PORTFOLIO MANAGEMENT

A Roadmap to Make Long-Term Infrastructure Investment Relevant to Institutional Investors

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Long-term investing and the demand for monitoring

The intertemporal monitoring demand

Long-term investment can be defined in terms of investor horizon or instrument characteristics. Long-term investors intend to hold securities over multiple trading periods, possibly until maturity. Long-term instruments are characterized by the unavailability of a fair instantaneous payoff[8]: trades are infrequent and investing requires patience. Infrastructure equity investment requires both long-term investors and instruments.

Long-term equity investment leads to an increase in the demand for monitoring on the part of investors. Two motives determine this intertemporal monitoring demand: first, the opportunity to improve firm performance as an active shareholder with a long-term horizon; and second, the necessity to measure and benchmark the performance of infrequently traded assets.

Recent research on the impact of longer investment horizons on monitoring demand with frequently traded assets allows the two motives to be isolated. In public markets, investors have a choice between monitoring and trading (Shleifer and Vishny, 1986). Long-term ownership is expected to create incentives to engage in corporate monitoring and thus to specialize more in monitoring than in trading. Chidambaran and John (1998) argue that a long-term investment horizon creates incentives to improve shareholder value by imposing disciplinary mechanisms on managers to align their interests with those of shareholders and leads to "relationship investing" refers to the active cooperation between an institutional shareholder and the manager of a firm. Chen, Harford, and Li (2007), Elyasiani and Jia (2008), Elyasiani and Jia (2010), Elyasiani, Jia, and Mao (2010) and Attig, et al. (2012), among others, find that concentrated holdings by independent institutional investors with a long-term horizon leads to increased monitoring and is related to better public firm performance.

Thus, investors' demand for firm monitoring is an increasing function of their investment horizon. But if long-term equity investors tend to be active shareholders, they are also passive investors whose asset-allocation decisions require that long-term expectations about risk and returns, that is, investment benchmarks, be met. In the case of frequently traded assets, market prices provide the basis for these expectations. In effect, private monitoring efforts by large block holders contribute to market efficiency, since they also benefit other stockholders. In turn, the market also provides monitoring benefits to long-term investors by processing information that is not available privately (see Holmström and Tirole (1993)).

Unlisted equity and the failure of delegated monitoring

Investing in infrequently traded assets also requires a longer investment horizon, hence it is a de facto asset-allocation decision for investors. However, without the feedback of market prices, the formation of long-term expectations about risk and returns is less straightforward. It follows that investing in unlisted equities must increase investors' monitoring demand. As is the case with listed firms, for unlisted firms, a long-term investment horizon creates incentives to monitor performance to preserve or improve shareholder value, but their illiquid nature also creates a second motive for monitoring: investment benchmarking.

The ability of unlisted firms to meet investors' demands for continuous performance monitoring determines their attractiveness. Achieving effective allocation requires understanding performance, but inadequate performance measurement also leads to a regulatory dead end: when faced with unknown quantities, prudential regulation penalizes long-term unlisted bets, further distorting allocation decisions.

Hence, for investors to make substantial investments in unlisted firms, such as unlisted infrastructure equity, they have to be in a position to make a strategic asset-allocation decision and this, in turn, requires substantial and continual performance monitoring of comparable assets. In Bayesian terms, long-term investing in listed equities is based on a prior benchmark, formed with historical market data (passive investment), but also leads to active shareholder management, potentially improving firm performance and also contributing to market efficiency (information revelation). At the next period, the updated (posterior) market benchmark can be used to revise the initial asset allocation. With unlisted equity, arriving at a prior asset allocation decision cannot be based on market prices unless near-equivalent traded assets can reliably be found. If they cannot, monitoring comparable unlisted instruments is necessary to form long-term expectations about performance and will serve as a basis for asset allocation. Once the investment has been made, both the motive to act as an active shareholder and that of being a passive investor (investing according to a benchmark) continue to support an investor's inter-temporal monitoring demand. Continued updating of investors' knowledge about performance requires ongoing monitoring because the information feedback loop created by market prices is now absent.

Next, investing in unlisted, illiquid firms with a long-term horizon requires specialist knowledge and should lead investors to delegate this process to investment managers. Unfortunately, the current delegated model of private equity investment mostly fails to respond to investors' intertemporal monitoring demand. This is most apparent with the kind of performance reporting offered by private equity (PE) managers.

