of private infrastructure, and usually have to include various 'add-ons' to such approaches, making them completely ad hoc and unscientific.
- ➔ By defining infrastructure according to the relationship-specific and contractual nature of the infrastructure business, we find that listed infrastructure may help identify exposures that have at least the potential to persistently improve portfolio diversification on a total return basis.

◀ exhibit sufficiently unique characteristics to be considered an ‘asset class’ in its own right.

Empirically, there are at least three reasons why this view requires further examination:

- ➔ Most existing research on infrastructure has used public equity markets to infer findings for the whole infrastructure investment universe, but robust and conclusive evidence is not forthcoming in existing papers;
- ➔ Index providers have created dedicated indices focusing on this theme and a number of active managers propose to invest in ‘listed infrastructure’ arguing that it does indeed constitute a unique asset class;
- ➔ Listed infrastructure stocks are often used by investors to proxy investments in privately held (unlisted) infrastructure equity, but the adequacy of such proxies remains untested.

The existence of a distinctive listed infrastructure effect in investors’ portfolios would support these views. In the negative, if this effect cannot be found, there is little to expect from listed infrastructure equity from an asset allocation (risk/reward optimisation) perspective and maybe even less to learn from public markets about the expected performance of unlisted infrastructure investments.

There is no listed infrastructure asset class

We test the impact of adding 22 different proxies for ‘listed infrastructure’ to the portfolio of a well-diversified investor using mean-variance spanning tests. We focus on three definitions of ‘listed infrastructure’ as an asset selection scheme:

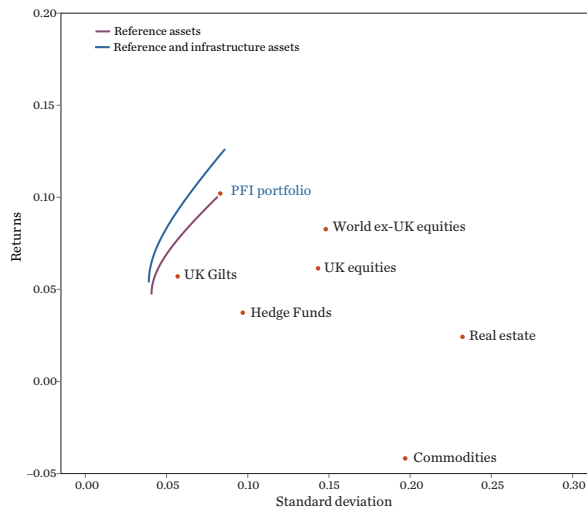
- ➔ A ‘naïve’, rule-based filtering of stocks based on industrial sector classifications and percentage income generated from predefined infrastructure sectors (nine proxies);
- ➔ Existing listed infrastructure indices designed and maintained by index providers (12 proxies);
- ➔ A basket of stocks offering a pure exposure to several hundred underlying projects that correspond to a well-known form of infrastructure investment defined – in contrast with the two previous cases – in terms of long-term public-private contracts, not industrial sectors (one proxy).

Employing the mean-variance spanning tests originally described by Huberman and Kandel (1987) and Kan and Zhou (2012), we test the diversification benefits of these proxies for the listed infrastructure effect.

Some stylised findings include:

- ➔ Our 22 tests of listed infrastructure reveal little to no robust evidence of a ‘listed infrastructure asset class’ that was not already spanned by a combination of capital market instruments and alternatives, or by a factor-based asset allocation;
- ➔ The majority of test portfolios that improve the mean-variance efficient frontier before the global financial crisis (GFC) fail to repeat this feat post-GFC. There is no evidence of persistent diversification benefits;
- ➔ Of the 22 test portfolios used, only four manage to improve on a typical asset allocation defined either by traditional asset classes or by factor exposure after the GFC and only one is not already spanned both pre- and post-GFC;
- ➔ Building baskets of stocks on the basis of their SIC code and sector-derived income fails to generate a convincing exposure to a new asset class.
- ➔ Hence, benchmarking unlisted infrastructure investments with thematic (industry-based) stock indices is unlikely to be very helpful from a pure asset allocation perspective – ie, the latter do not exhibit a risk/return trade-off or betas that large investors did not have access to already.

1. Efficient frontier January 2000–December 2013



Overall, we do not find persistent evidence to support the claims that listed infrastructure is an asset class. In other words, any ‘listed infrastructure’ effect was already spanned by a combination of capital market instruments over the past 15 years in global, US and UK markets.

We show that defining infrastructure investments as a series of industrial sectors and/or tangible assets is fundamentally misleading. We find that such asset selection schemes do not create diversification benefits, whether refer-

ence portfolios are structured by traditional asset classes or factor exposures.

We conclude that in general, what is typically referred to as listed infrastructure, defined by SIC code and industrial sector, is not an asset class or a unique combination of market factors, but instead cannot be persistently distinguished from existing exposures in investors’ portfolios, and that expecting the emergence of a new or unique ‘infrastructure asset class’ by focusing on public equities selected on the basis of industrial sectors is misguided.

Figure 2 provides an illustration of these results in the case of the FTSE Macquarie Listed Infrastructure index for the US market.

