An EDHEC-Risk Institute Publication

Pension Fund Investment in Social Infrastructure

Insights from the 2012 reform of the private finance initiative in the United Kingdom

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EDHEC-RISK Institute

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About the Author

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Executive Summary

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In February 2012, EDHEC-Risk Institute responded to the UK Treasury's *Call for Evidence* about the reform of the Private Finance Initiative (PFI) with a particular reference to the opportunity for pension funds to invest in infrastructure assets, which the UK Treasury has earmarked as a priority theme.

In this publication, we extend our response to the issues relating to pension fund investment in *social* infrastructure. Social infrastructure investments have *by design* the characteristics that pension funds find attractive in a liability-driven investment context: long-term contracts with steady and predictable inflation-linked income, high operating margins and high risk-adjusted return. Social infrastructure also corresponds to the bulk of the assets procured under the PFI and a model that has successfully been exported to the rest of Europe, and beyond to Asia and the Americas.

Moreover, social infrastructure investment may address some of the shortcomings of the general infrastructure investment case, which we outlined in our original response. 'Economic' infrastructure in particular tends to be too lumpy and fragmented for investors to contemplate holding a representative basket of investable infrastructure assets. Thus there is no available passive infrastructure investment strategy that a pension fund can follow by holding a highly diversified portfolio. Actual investments are likely to include exposures to the class and to firm-specific risk.

In contrast, social infrastructure is characterised by smaller-sized and relatively homogeneous assets and may offer better opportunities for diversification while giving access to cash flow characteristics that are desirable to investors. It is thus striking that with the PFI, the UK Government created an investment product which better corresponds to the ideal type of pension funds' passive investment in infrastructure, delivering long-term, stable, inflation-linked cash flows, than most other infrastructure investment opportunities.

If social infrastructure provides a special case, understanding its investment characteristics matters in the context of pension funds' strategic allocation to infrastructure. In what follows, we use standard results from economics and the political economy of public-private contracts to characterise the sources of returns and risk found in social infrastructure.

We argue that the value found in social infrastructure investment is not to be found in real assets *per se*, but is determined by long-term contracts: public-private commitment mechanisms through which two parties agree to invest in and remunerate an operational infrastructure asset. Because of the information asymmetry that characterises this relationship, we know that long-term contracts that transfer most risks to the private sector to achieve the best cost-effective delivery of social infrastructure *must* lead the public sector to commit to paying a risk-free rent to the firm and its investors. This rent springs from the difference of risk exposure between the public sector transferring risk and

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the private sector bearing risk when competition for the contract is imperfect. It can also be described as a case of pure arbitrage.

We emphasise that paying an information rent to the 'efficient firm' through a risk transfer contract is the *solution* to the task delegation problem found in public infrastructure procurement i.e. the social cost of the firm's rent is lower than the extra cost of procurement without risk transfer when no effort is made to minimise costs and control risks. The complete *solution* to the task delegation problem found in public infrastructure procurement under asymmetrical information and limited competition, is for the public sector to *commit not to expropriate the rent of the efficient firm* by entering into a long-term contract. This can include some form of inflation indexation as well.

Thus, social infrastructure investment schemes like the PFI deliver the stable, inflation-linked high risk-adjusted returns that are meant to characterise infrastructure assets *only because they were meant by the public sector to deliver just these characteristics*.

However, the UK PFI and other examples also suggest that the commitment of the public sector to pay the firm's rent may not last and that renegotiation and re-regulation are likely. Ironically, the latest attempt of the UK government to reform the PFI to attract pension funds to the sector is a vivid illustration of what pension funds should worry about when it comes to infrastructure investment: over a period of several decades, the government will more than once change its mind about how such contracts should be regulated.

Because the rent of the firm is both the source of infrastructure investment's desirable characteristics and that of the political risk threatening its long-term viability, future reforms of the sector should aim to create a clear and transparent regulatory framework, mitigating political and headline risks. Transparency about costs and risks, *as well as an independent regulator which would* considerably mitigate the political risk currently embedded in social infrastructure investment schemes.

A significant research effort remains to be done to benchmark social infrastructure assets as financial assets and work towards the most efficient building blocks that will allow institutional investors to integrate them in their asset allocation decisions.

The public sector must work with intermediaries, academics and regulators to create investment solutions in social infrastructure that offer the liability-hedging or performance-seeking characteristics that pension funds require. Developing and maintaining interest for this would-be asset class requires a continued supply of potential investment prospects for pension funds. Indeed, the size of the social infrastructure asset pool (USD100bn invested between globally between 1995 and 2010, mostly in the UK) is such that modest allocations by major pension funds would lead to a rapid rarefaction of such assets. This could be the most challenging dimension of social

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infrastructure investment by pensions funds from a public policy perspective. Social infrastructure debt, which funds the bulk of social infrastructure capital investment, is unlikely to be treated as a separate asset class by pension funds and thus to be the object of a specific asset allocation at the strategic level; however, it can find a place as a theme within these investors' existing fixed income buckets. While social infrastructure equity has specific characteristics which make it a better candidate for treatment as a separate asset class, policy initiatives at the continent level may be necessary for the social infrastructure equity pool to reach a big enough size for consideration as an asset class.

1. Introduction

Introduction: The reform of the Private Finance Initiative and the search for a new infrastructure investment model involving pension funds

The Private Finance Initiative (PFI) has been the main method used to deliver privately financed public infrastructure in the United Kingdom (UK) for the past twenty years, with the signature of more than 700 individual long-term contracts for the financing, construction or rehabilitation and operation of infrastructure projects.

However, the British Treasury (HMT) is currently going through a major re-think of the PFI brought about by:

- The financial crisis, which considerably increased the cost of capital in PFI projects;
- The continued criticism of the PFI model because of its perceived high returns;
- A change of national government warranting the reform of the policy.

In a recent *Call for Evidence* describing the rationale for reforming the PFI as a procurement route, HMT ranks accessing new sources of financing "including encouraging a stronger role to be played by pension fund investments" (Treasury 2011c) as a high priority.

The promotion of pension fund investment in UK infrastructure has at least three different but converging rationales:

- HMT wishes to promote infrastructure investment as part of the Government's effort to support the economy both in the short and long term;
- There is an apparent funding gap for the GBP200bn of infrastructure investment identified by HMT and required by 2020 (iUK);
- The premise that it is in pension funds' best interest to invest in long-term assets like infrastructure because "for pension funds (...) the long duration, inflation hedging and steady cash flow nature of infrastructure investments holds considerable appeal." (Mansour and Patel 2008).

Indeed, promoting pension fund investment in infrastructure assets is not a new theme but one that has gained considerable political and commercial momentum in recent years in Europe, the United States and Asia alike.

In this publication, we focus on the opportunity of pension fund investment in 'social' infrastructure. Social infrastructure projects deliver public infrastructure assets and services in exchange for a revenue stream paid directly by the public sector, as opposed to 'economic' infrastructure, which collects revenues from end users. Examples of social infrastructure include schools and hospital buildings, municipal services such as street lighting and waste management and even public transport. Instead, economic infrastructure tends to include toll road, ports, airports or power generation.[1]

We choose to focus on social infrastructure as an investment opportunity for pension funds for the following reasons:

- Social infrastructure has been the model of choice for the PFI in the UK.
- The model of social infrastructure investment has been successfully exported from the UK to numerous countries from Finland to Portugal including France, which now has an ambitious public infrastructure procurement programme using a very similar model[2] or the USA.[3] This model is also used in the more sophisticated Asian markets, especially in Korea, Singapore and Japan. In due course, the social infrastructure investment model for the delivery of public infrastructure can be expected to grow

1 - The use of the terms 'social' and 'economic' to describe what is essentially a difference of revenue risk is arbitrary and will seem unsatisfactory to some. However, it presents the advantage of being currently widely used and understood.
2 - The 'contrats de partenariat' enacted by a 2004 government directive.
3 - In the USA, such contracts are known as P3

Introduction: The reform of the Private Finance Initiative and the search for a new infrastructure investment model involving pension funds

in markets like India and China. It thus represents a significant and growing way to access infrastructure investment for pension funds worldwide.

- As opposed to economic infrastructure, social infrastructure features *by design* the investment characteristics that pension funds find attractive in a liability-driven investment context: long-term contracts with steady and predictable inflation-linked income, high operating margins and high risk-adjusted returns.