Phalippou and Gottschalg (2009) propose a comprehensive critique of the performance monitoring of typical private equity funds. They highlight the well-known finding that to ensure consistent internal rates of return (IRRs), dividends and borrowing must respectively be reinvested and maintained at the same rates—an assumption that is nearly impossible to replicate in practice.

Pooling individual investment and fund IRRs also creates misleading results because IRRs cannot be averaged. The authors also find a large negative correlation between duration and performance in private equity funds, which, combined with the incentive to time cash flows strategically, tends to create an upward bias in reported performance and creates incentives to exit investments quickly.

In effect, IRRs are grossly inadequate for the purpose of asset allocation. As long as PE was a subplot of the alternative investment universe, the absence of a clear benchmark did not stop investors from committing funds to "absolute return" strategies. However, the growing interest in unlisted assets among large institutional investors with long investment horizons requires that the question of unlisted equity performance be answered seriously.

The end of delegation?

With unsatisfactory performance measurement and monitoring by PE managers, as well as potentially misaligned reporting incentives, a number of large institutional investors have ceased to delegate their investments in unlisted firms and have instead internalized the function of acquiring and managing infrequently traded assets, such as real estate, industrial firms (which are still often called - private equity) or infrastructure. This trend towards direct investment in illiquid assets is most developed among Canadian pension funds, a few large European pension funds and sovereign wealth funds.

Thus, because long-term investment in unlisted firms leads to a significant increase in the demand for performance monitoring, and because the PE industry has been mostly incapable or unwilling to provide better monitoring to investors, in particular the kind of performance measure that would be meaningful for asset allocation, the largest investors have resorted to internalizing the investment and monitoring functions necessary to access and benefit from unlisted equity.

This is not necessarily an improvement. Delegation to a specialist agent should improve efficiency. It is only because information asymmetries between investors and managers can be large enough to destroy all the benefits from delegation, that a number of large investors have decided to abandon delegated PE altogether. Nevertheless, internalizing creates other costs. In particular, as discussed by Blanc-Brude (2013), it can be difficult to create a well-diversified portfolio of large illiquid assets such as infrastructure project equity. Moreover, this approach is only available to very large investors, who can bear the full cost of deal sourcing and the ongoing management of their portfolio companies.

Faced with a retreat from such large accounts as the Canadian pension industry, why are PE managers not offering to improve their monitoring and reporting so that investors can benefit from delegation while making well-informed asset-allocation choices? One explanation is that in a world where some PE managers are capable of making the costly effort to deliver high-quality services and others are not, when information asymmetries between investors and managers are sufficiently large managers tend to pool together and offer only the low-effort service at the same high fees.[9]

Some managers are already evolving toward new PE models, allowing investors to gain the kind of longer-term exposure they require. Moreover, the tendency for institutional investors to create large or very large unlisted equity allocations is a recent development and the need to monitor and benchmark performance has only recently become more pressing.

But the failure of the PE industry to provide satisfactory monitoring for large investors is also a collective action problem: most of the necessary information is private; dissemination

[8] *As opposed to a distressed sale.*
[9] *This is a standard result of agency theory known as a "pooling equilibrium" (see Laffont and Martimort 2002).*

and data collection, when they exist, are more or less ad hoc. While PE managers could be more transparent and try to provide performance measures that are more relevant to long-term investors, taken individually, none of them has access to enough information to answer the question of PE asset allocation.

How to make unlisted infrastructure investment relevant to institutional investors

Effective and efficient long-term institutional investment in unlisted infrastructure must combine preserving the benefits of delegation to a specialist manager who can act on behalf of an active shareholder, while enforcing sufficient long-term performance monitoring and benchmarking to allow a passive investment stance, justified as the strategic asset-allocation level.

To achieve this, we propose steps to require a multi-stakeholder effort to reveal the characteristics of infrastructure assets at the underlying and portfolio levels, and reduce information asymmetries between investors and managers.

1. DEFINITION: The first step is an unambiguous definition of the underlying asset as a financial instrument. As we have argued before (Blanc-Brude, 2013) infrastructure assets are not real assets and from an investment perspective, industrial classifications are close to useless.

2. VALUATION AND RISK MEASUREMENT TECHNOLOGY: With a clear and well-accepted definition of underlying instruments, adequate valuation and risk measurement methodologies can be developed that take into account infrequent trading. By adequate we mean that such methodologies should rely on the rigorous use of asset-pricing theory and statistical techniques to derive the necessary input data, while aiming for parsimony and realism in terms of data collection. The proposed methodologies should lead to the definition of the mininum data requirement (MDR) necessary to derive robust return and risk estimates.