Thus, asset owners and managers who use the common ‘listed infrastructure’ proxies to benchmark private infrastructure investments are either misrepresenting (probably over-estimating) the beta of private infrastructure, and usually have to include various ‘add-ons’ to such approaches, making them completely ad hoc and unscientific.

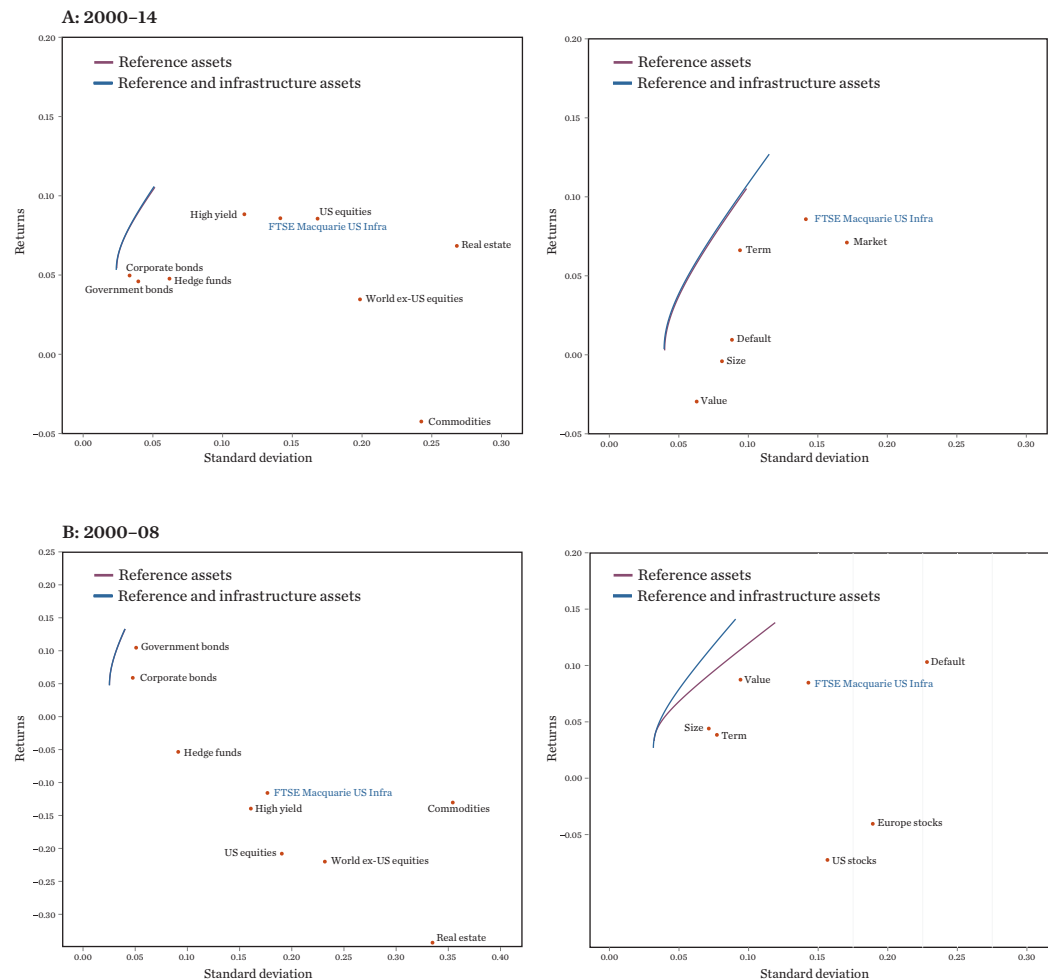
Defining infrastructure differently

Our tests also tentatively suggest a more promising avenue to ‘find infrastructure’ in the public equity space: focusing on underlying contractual or governance structures that tend to maximise dividend payout and pay dividends with great regularity, such as the public-private partnerships (PPPs) or master limited partnerships (MLPs) models, we find that the mean-variance frontier of a reference investor can be improved.

The answer to our initial question this partly depends on how infrastructure is defined and understood as an asset selection scheme.

Under our third definition of infrastructure, which focuses on the relationship-specific

2. Asset class and factor-based reference



◀ and contractual nature of the infrastructure business, we find that listed infrastructure may help identify exposures that have at least the potential to persistently improve portfolio diversification on a total return basis. This effect is driven by the regularity and the size of dividend payouts compared to other corporations, infrastructure or not.

What determines this ability to deliver regular and high dividend payouts is the contractual and governance structure of the underlying businesses, not their belonging to a given industrial sector. Bundles of PPP project companies or MLPs behave differently than regular corporations – ie, their ability to retain and control the free cash flow of the firm is limited and they tend to make large equity payouts. In the case of PPP firms, as Blanc-Brude, Hasan, and Whittaker (2016) show, they also pay dividends with

much greater probability than other firms.

In other words, going beyond sector exposures and focusing on the underlying business model of the firm is more likely to reveal a unique combination of underlying risk factors.

However, it must be noted that the relatively low aggregate market capitalisation of listed entities offering a ‘clean’ exposure to infrastructure ‘business models’ as opposed to ‘infrastructure corporates’ may limit the ability of investors to enjoy these potential benefits unless the far larger unlisted infrastructure fund universe has similar characteristics.

Future work by EDHEC*infra* aims to answer these questions in the years to come.

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