In what follows, we characterise the nature and options available to invest in social infrastructure. We use standard results from economics and the political economy of long-term public-private contracts to describe the risk and return characteristics of social infrastructure. Finally, we draw some conclusions about the reform of the sector in the UK and beyond and what might enable pension funds to access such investments.

Introduction: The reform of the Private Finance Initiative and the search for a new infrastructure investment model involving pension funds

1. Investing in Social Infrastructure

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1.1 The Limits of Infrastructure Investment for Pension Funds

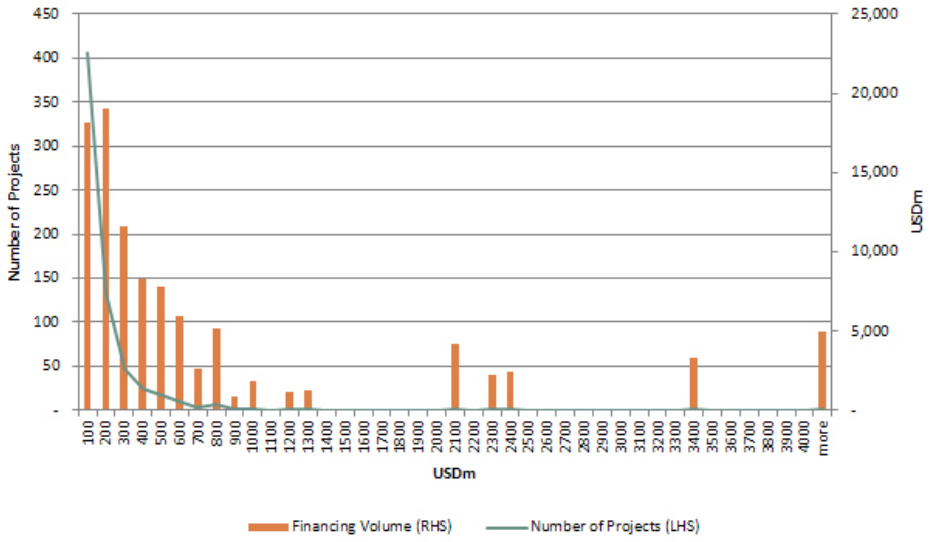
Infrastructure investment typically suffers from a problem of minimum investment size, which makes diversification difficult to achieve. With normally distributed returns and equal weights, listed equities can achieve 95% diversification of specific risk with 44 stocks (Brown and Matysiak 2000). While infrastructure return distributions are not well-documented, real estate assets can give us some perspective: if returns are skewed and leptokurtic[4], we know that with assets as bulky as real estate assets, a portfolio of at least 1,700 properties is needed to reduce risk ten-fold (Young and Lee 2006). The problem of non-normal returns is compounded by the indivisibility of assets, which prevents equal weighting. If equal weighting is not an option, larger portfolios of value-weighed properties are required to obtain the same level of diversification (Ducoulombier 2007).

Thus, even if the infrastructure 'asset class' exists in theory, in all likelihood it cannot be directly invested as such i.e. infrastructure remains too lumpy and fragmented for investors to contemplate holding a representative basket of investable infrastructure assets. As a consequence, there is still no available passive infrastructure investment strategy for a pension fund through a highly diversified portfolio since actual investments are likely to include exposures to the class and to firm-specific risk. The separation of the *beta* and *alpha* decisions is impossible, and the estimation of the beta is particularly challenging since it must proceed from information about a limited set of investment *vehicles* that are necessarily under-diversified.

Since investors committing capital to infrastructure are pursuing a *de facto* active strategy, negative or positive selection biases are likely and investors must focus on active management to try and optimise portfolio returns instead of merely picking up the infrastructure market premium associated with a diversified exposure.

4 - With unequal tails and a high peak, like the beta-PERT distribution that infrastructure project engineers know well.

Figure 1: Distribution of social infrastructure projects by cumulative capital investment and number in Europe, 1995-2009: $100bn capex, 660+ projects



80% of PPP projects in Europe by value–and 99% by number–represented less than US$1bn in capital investment and had less than $200m in equity capital between 1995 and 2009 in Europe (Blanc-Brude et al 2010).

1. Investing in Social Infrastructure

Partly for the reasons outlines above, pension funds' experience with infrastructure investments has reportedly been disappointing (Johnson 2011). This is confirmed by recent academic research on the performance of infrastructure investment: using samples of Australian, US and global data, both listed and unlisted, recent papers conclude that infrastructure returns can be high but only because risk is also high, that diversification benefits are limited and may disappear with time, that inflation protection is seldom experienced except in the utilities sector, and that downside protection, while real, can be hampered by fund-level risk such as excessive leverage. (Peng and Newell 2007; Bitsch, Buchner, and Kaserer 2010; Bird, Liem, and Thorp 2011).

5 - Source: InfraNews 2012

1.2 Social Infrastructure as an Asset Class

Compared to the rest of the infrastructure investment universe, social infrastructure projects like the PFI have different characteristics in terms of size: both the average project size and the size of the overall pool of assets are small.

Indeed, in the UK, which is the most developed market for social infrastructure investment, the pool of investable equity looks small at around GBP 8bn. Likewise, assets are small. For example, between 1995 and 2011, 559 new social and defence infrastructure facilities were financed under the PFI with projects ranging from GBP1.15m to GBP3.2bn and a mean (median) value of GBP87m (GBP43m), hence an equity tranche in the GBP0.1-300m range with a mean (median) value of GBP8.9m (GBP5m).[5] In the majority of cases, most of the equity tranche really is quasi-equity (subordinated debt extended by the project sponsors) and only a few hundred thousand Pounds, or pinpoint equity, make the paid up capital of the project company.

In effect, 99% of existing social infrastructure projects in Europe involve a total capital investment of less than $1bn (see figure 1), which suggests equity tranches of less than $200m, including quasi-equity and subordinated debt. Such projects are thus clearly outside the scope of direct investment by pension funds, which find the transaction costs to be too high for such modest levels of investment.

The average investment size in social infrastructure leads to three important conclusions:

- The number and size of PFI contracts suggests that better diversification and possibly *passive strategies may be achievable with social infrastructure*. If this is indeed the case, further research will be required to document the potential contribution of social infrastructure to a diversified investor's portfolio, e.g. its relevance for performance seeking and liability hedging in the context a modern liability-driven investment framework (Amenc *et al.* 2010)
- Intermediaries are necessary to channel most pension fund money into social infrastructure projects because direct co-investment by pension funds is synonymous with a minimum investment size of approximately USD200m, which is much bigger than the combined equity and quasi-equity tranches of most social infrastructure projects. Intermediated investment through specialist funds (and funds of funds) should be the best way to

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deliver the benefits of social infrastructure investment to final investors.

- The size of the asset pool (USD100bn of debt and equity invested globally between 1995 and 2010, mostly in the UK) is currently such that modest allocations to social infrastructure by major pension funds would lead a rapid rarefaction of such assets. The continued supply (procurement) of new projects for investors to benefit from the opportunity to diversify project specific risks and capture the beta of social infrastructure is important and may warrant large-scale policy initiatives at the continent level.

Next, we characterise the nature of and options available for investments in social infrastructure.

1.3 A Risk Transfer Contract

With social infrastructure projects, the public sector buys public assets and services at a pre-agreed fixed price paid over a given period. Thus, while the firm(s) cost of capital is typically higher than the public sector's, the assumed ability of the former to improve the cost efficiency of infrastructure project delivery over a period of several decades provides the justification for transferring risk. In other words, the improved cost efficiency of private sector infrastructure delivery must more than offset its higher cost of capital to make the risk-transfer contract valuable to tax payers, or to create 'value of money' in British procurement parlance.

To determine whether or not this is the case, the public sector is required to define a counter-factual to private sector bids. This counter-factual is a risk-adjusted, discounted cash flow comparison between the cost of hiring the preferred bidder for a social infrastructure investment scheme and that of using traditional procurement methods. It presupposes that the public sector knows the risks it is exposed to when delivering public infrastructure by itself. This 'public sector comparator' (PSC) is used to assess social infrastructure investment contracts in the UK (Treasury 2011b), Australia (Infrastructure Australia 2008), New Zealand (Treasury NZ 2009) or France (MAPPP 2011).