3. DATA COLLECTION REQUIREMENTS: While ensuring theoretical robustness is paramount to the reliability of performance measurement, it must be balanced with the requirement to collect real-world data from market participants. Proposed methodologies should particularly aim to minimize the number of inputs in order to limit parameter estimation errors. Adequate models should also focus on using data points that are known to exist and that have been, or that could easily be, collected and monitored. In all cases, data requirements should be derived from the theoretical framework, not the other way around. Whether the necessary data exist or not, this process will also inform the standardization of investment data collection and reporting.

4. REPORTING STANDARD: The standardization of infrastructure investment data collection should allow the emergence of an industry-wide reporting standard, which can be recognized by investors and regulators alike. Such a reporting standard would increase transparency between investors and managers, who would now be mandated to invest in a well-defined type of instrument and commit to reporting enough relevant data for investors to benefit from their specialized monitoring.

5. INVESTMENT BENCHMARKS: Once the investment profile of the underlying asset has been documented as well as existing data allow, spanning expected returns, risk and market correlations, investment benchmarks can be designed to reflect the performance of a given strategy (e.g., maximum Sharpe ratio) for a given horizon. If such benchmarks are found to improve the investible set then investment solutions can be designed.

6. INVESTMENT SOLUTIONS: These investment benchmarks can serve as the basis for the development of various standard or tailored investment solutions by the industry, including different types of funds with explicit horizons and risk profiles.

7. REGULATION: The robust performance benchmarking of unlisted infrastructure equity portfolios also has direct regulatory implications for risk-based prudential frameworks like Solvency II. It should allow the calibration of, for example, a dedicated unlisted infrastructure sub-module in the context of the standard formula, or usefully inform investors' internal risk models.

8. PUBLIC PROCUREMENT: Finally, documenting the financial performance of unlisted infrastructure is relevant for the design of public infrastructure tenders and contracts. It is the opportunity for the public sector to involve investors early in the design of public infrastructure contracts on the basis of an academically-validated and industry-recognized measure of investment performance.

Recent progress

In recent publications, we have begun to highlight some of our proposed answers to this roadmap, in particular, the definition of underlying assets and the methodologies required to measure value and risk adequately, with parsimonious data inputs.

Definition: project finance as the infrastructure investment benchmark

It is often said that there is no universally accepted definition of infrastructure. For a long time, the energy sector (coal and gas-fired power plants, wind power, etc.) was considered to be separate from infrastructure, understood as network utilities (water, road and gas networks). Today, with the growing popularity of infrastructure as an investment topic, more industrial sectors are covered by the umbrella term of infrastructure. In our view, the definition of what constitutes physical infrastructure is unimportant. The terminology is close to meaningless from an investment point of view, since it does not refer to a specific type of financial instrument or investible asset.

Defining infrastructure investment for strategic asset allocation helps determine expected returns, risk and market correlations, in short: the existence of a distinctive or remarkable beta. If infrastructure investment is defined in such a way that it overlaps significantly with existing betas (e.g., venture capital or corporate debt) then this definition does not help in allocating funds to infrastructure assets.

In the case of long-term and infrequently traded assets like infrastructure, an approach that relies on large amounts of historical data cannot dependably isolate the relevant characteristics. There will never be enough data. Hence, we need to think about the determinants of risk, return and correlations of such assets through ex-ante models, which can then be tested and calibrated, but which necessarily assume the existence of certain mechanisms explaining risk and value in time. Consequently, our definition of underlying infrastructure assets must treat these mechanisms explicitly.

A definition of infrastructure investment based on explicit economic and financial mechanisms that are expected to determine the value and the volatility of cash flows will also present the advantage of being clear and uncontroversial. Nevertheless, there is a trade-off between clarity and scope. The explicit formulation of underlying mechanisms must almost certainly restrict our definition to a subset of what is commonly understood to be infrastructure. Again, from a pure investment point of view, this is not a problem.

Our proposed solution in a forthcoming paper (Blanc-Brude and Ismail, 2014) is to define the underlying asset in infrastructure investment using the Basel II definition of Project Finance (BIS, 2005), i.e., a special-purpose entity (SPE) dedicated to the construction and operation of a new infrastructure project over a given period, typically 25 to 30 years. In effect, most infrastructure investment and the immense majority of new projects are financed using such structures.[10]

Crucially, existing research on project financing concludes that it is an unusual form of corporate governance relying extensively on contractual arrangements to manage risks and in which both equity investors and lenders play an important structuring and monitoring role (see Blanc-Brude and Ismail, 2013, for a review of the literature). Hence, project finance provides a well-defined model of generic underlying investments, which may be calibrated, and the exposure to which may or may not be relevant for investors.