Once awarded, each contract leads to the creation of a special purpose vehicle (SPV) or project company, funded with equity from investors and raising commercial debt to finance a capital programme. The financial structure of such SPVs corresponds to a 90/10 debt/equity split with variations from going from 80/20 to 100% debt (Blanc-Brude, Jensen, and Arnaud 2010). The SPV hires contractors to build and operate an infrastructure facility and deliver services according to the output specification agreed at the bidding stage. In exchange, it receives a recurrent, pre-agreed, inflation-linked payment, known as the 'unitary charge' in the UK or the 'loyer' (rent) in France, for the duration of the contract, typically 25 years, sometimes longer.

Thus, for a pension fund, investing in social infrastructure projects should amount to buying the following proposition: "To receive the inflation-linked returns from a long-term risk transfer contract for the provision of specific public services with a credible commitment from the public sector *not* to renegotiate the fixed price agreed at the onset during the entire life of the contract."

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Incidentally, this is not very different from a total rate of return swap: the public sector receives a given stream of services at a fixed price and the firm (investor) receives a fixed income stream and faces variable costs. Valuing this contract on the private sector side demands taking a view on total delivery costs (including, for example, refinancing risk) and on whether the public sector might renege on its commitment (political risk).

1.4 Investment Options and the Nature of Social Infrastructure Assets

To access this investment opportunity, pension funds can invest in equity directly at the SPV level, via an unlisted intermediary fund, or a listed fund. All three types of equity investments are now frequently made in Europe. The equivalent debt products are still rather uncommon, but, in principle, investors may lend directly to project companies, by extending loans or purchasing project bonds, or indirectly via unlisted or listed debt funds.

Whether one has listed or unlisted assets in mind, project equity or debt, direct investment or shares of specialised funds, infrastructure investment always begins with discrete, real world assets: large, complex endeavours almost always characterised by a high upfront sunk investment into a durable and immobile asset with little or no alternative use and a long economic life and repayment profile. However, it must be emphasised that the *value* of privately-financed infrastructure rests on implicit and explicit, direct and indirect *contractual relationships*.

This is an old problem in economics: two parties can reduce their costs by making a 'relationship-specific' investment (with no alternative use) but this creates the possibility of opportunistic behaviour by one or both parties; the solution is to sign a long-term contract before the investment is made. In the infrastructure sector, economies of scale require single, durable and immobile investments in relationship-specific assets (e.g. it is cheaper for a given city to have a single larger hospital) and investment can only take place if long-term contracts have been entered into.

Infrastructure assets are *not* real assets (as opposed to commodities or real estate) because they are only worth what contracts creating *credible commitment* to fund, build, operate and use a discrete piece of infrastructure in exchange for an income stream, say they are. Contractual governance (including financial structure), the balance of payoffs and the likelihood of renegotiation, are some of the main factors driving the value of such investments.

Hence, investing in social infrastructure means *investing directly or indirectly in debt or equity backed by long-term public-private contracts* for the provision of specific capital goods and their related usage, in which different parties agree to take different risks and to receive their related payoffs. The drivers of these payoffs are discussed below.

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2. Sources of Return in Social Infrastructure Projects

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The investment characteristics of social infrastructure projects, in particular, the commitment of the public sector to let investors earn high risk-adjusted inflation-linked returns can be usefully illustrated by *agency* theory.

Investment schemes in public infrastructure can exist for numerous reasons, but the main justification for such contracts is the reduction of public procurement costs thanks to more efficient cost and risk management by private firms and investors.

Agency problems arise with public infrastructure procurement because information about costs and risks is not equally distributed. Assume that there exists two types of private agents that can deliver infrastructure projects. The first type is efficient and can reduce costs and control risks, the other is not and cannot. The public sector or 'principal' wants to delegate the task of building and operating public infrastructure but does not know which firms to delegate the task to. If the principal writes a contract transferring little or no risk to the firm, as with most traditional public procurement, the efficient firms have an incentive to mimic the inefficient ones at the bidding stage (adverse selection) and make no effort to reduce and control costs (moral hazard). In this case, whichever firm is hired, the public sector has to cover any future costs and evidence shows that significant cost overruns are indeed the norm in public works (Flyvbjerg and Holm 2003). In other words, asymmetric information about agents' type (efficient or not) and actions (risk management of not) leads to high procurement costs for taxpayers.

To solve the contracting problem, the principal must offer to all agents a 'menu of contracts' (Laffont and Tirole 1993; Laffont and Martimort 2002) by which firms have a choice to bid for the same low-risk traditional procurement contract or for a new contract to *invest* in the delivery of public infrastructure in exchange for a fixed payment, as long as the demonstration of cost-savings compared with the low-risk option can be made (this is the idea behind the 'public sector comparator' described above).

The point of such contracts is to transfer risks that are endogenous. Exogenous risk like the effect of the weather or ground conditions on costs are the same whoever is exposed to them and it is always socially desirable for the least risk-averse party to bear them i.e. the risk-neutral public sector (Arrow 1970). But if risks are a function of who bears them and risk transfer creates incentives to manage risks, then a risk transfer contract can be socially desirable even if the party bearing the risks is not the least risk averse and requires a risk premium i.e. a higher cost of capital: with endogenous risks, risk transfer can reduce total future costs.

However, the endogeneity of risk is also what makes risk transfer inefficient: how much risk the firm is effectively taking under the fixed price contract is private information. It follows that, unless competition for the contract is *perfect*, this private information is a source of *rent* or risk-free profit for the firm.

Indeed, competition for long term public-private risk transfer contracts is never perfect.[6] In the case of the PFI, we see

6 - A number of studies confirm that competition in the UK PFI sector has been limited (NAO 2007) and that collusion in the UK construction sector is widespread (OFT 2008). Blanc-Brude and Jensen (2010) thus show that concentration measures for PFI school construction contracts for example are three times as high as they are for traditional school contracts.

2. Sources of Return in Social Infrastructure Projects

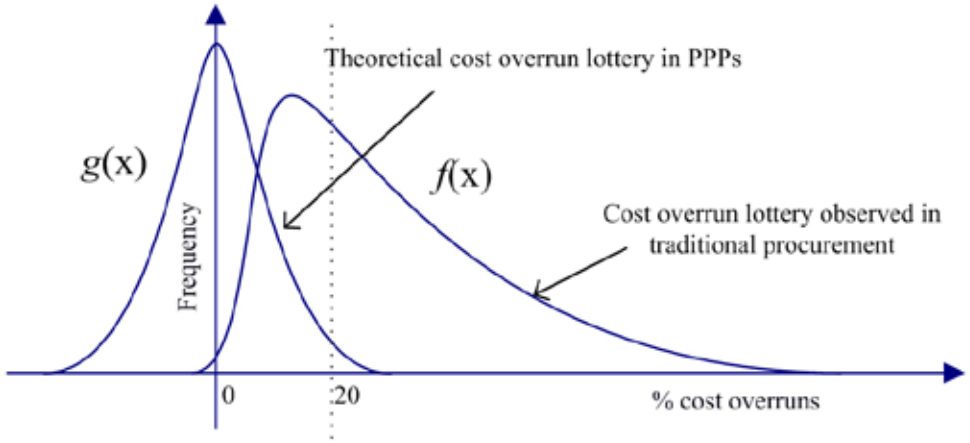
bids cluster 'a bit below' the Public Sector Comparator (PSC) i.e. the estimate of the public sector's total *ex post* cost accounting for its own risk of cost overruns.[7] This is because the benefits of the risk transfer contract are estimated as a function of how much risk the public sector is insured against under a PFI contract, not how much risk the firm bears. With imperfect competition, it should not be a surprise that bids should simply reflect the *willingness to pay* for risk transfer of the public sector rather than the required risk premium of the firm.

Competition is all the more limited that contracts like PFI schemes used to deliver social infrastructure transfer certain categories of risk to the firm *in full*, as opposed to more optimal risk sharing rules.[8] This further limits competition because only a few large (groups of) firms can take all design, construction, operations and maintenance risks as well as arranging financing. In turn, this further increases the rent of the selected firm.

Thus, purchasing infrastructure assets and service for a fixed price over a 25-year period leads to a *separating equilibrium* in which only the largest firms (the most efficient but also with the lowest costs of risk bearing) self-select to bid for the risk transfer contracts.[9] Competition between efficient firms is limited and the information rent of the selected firm always survives competitive tendering.

It should be noted and emphasised that when private information exists, paying an information rent to the efficient firm through the risk transfer contract is the *solution* to the task delegation problem initially identified i.e. the social cost of the firm's rent is lower than the extra cost of procurement without risk transfer when no effort was made to minimise costs and control risks. In the worst case, if there is no effective competition, the ex post cost to the taxpayer is roughly similar and the public sector only buys cost certainty.[10]

Figure 2: Public vs. private cost overrun lotteries in European infrastructure



Source: (Blanc-Brude 2008)

7 - Examples abound: Carlisle PFI Hospital Scheme, PFI: GBP173.1m, PSC: GBP174.3m; Main MOD Building, PFI: GBP746.1m, PSC: GBP746.2m; Haringey Schools, PFI: GBP97.5m, PSC: GBP99m.
8 - Under both adverse selection and moral hazard, the economic literature always concludes that 'incentive contracts' (between cost-plus and fixed price) should be preferred to pure fixed price or cost-plus contracts (Baron and Myerson 1982; McAfee and McMillan 1986). The optimal incentive contract is found to be closer to a fixed price contract than a cost-plus one. Indeed, cost-plus contracts perform poorly in selecting efficient (low-cost) firms and also fail to incentivise firms to reduce risk.
9 - Blanc-Brude and Jensen (2010) show this effect for the top 10 PFI and traditional school building firms in the UK by market share. Most of the firms active in one segment are not leading contractors or even involved in the other. Concentration in the PFI segment is found to be three times as high than in the traditional segment of school construction contracts.
10 - Cost certainty has not value in itself as long as the public sector is considered risk neutral.

2. Sources of Return in Social Infrastructure Projects

A study of construction risk pricing in European PPP road projects provides an clear illustration (Blanc-Brude, Goldsmith, and Välilä 2009): while the public sector experiences systematic cost overruns in road construction averaging 20-25% of ex ante estimates with extreme values as high as 160%, the bid price of construction contracts in PPP projects delivering the same infrastructure for a fixed price is, ceteris paribus, 24% higher than traditional procurement *ex ante* cost estimates. However, *ex post* data for the PPP projects suggests strongly that the firm does not face the same risk: its distribution of cost overruns is zero-centered and much less skewed than the public sector lottery as figure 2 illustrates. (Blanc-Brude 2007).

Social infrastructure investment schemes, as they exist in the UK and elsewhere today, are thus a case of solution to the moral hazard problem (creating maximum incentives for cost reduction) at the expense of increasing the adverse selection problem and therefore the selected firm's information rent.[11] Such contracts can be said to achieve *ex ante* efficiency (solving the task delegation problem under asymmetric information) at the cost of *ex post* inefficiency (the selected firms receives a risk-free rent).

To be clear, the efficient firm's risk-free rent springs from the difference of risk exposure between the public sector transferring risk and the private sector bearing risk. It can also be described as a case of pure arbitrage.

Finally, the *complete solution* to the task delegation problem found in public infrastructure procurement under asymmetrical information and limited competition is for the public sector to *commit not to expropriate the rent of the efficient firm* by entering into a long-term contract. This can include some form of inflation indexation as well.

These findings explain why 'public-private partnership' contracts, as such schemes are often labeled, are frequently perceived as expensive a few years after that have been entered into. This is also why vendors may describe such investments as having 'equity-like returns with bond-like risk' (Mansour and Nadji 2006).

11 - Laffont and Martimort (2002) show that preventing moral hazard hardens the adverse selection problem and allocative distortions are then always greater than under pure adverse selection.

3. Sources of Risk for Investors

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3.1 Performance Risk and Mitigation

The conclusion that to have private sector firms enter into long-term contracts to invest in social infrastructure delivery, under asymmetric information and limited competition, the public sector must commit *ex ante* to paying a rent to the firm, is echoed by the return expectations found in PFI contracts in the UK.

Nominal PFI project IRRs are expected to range from 7 to 9% and nominal pre-tax equity IRRs from 13 to 18% (HMT 2007a), with pinpoint equity[12] returns reaching much higher levels thanks to 99.9% effective leverage. Importantly, the volatility of real returns is believed to be very low because:

- Income is fixed and inflation linked
- Construction risk is passed to a subcontractor (typically one of the original equity investors) with a fixed-price date-certain contract. Likewise, operations and maintenance cost risks are typically passed on to contractors and subcontractors.
- The deductions that can be made to the unitary charge because of service delivery failure are small and capped so that debt repayment and equity distributions are unlikely to be affected (Ipsos Mori Social Research Institute 2009)

The remaining performance risk is shared by level of seniority in the SPV capital structure:

- Senior debt is found to be very safe in European PFI. In a recent study using a sample of 800 loans to PFI/PPP projects, Moody's found that senior loans to PFI SPVs had a maximum of 0.5% probability of default in any given year during the first ten years of the contract, by which time default rates reached zero. (Moody's 2012).
- Data on equity distribution and subordinated debt credit risk is not public but the dividend policy of listed entities investing solely in PFI equity can give an indication of the risks involved. For example, the HSBC Infrastructure Investment Company Ltd (LDN:HICL) has had a 6.5% annual dividend yield target since its creation in 2005 and has met its target every year.

This also makes intuitive sense since high leverage can be considered to be a sign a low asset risk (Esty 2002).

Thus, just as agency theory predicts, risk-adjusted returns have been set at an attractive level to make the PFI happen in the UK. While this is makes such assets very attractive indeed for investors, pension funds considering long-term positions also have to consider the extreme risks created by the political nature of the contract's counter-party.

3.2 Political and Regulatory Risk

Not all infrastructure gets built because of decisions taken by the public sector. The private sector has historically developed, financed and delivered infrastructure such as privately-financed roads, bridges and canals, lighthouses or libraries, with varying degrees of commercial success (Coase 1974). Fully private infrastructure also gets built in heavy industrial sectors like mining or oil & gas.

However, *most* infrastructure is developed because there exists a matching government department (transport, education, defence etc.) and because the public sector is considered, for historically and socially

12 - In the majority of cases, most of the equity tranche invested in SPVs is quasi-equity (subordinated debt extended by the project sponsors) and only a few hundred thousand Pounds or Euros, or pinpoint equity, make the paid up capital of the SPV.

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contingent reasons, to be the guarantor of the continuity of certain public services. As a consequence, the implicit or explicit public-private contracts that define infrastructure investment opportunities are always a *function of public policy*: without public subsidies, most infrastructure would not exist[13] and the infrastructure that would would be in the hands of monopolists restricting supply, underinvesting and charging high prices, thus failing to deliver any *public* service. (Blinder, Baumol, and Gale 2001)

This is why, as we argued above, infrastructure investment is really underpinned by contracts rather than concrete: infrastructure is only ever conceded by the public sector, either explicitly or not i.e. the source of enterprise value springs from the existence of a relationship between the public sector and a firm allowing the latter to provide a public service according to an agreed business model.

For example, With the PFI in the UK, the actual building or facility that is the object of PFI contracts is not privately owned (school buildings are owned by Local Education Authorities (LEAs), hospital buildings are owned by National Health Service Trusts (NHS), roads are owned by the UK Department of Transport, etc.) The value of the investment made is in the contract entered into with the public sector, not the ownership of a hard asset. Even when assets are privately owned during the life of the concession (e.g. Skynet 5, a PFI providing satellite communication to the UK Department of Defence) their specificity is clearly such that their value is nil *without* a long-term contract.

This fundamental point has two very significant consequences for a pension fund investing in public infrastructure:

- It is *always and only* up to the public sector to make investing in public infrastructure a valuable proposition; in other words, it is public policy, not markets, that determines the opportunity to invest.
- Political risk is thus an inescapable dimension of infrastructure investment because public policies are likely to change over the decade-long investment periods that characterise infrastructure assets.

Thus, social infrastructure investment schemes deliver the stable, inflation-linked high risk-adjusted returns that are meant to characterise infrastructure assets *because they were meant by the public sector to deliver just these characteristics*. As discussed above, committing to paying an information rent to the efficient firm so that it would consider investing in a long term asset to deliver public infrastructure services is the *solution* to the initial contracting problem.