Adequate methodologies to measure value and risk in infrastructure project finance equity are proposed in a forthcoming paper (Blanc-Brude and Ismail, 2014) and briefly discussed below.

Methodology: measuring value and risk in incomplete markets

Standard asset pricing theory relies on a demanding framework of market completeness and efficiency, which is at odds with the valuation of infrequently traded assets like infrastructure equity. Even without relaxing the assumption of market efficiency, by which enough information is available to rational investors to arrive at arbitrage free prices, the assumption that markets are complete is difficult to maintain; it is not clear that there exists a set of contingent claims that could be used to continuously hedge the value of infrastructure equity stakes.

Indeed, while the equity investor in an infrastructure project can always be described as writing a call option on the project's free cash flow (with the debt service as the strike price), there is no traded instrument representing the free cash-flow process that could be combined with a risk-free bond to replicate the pay-off of the call option. If investors cannot continuously hedge the call option, their valuations will not converge toward a specific pricing measure.

[10] We estimate that more than USD 3 trillion of project financing was closed worldwide between 1995 and 2012 (Blanc-Brude and Ismail, 2013).

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So, in an incomplete market setup, individual investors will arrive at different valuations. In other words, there is no single set of discount rates of the expected payoff. Instead, individual investor risk preferences determine their cost of capital for a given expected payoff. In other words, it is inadequate to use standard option pricing (assuming risk neutral pricing) to value infrequently traded assets that cannot be easily replicated with traded assets. Likewise, CAPM approaches imply the law of one price. Instead, adequate and rigorous infrastructure equity valuation must be developed using an incomplete market setup. Valuing infrequently traded assets also affects the adequate choice of statistical inference techniques. Both investors and researchers start the process of valuing infrastructure assets from a position of relative ignorance and gradually learn about the value of the model's parameters. It is a Bayesian process of learning, during which our prior knowledge of the value of model parameters is updated by observing the behavior of infrastructure equity investments.

Starting from the necessarily subjective dimension of infrastructure equity pricing, we propose a first approach to valuation and risk measurement in Blanc-Brude and Ismail (forthcoming 2014). Building on El Karoui and Quenez (1995), we suggest that while individual investors value infrastructure equity investment subjectively, there exist objective bounds to their valuation. These upper and lower limits, or arbitrage bounds, encompass the valuations that different investors would reasonably arrive at. The methodological challenge is to formulate and then shrink these bounds in order to arrive at a sufficiently narrow band of valuations and potential returns.

Risk measurement is also addressed from a subjective perspective: each instance of project finance leads to the explicit definition of an investment base case, a notional series of cash flows representing the initial equity investment proposition. This base case is risky and does not represent the expected cash flows in the statistical sense. In effect, any observed divergence from base case cash flows can be regarded as the risk faced by investors following their subjective appreciation of the investment proposal at t_0. In Blanc-Brude and Ismail (forthcoming 2014), we show that if we can observe and explain the tendency of infrastructure-project finance equity cash flows to diverge from their base case, we can derive relevant risk measures without having to value assets explicitly.

Next step: data collection

Relevant methodologies to value infrastructure equity stakes will continue to be developed, but their significance will depend on their data collection requirements. In Blanc-Brude and Ismail (forthcoming 2014) we also define the minimum amount of data that needs to be collected to implement our proposed methodologies. Widespread data collection using a standardized format, leading up to an industry recognized reporting standard for infrastructure investment managers, is the next important step on the road to building investment solutions in infrastructure that are relevant to institutional investors.

A major effort remains to be made by investors, managers, regulators and academics to contribute to the development of relevant investment solutions in infrastructure assets, including state-of-the-art methodologies and the definition of the minimum data required to implement them and answer benchmarking and asset allocation questions seriously. Market players must also embrace the standardized and transparent reporting of underlying cash-flow data for these benchmarks to become a reality.

EDHEC-Risk Institute will continue to support and contribute to this effort in the years to come.~

The research from which this article was drawn is part of the Meridiam / Campbell-Lutyens research chair on Infrastructure Equity Investment Management and Benchmarking at EDHEC-Risk Institute.

The purpose of this chair is to provide a better understanding of the nature and investment profile of equity investment in infrastructure assets. It will focus on fostering data collection and aggregation from investors and on improving the benchmarking of return distributions for direct and indirect investment in infrastructure equity by developing an academically-validated and industry-recognized index.

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