This solution may, however, be *politically* unsustainable.

At the beginning of a period of private sector involvement in public infrastructure delivery, the public sector is willing to see the efficient firm receive a rent because it values the effective delivery of infrastructure assets and services to the economy. For example, when the PFI was launched in 1992, the British infrastructure sector had been starved of capital expenditure for more than a decade. When Labour was elected in 1997 on a promise to deliver public services, the PFI provided the perfect vehicle to attract cost-efficient firms and

13 - Private infrastructure monopolists would shut down for lack of effective demand at a price that justifies production especially considering their high sunk costs and long repayment period.

3. Sources of Risk for Investors

capital to the sector. We showed that after 1997, the PFI delivered as much as half a percentage point of GDP equivalent of supplementary public investment (Blanc-Brude, Goldsmith, and Välilä 2007).

Later, once investments have been made and the attractive risk-adjusted returns become more apparent (and politically difficult to justify), the pressure to renegotiate the rules regulating initial contracts increases. Returning to the PFI, ever since their inception or almost, PFI contracts have regularly been criticized in the UK. The main concern being that investors may be receiving high returns, at the expense of taxpayers (BBC4 2011).

An important dimension of the contracts used to deliver social infrastructure in the UK, France and beyond, is that they do not set the private sector's rent, as opposed to for example, the economic regulation of utilities under the regulatory asset base model, which regularly benchmarks the cost of the efficient firm. As a consequence, if competition was so limited that adverse selection led to granting a large risk-free rent to the firm, or a new technology is introduced that delivers high costs savings, or if the firm is simply very good at generating costs savings or manipulating the SPVs financial structure to maximize its rent, the temptation or the pressure for the public sector to renegotiate or at least cap profits becomes too great to resist.

For example, until 2002, PFI debt was very frequently refinanced post-construction to benefit from a perceived change of risk profile and continued market pressure on spreads. PFI refinancings also generated significant gains on the equity side since a high gearing ratio can transform a small economy on debt service into a large equity distribution. The use of debt refinancing to generate equity outperformance became so frequent that the political pressure mounted for HMT to recover some of the gains made. In 2002, HMT unilaterally introduced a mandatory sharing rule for refinancing gains, requesting that 30% of the savings be returned to the taxpayer (HMT 2007b). Refinancings became less frequent afterwards.

Finally, even if a principal has to commit to letting the firm earn a risk-free rent under the risk-transfer contract, a new principal may not have to live by the commitment of its predecessor, especially if an external shock (e.g. an economic or financial crisis) provides good reasons to renege and renegotiate.

Thus, as long as Labour was in power, its commitment to the PFI remained. Elsewhere in the UK, local government that did not feel bound by the decisions of Labour challenged the validity of the rents embedded in PFI contracts continuously. On a number of instances, the governments of Scotland or Wales cancelled planned projects, terminated existing contracts (Roy 2011) and even sold assets that were still claimed by banks as security (Ashurst 2007). Each time, a change of government (Plaid Cymru in Wales and the Scottish National Party in 2007) combined with the perception that were expensive put an end to the prior commitment of the public sector via a long-term contract .

When a new coalition government was elected in the UK in the middle of a financial crisis, which was immediately followed by a

3. Sources of Risk for Investors

crisis of public finances, the commitment of the public sector to the PFI was unlikely to last. At the same time, the main difficulty encountered with entering into new PFI contracts was the accessibility of debt financing, especially long-term bank debt. PFI debt spreads followed the credit cycle and, having reached a through in 2008 at around Libor+80-90bps before fees for a 22.5-year term loan, they increased to Libor+300-350bps in 2009 for a seven-year mini-perm (figure 4) and have only slightly decreased since then.[14]

The increase of PFI borrowing costs induced by the reversal of the credit cycle has led to an increase by 6 to 7% of the unitary charge paid by the public sector over the lifetime of projects financed since 2009 (NAO 2010). The realisation that such costs increases may be locked-in for 25 years led HMT to announce a new rule on refinancing gains according to which up to 70% of the gains achieved from refinancing PFI debt raised after 2008 would have to be returned to the tax payer(HMT 2008).

The new UK government embarked on the search for a 'new model' for the PFI almost immediately after coming to power. While the PFI was designed to reduce the cost of traditional public procurement, in particular endemic cost overruns and delays, in its December 2011 *Call for Evidence*, HMT chose to characterise the past twenty years of PFI procurement as potentially "too costly, inflexible and opaque." (Treasury 2011c)

In the same consultation document, HMT suggests that:

- Like debt refinancing, equity transfers may become part of its remit as the *de facto* regulator of the sector, which means that future exits by specialist funds invested in PFI projects may come under scrutiny.
- A rate of return cap could be introduced following the regulatory asset base model and applying economic regulation techniques developed in the context of the privatization of natural monopolies in the 1980s by a previous Conservative government. We defended this idea in an earlier paper (Jensen and Blanc-Brude 2010)

Clearly, the commitment of the UK public sector to the long-term contracts delivering its social infrastructure has eroded and it now considers their net benefits to be insufficient. Still, it should be noted that the UK government has so far refrained from full retroactive renegotiations or re-opening of existing contracts. It has however entered into negotiations with existing PFI investors about minimizing or optimizing certain contracts to achieve GBP1.5bn of savings (Treasury 2011a) and has put an end to certain practices by investors such as integrating debt refinancings in their initial return calculations. Even in the UK however, retroactive renegotiations are always possible, as the windfall tax imposed by Labour to privatized utilities in the late 1990s demonstrates. (Chennells 1997)

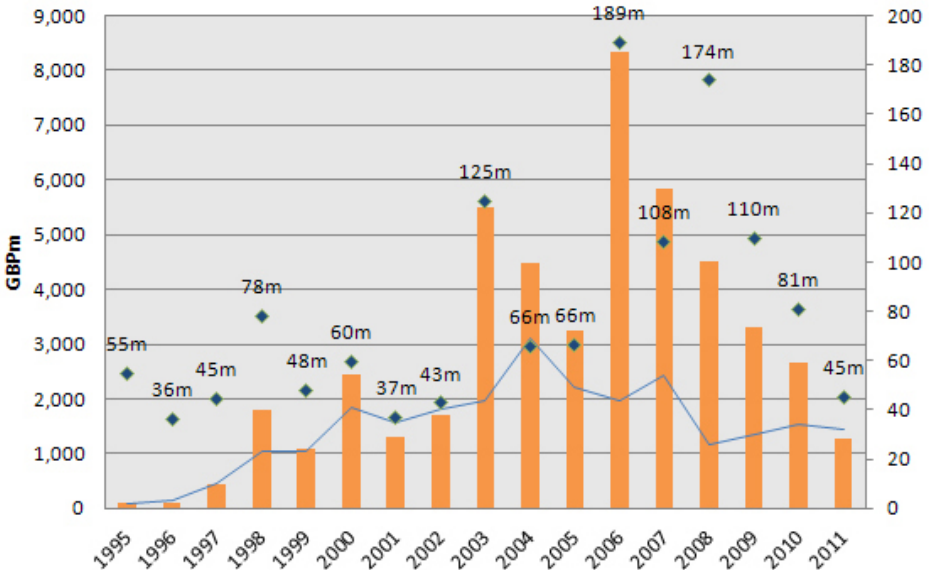
This *shift from commitment to resentment* is not specific to the UK or PFI contracts. All investments in policy-derived long-term contracts for infrastructure delivery tend to go through the same pattern of events or policy cycle as previous research has shown: "Private initiatives work for a while but after a shock to the sector takes place the public sector returns as regulator, owner or financier; after a while the public sector runs into problems and

14 - 'Mini-perm' debt with tenors of 5 to 7 years ('hard' mini-perms) introducing significant refinancing risk for projects closed after 2009 has become the norm. 'Soft' mini-perms allowing for longer tenors but with a margin ratchet or cash sweep encouraging a refinancing are also used and introduce new risks for equity investors in PFI SPVs.

3. Sources of Risk for Investors

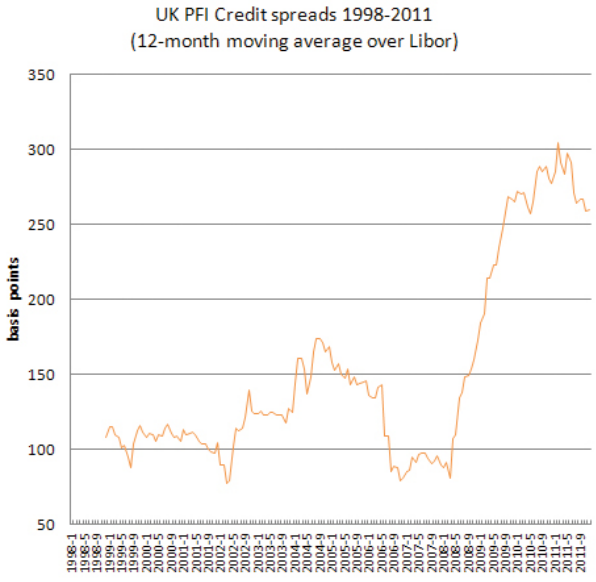
eventually finds a hybrid solution to ensure the survival of the sector." (Estache and Serebrisky 2004)

Figure 3: New social infrastructure deal flow under the PFI, 1995-2011



Source: InfraNews

Figure 4: Libor spreads for term loans extended to PFI projects, Jan 1998-Dec 2011



Source: Thomson Reuters

4. Implications for Social Infrastructure Reform and Regulation

4. Implications for social infrastructure reform and regulation

We concluded above that social infrastructure was mostly outside the scope of direct infrastructure investment by pension funds because the average investment size is too small. This means that intermediation will be instrumental to enable pension fund investment in social infrastructure. This should be a major question for the policy maker as the emergence of social infrastructure as an asset class depends greatly on the potential scale of the sector especially if most of the capital expenditure continues to be financed through debt, which suggests that infrastructure investment would fit in existing fixed income allocations and may fail to receive the attention from pension funds that governments currently hope for.

However, this also suggests that social infrastructure can achieve levels of diversification that are unattainable with other, larger, infrastructure assets. Indeed, we also concluded earlier that the value of investing in social infrastructure is a function of policy-dependent public-private contracts and that they tend to have investment characteristics that are attractive to pension funds. Thus, with the PFI, the UK Government created an investment product which better corresponded to the ideal type of pension funds' passive investment in infrastructure, delivering long-term, stable, inflation-linked cash flows, than most other infrastructure investment opportunities.

Finally, we concluded, the contracts enabling investment in social infrastructure are also characterised by significant long-term political and regulatory risk.

These conclusions have clear implications for the reform of the PFI in the UK and beyond to allow the continued development of social infrastructure investment by pension funds.

Firstly, a clear, transparent regulatory framework is necessary to mitigate political risk and the inevitable pressure that long-term public-private risk transfer contracts find themselves under after a few years of operation. An independent regulator setting the price of risk transfer in regular 'rate rebasing' exercises would protect long-term investors from the political cycle.

An independent regulator would bring transparency about risk and returns and conduct an ongoing benchmarking exercise of the cost of delivering social infrastructure *by firms* (as opposed to benchmarking public sector risk with the Public Sector Comparator approach). Such benchmarking of costs and risk in the delivery of social infrastructure would not only bring transparency but also ensure that taxpayers get the best 'value for money'.

Importantly, this regulatory framework would allow, by the same token, the benchmarking of investment returns in different categories of social infrastructure assets, thus informing the strategic asset allocation decision of long-term investors like pension funds.

Secondly, since intermediation is necessary, governments should take steps to make sure that the benefits of intermediated infrastructure investment are real. This means working with intermediaries, academics and regulators to create investment products in public infrastructure that offer the liability-hedging or

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performance-seeking characteristics that pension funds require.

Finally, a pipeline of investment projects at the continent level is probably necessary to deliver the asset pool size that could make social infrastructure equity emerge as an asset class. This could be the most challenging dimension of social infrastructure investment by pensions funds from a public policy perspective. Social infrastructure debt, while consisting the bulk of social infrastructure capital investment, is unlikely to be treated as a separate asset class by pension funds and thus to be the object of a specific asset allocation at the strategic level.

4. Implications for social infrastructure reform and regulation

5. Conclusion and recommendations

5. Conclusion and Recommendations

In this paper, we have considered in broad, non-technical terms some of the fundamental aspects of pension fund investing in infrastructure with special reference to social infrastructure and the UK Private Finance Initiative.

We argue that the value found in social infrastructure investment is essentially determined by public-private contracts: long-term commitment mechanisms through which two parties agree to invest in and remunerate an operational infrastructure asset. Because of the information asymmetry that characterises this relationship, we know that long-term contracts that transfer most risks to the private sector to achieve the best cost-effective delivery of social infrastructure *must* lead the public sector to commit to paying a risk-free rent to the firm and its investors. As long as contracts are awarded on the basis of how much risk the public sector is transferring, this rent springs from the difference of risk exposure between the public sector transferring risk and the private sector bearing risk when competition is imperfect. It can also be described as a case of pure arbitrage.

It should be emphasised that paying an information rent to the efficient firm through a risk transfer contract is the *solution* to the task delegation problem found in public infrastructure procurement i.e. the social cost of the firm's rent is lower than the extra cost of procurement without risk transfer when no effort is made to minimise costs and control risks. The *complete solution* to the task delegation problem found in public infrastructure procurement under asymmetrical information and limited competition, is for the public sector to *commit not to expropriate the rent of the efficient firm* by entering into a long-term contract.

Ironically, the latest attempt of the UK government to reform the PFI to attract pension funds to the sector are a vivid illustration of what pension funds should worry about when it comes to infrastructure investment: over a period of several decades, the government will change its mind about how such contract should be regulated more than once.

For pension funds, it follows that:

- Social infrastructure investment can deliver some desirable characteristics in a liability-driven investment context, especially high risk adjusted returns and inflation protection.
- Political risk partly springs from these characteristics and *ex post* expropriation should be considered likely.
- Thus, pension funds should aim to invest in infrastructure during the period when government commitment to the financial viability of infrastructure investment is demonstrably stable.

In turn, PFI reform in the UK and the regulation of social infrastructure investment in general should aim to demonstrate this stability to long-term investors:

- The rent-seeking behavior observed in long-term public-private contracts should be acknowledged, as well as the need to regulate it.
- To attract pension funds to invest in social infrastructure, governments must create a clear, transparent and independent regulatory framework of the

5. Conclusion and Recommendations

firm's rent, thus mitigating political and headline risks.

- Given the average investment size in social infrastructure projects and the benefits of intermediation, governments should take steps to make sure that the benefits of intermediated investment are real. This means working with intermediaries, academics and regulators to create investment products in public infrastructure that offer the liability-hedging or performance-seeking characteristics that pension funds need and want.
- A concerted effort between academia and the industry is needed to benchmark infrastructure assets as financial assets and work towards the most efficient building blocks that will allow institutional investors to integrate infrastructure in their asset allocation decisions. Research still needs to be done to document the potential relevance of infrastructure investments for long-term investors.
- The public sector must also ensure a continued supply of potential investment prospects for pension funds to maintain interest in the asset class. In this perspective, the standardization of contracts achieved for the PFI is an asset and further steps are now necessary to standardize the delivery of social infrastructure as a financial investment product for institutional investors. Policy initiatives at the continent level might be necessary for the social infrastructure equity pool to reach a big enough size and qualify as an asset class.

5. Conclusion and Recommendations

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Annex: Contribution to the UK Treasury Call for Evidence on the PFI

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Remarks on institutional investment in privately financed public infrastructure

Introduction

Among the objectives set in HM Treasury's call for evidence on the reform of the Private Finance Initiative (PFI) is the encouragement of pension fund investment in the delivery of public facilities, namely, the public infrastructure projects delivering public services.

With PFI projects or their equivalent looking forward, institutional investors may consider investing in equity directly at the special purpose vehicle level, via an unlisted intermediary fund, or a listed fund. While all three types of equity investments are now frequently made, the equivalent debt products are still rather uncommon, but, in principle, investors may lend directly to project companies, by extending loans or purchasing project bonds, or via unlisted or listed debt funds.[15] As I discuss below, the possibility and opportunity of institutional investment in infrastructure projects revolves in large part around the *relative value of intermediation* in the context of the strategic asset allocation decision and portfolio optimisation of pension funds.

In what follows, I consider in general, non-technical terms what asset and risk management questions are raised by the prospect of substantial pension fund investment in UK public infrastructure.

Strategic allocation to infrastructure

To invest in PFI projects or the next generation of privately financed public infrastructure projects in the UK, institutional investors have to decide where in their strategic asset allocation such investments should go. In the case of debt-related investments, debt and fixed income buckets would probably be the locations of choice. With regards to equity investments, the question of the definition of infrastructure investment as a separate asset class remains a difficult one to answer because the ideal-type associated with infrastructure investment (stable, long-term cash flows, inflation protection, high operating margins, high probability of distributions) has not always been matched by the experience of investors in numerous markets.

Indeed, recent academic research on the performance of infrastructure investment is rather mixed. Using samples of Australian, US and global data, both listed and unlisted, recent papers conclude that infrastructure returns can be high but only because risk is also high, that diversification benefits are limited and may disappear with time, that inflation protection is seldom experienced except in the utilities sector, and that downside protection, while real, can be hampered by fund-level risk (e.g. excessive leverage) (Peng and Newell 2007; Bitsch, Buchner, and Kaserer 2010; Bird, Liem, and Thorp 2011).

These results do not necessarily mean that institutional investment in infrastructure is not a good idea. Existing research relies on limited and biased datasets and we know that statistical estimates of returns are mostly unreliable (Merton 1980). Instead, the inconsistency and lack of clear conclusions of recent research

15 - Since the question is that of promoting institutional investors' involvement in the financing of public infrastructure projects, their investing in listed or unlisted infrastructure developers or service providers is outside the scope.

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results suggests that infrastructure is an ill-defined investment class, lacking *useful* benchmarks and adapted investment products.

Before churning more data, a serious effort is needed on the theoretical side: what should we expect from investment in infrastructure assets? There is a significant body of economic literature on the infrastructure sector, most of which still has to be translated into financial economics. Likewise, project finance practitioners know a lot about how infrastructure project cash flows behave. What is needed today is a concerted effort between academia and the industry to benchmark infrastructure assets as financial assets and work towards the most efficient building blocks that will allow institutional investors to integrate infrastructure in their asset allocation decisions.

16 - With unequal tails and a high peak, like the beta-PERT distribution that infrastructure project engineers know well.

Infrastructure investment as an active strategy

Speaking of asset classes makes sense if the addition of a new class to an opportunity set improves the available risk-return trade-off. An asset class also has to be investable if its characteristics are to be captured in an investor's portfolio.

Most research on infrastructure investment refers to a list of industrial sub-sectors, from roads to hospital buildings, as the 'asset class.' Assuming one can agree on a definition of what all listed and unlisted, direct and indirect infrastructure assets consist of, a basket of these assets, weighted by value, would be a true representation of the 'infrastructure asset class.'

How large would an infrastructure portfolio have to be to achieve reasonable diversification? With normally distributed returns and equal weights, listed equities can achieve 95% diversification of specific risk with 44 stocks (Brown and Matysiak 2000). But how are infrastructure asset returns distributed? This is not currently well documented but looking at real estate assets can give us the beginning of an answer: If returns are skewed and leptokurtic[16] we know that with direct real estate assets, a portfolio of at least 1,700 properties is needed to reduce risk ten-fold (Young and Lee 2006). Assuming the same return characteristics for PFI investments, would mean that investing in all the PFI projects ever financed would not be enough to achieve the same level of diversification! The problem of non-normal returns is compounded by the indivisibility of assets which prevents equal weighting. If equal-weighting is not an option, larger portfolios of value-weighed properties will be required to obtain the same level of diversification. (Ducoulombier 2007)

Thus, even if the infrastructure 'asset class' exists in theory, in all likelihood it cannot be directly invested as such i.e. infrastructure remains too lumpy and fragmented for investors to contemplate holding a representative basket of investable infrastructure assets. As a consequence, *there is still no available passive infrastructure investment strategy for a pension fund through a highly diversified portfolio* since actual investments are likely to include exposures to the class and to firm-specific risk. The separation of the beta and alpha decisions is impossible because the estimation of the

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obtainable beta is a function of a limited set of available investment vehicles.

Intermediation vs. direct investment

Since investors committing capital to infrastructure are pursuing a *de facto* active strategy, negative or positive selection biases are likely and investors must focus on active management to try and optimise portfolio returns instead of merely picking up the infrastructure market premium associated with a diversified exposure.

The realisation of this last point by the more sophisticated pension funds, combined with their reported dissatisfaction with specialist funds is currently leading them to try direct co-investment in projects, with the premise that direct ownership is more likely to deliver the desirable cash flow characteristics described above.

But this is not without problems since it leads to several large players chasing the same few large deals available at one point in time ($200m minimum equity stake in a standard threshold), resulting in higher asset prices[17] and leaving the small and medium size infrastructure projects (i.e. 90% of projects in Europe[18]) out of their investment scope. It is a classic case of high transaction costs leading to a market failure if intermediation is excluded.

Thus, from a public policy perspective, intermediaries remain necessary to channel pension fund money into the majority of infrastructure projects and except in the case of very few extremely large pension funds with the ability to invest in hundreds of assets, intermediated investment through specialist funds (and funds of funds) should be the best way to deliver the benefits of infrastructure investment to final investors.

But if return dispersion is significant and selection biases are unavoidable, accessing infrastructure through the best managers will remain essential to ensuring performance, since the average performance may be quite average indeed. This is why the best infrastructure funds will continue to charge high fees.

The infrastructure knowledge gap

Today, we do not know what portfolio benefits infrastructure can bring. We are faced with a lack of evidence (about performance) compounded by a lack of knowledge (about expected returns and correlations).

The lack of accepted benchmark prevents investors from understanding the risk, returns and correlation characteristics of infrastructure investments and without a consensus on historical returns, little guidance on strategic asset allocation can exist.

How should we design good benchmarks of long-term returns in infrastructure?

Infrastructure investment *products* should be determined by the financial economics of contracts, not technical sectoral characteristics. Infrastructure investment in the UK rests on *policy-driven long-term risk transfer contracts*, and benchmarking returns by industrial sectors such as toll roads or wind power makes little sense.

17 - Direct investors must also have their own infrastructure team, a transaction cost which must be reflected in deal prices.
18 - By number of infrastructure projects with total equity investment below $200m between 1995 and 2009 in Europe (Blanc-Brude et al 2010)

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Contracts (and policy) should be the defining characteristics of infrastructure subclasses. It is almost dangerous to claim, as many presentations do, that greenfield toll roads have a 12 to 16 per cent IRR while operational ones offer 8 to 12 per cent (Weber and Alfen 2010). What really matters is what the concession contract says, and from this perspective, some Northern European PPP roads look a lot more like PFI schools than like Hungarian or Portuguese PPP roads.

As current research demonstrates, past data will not be very informative and forward looking models are likely to be more helpful. Analytically, the primacy of *contracts* in infrastructure investment suggests the need to identify generic risk categories that are relevant to the risk/return profile of investments on the income side (e.g. availability-based income, demand-based and regulated income) and on the cost side (e.g. the probability distribution of construction cost overruns under private management should be very different than under traditional procurement). Thankfully, with infrastructure project finance, the future is better defined than with most other investment vehicles and constructing forward looking benchmarks for generic assets should be possible.

Infrastructure products should be better defined

Pension funds can invest to hedge their liabilities or to seek performance. At the moment they are asked to invest in something called 'infrastructure' and to expect getting both. At the same time, the characteristics of the underlying cash flows seem to be evaporating at the infrastructure fund level.

But contrary to private equity, it should be possible to tailor infrastructure investment to deliver the specific investment characteristics that pension funds require.

At the underlying level, such flexibility is partly a function of how infrastructure project finance works. Financial structure, repayment profiles and debt covenants can be chosen to create a desired risk profile. This is why, for example, debt tranche size or tenor does not have a statistically significant effect on debt spreads in PPP project finance (Blanc-Brude and Strange 2007; Kleimeier and Megginson 2001) while they do drive spreads on corporate debt (Megginson 1999).

But infrastructure contracts are mostly malleable because of their public policy dimension: governments, not markets, decide whether infrastructure is needed and should be built. Any infrastructure project which is not funded directly or indirectly by the public sector requires some kind of public-private risk transfer contract or mechanism (Blanc-Brude 2008). With public infrastructure in general and with the PFI in particular, it is the public sector that ultimately decides whether or not investing in public infrastructure projects will be worth investors' while.

Admittedly, the public sector has not been very good at transferring risk and has tended to take a very binary approach to public-private risk transfer. For example, under the PFI, 100% of construction risk is typically transferred, whereas economics suggest that the 'second best' in a risk transfer contract designed to

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address the moral hazard that springs from asymmetrical information requires 'some' risk transfer. As I have discussed before (Blanc-Brude and Jensen 2010), the PFI deals with the agency problem inherent in public procurement by solving the moral hazard problem (creating incentives though risk transfer) at the cost of maximising the adverse selection problem, which in turn is supposed to solve itself through the naive narrative of competitive bidding for public-private risk transfer contracts.[19]

However, there is no reason to believe that this cannot be improved. Smart risk sharing contracts should be possible to create infrastructure assets emphasising the characteristics demanded by investors (e.g. income stability) without removing the incentive to perform of developers and contractors. Thus, in the event that construction risk cannot be passed through to a contractor - which it normally can be - the public sector could, for example, insure against extreme losses the portion of the equity that is held by a pension fund. The cost to the public sector to do his should be very low and the greenfield risk 'black box' which worries investors so much could become more transparent.

Likewise, instead of agonising about whether or not infrastructure investment can deliver inflation protection, the public sector should work together with financial intermediaries to design products that do (e.g. Inflation-linked subordinated paper at the project level or debt funds lending only to projects with an explicit inflation-indexation revenue clause).

With investment products designed around the investment characteristics of infrastructure contracts would then be much more likely to deliver consistent performance and final investors could appreciate whether allocating to infrastructure improves the risk/return profile of their portfolios. Different infrastructure-related investment products could be designed: some for liability hedging, some for performance seeking.

PFI equity as an asset class

Contrary to a frequent presentation of infrastructure investment, infrastructure assets are *not* real assets (as opposed to commodities or real estate) because they are only worth what contracts creating *credible commitment* to fund, build, operate and use a discreet piece of infrastructure in exchange for an income stream, say they are. Contractual governance including financial structure, the balance of payoffs and the likelihood of renegotiation, are the main factors driving the value of such investment.

As a consequence, the contractual standardisation which is one of the great achievements of the PFI contributes greatly to making investing in such contracts a coherent investment class in itself. Indeed, the minimum characteristics of an asset class should include the following: (Markowitz, Fabozzi, and Kostovetsky 2004)

- The major economic factors that influence the value of the asset class correlate highly with the returns of each member included in the class
- Risk and return characteristics are similar

19 - Because firm 'type' is non-homogenous in risk aversion, the more risk is transferred, the lower the number of firms willing to take these risks i.e. the cost of risk bearing of the firm is inversely proportional its size. This leads to a process of self -selection and separating equilibrium in which only a few large firms choose to bid for PFI projects. (Blanc-Brude & Jensen 2010)

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• Legal and regulatory structure is common

With the PFI, the UK public sector procures a stream of public services at a fixed price i.e. it effectively buys insurance on the cost of procuring a set amount of infrastructure-related public services. Whether or not cost certainty is something worth paying for the public sector is still a cause for great debate. But for a pension fund, investing in PFI equity amounts to buying this proposition: "receiving the returns from a long-term risk transfer contract for the provision of specific public services with a credible commitment from HMG's *not* to renegotiate the unitary charge during the life of the contract."

This is also not very different from a total rate of return swap: the public sector receives a given stream of services at a fixed price and the firm (investor) receives a fixed income stream and faces variable costs. Valuing this contract on the private sector side demands taking a view on total delivery costs (including, for example, refinancing risk) and on whether the public sector might renege on its commitment (political risk).

A model-based forward-looking benchmark for investing equity in standardised PFI projects (accommodation, schools, municipal services &tc) should be possible, thus allowing the integration of the PFI in strategic allocation exercises. Of course, PFI equity as an investment category does not diversify political risk.

Conclusion

As a conclusion, the case for pension fund investment in UK public infrastructure still has to be made in terms that fit the requirements of institutional investors.

As discussed above, infrastructure is unlikely to be an investment class for which institutional investors can adopt a passive approach. The need for and cost of active management of infrastructure investment should be recognised.

It also follows that, with the exception of a few very large players, intermediation remains the solution of choice to achieve substantial levels of institutional investment. This also should be recognised and the cost of using intermediaries compared to the benefits of intermediation.

Since attracting pension fund investment to UK infrastructure is a public policy objective, HMG should take steps to make sure that the benefits of intermediated infrastructure investment are real. This means working with intermediaries, academics and regulators to create investment products in UK public infrastructure which offer the liability-hedging or performance-seeking characteristics that pension funds want.

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About EDHEC-Risk Institute

About EDHEC-Risk Institute

Founded in 1906, EDHEC is one of the foremost international business schools. Accredited by the three main international academic organisations, EQUIS, AACSB, and Association of MBAs, EDHEC has for a number of years been pursuing a strategy of international excellence that led it to set up EDHEC-Risk in 2001. With eighty professors, research engineers, and research associates, EDHEC-Risk has the largest asset management research team in Europe.

The Choice of Asset Allocation and Risk Management

EDHEC-Risk structures all of its research work around asset allocation and risk management. This issue corresponds to a genuine expectation from the market. On the one hand, the prevailing stock market situation in recent years has shown the limitations of diversification alone as a risk management technique and the usefulness of approaches based on dynamic portfolio allocation. On the other, the appearance of new asset classes (hedge funds, private equity, real assets), with risk profiles that are very different from those of the traditional investment universe, constitutes a new opportunity and challenge for the implementation of allocation in an asset management or asset-liability management context.

This strategic choice is applied to all of the Institute's research programmes, whether they involve proposing new methods of strategic allocation, which integrate the alternative class; taking extreme risks into account in portfolio construction; studying the usefulness of derivatives in implementing asset-liability management approaches; or orienting the concept of dynamic "core-satellite" investment management in the framework of absolute return or target-date funds.

Academic Excellence and Industry Relevance

In an attempt to ensure that the research it carries out is truly applicable, EDHEC has implemented a dual validation system for the work of EDHEC-Risk. All research work must be part of a research programme, the relevance and goals of which have been validated from both an academic and a business viewpoint by the Institute's advisory board. This board is made up of internationally recognised researchers, the Institute's business partners, and representatives of major international institutional investors. Management of the research programmes respects a rigorous validation process, which guarantees the scientific quality and the operational usefulness of the programmes.

Six research programmes have been conducted by the centre to date:

- Asset allocation and alternative diversification
- Style and performance analysis
- Indices and benchmarking
- Operational risks and performance
- Asset allocation and derivative instruments
- ALM and asset management

These programmes receive the support of a large number of financial companies. The results of the research programmes are disseminated through the EDHEC-Risk locations in Singapore, which was established at the invitation of the Monetary Authority of Singapore (MAS), the City of London in the United Kingdom, and Nice, France. In addition, it has a research team located in the United States.

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- Solvency II Benchmarks, *in partnership with Russell Investments*
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The philosophy of the Institute is to validate its work by publication in international academic journals, as well as to make it available to the sector through its position papers, published studies, and conferences.

Each year, EDHEC-Risk organises two conferences for professionals in order to present the results of its research, one in London (EDHEC-Risk Days – Europe) and one in Singapore (EDHEC-Risk Days – Asia), attracting more than 2,000 professional delegates.

EDHEC also provides professionals with access to its website, www.edhec-risk.com, which is entirely devoted to international asset management research. The website, which has more than 50,000 regular visitors, is aimed at professionals who wish to benefit from EDHEC's analysis and expertise in the area of applied portfolio management research. Its monthly newsletter is distributed to more than 1,000,000 readers.

EDHEC-Risk Institute: Key Figures, 2010-2011

Nbr of permanent staff	80
Nbr of research associates	18
Nbr of affiliate professors	6
Overall budget	€11,200,000
External financing	€6,215,000
Nbr of conference delegates	1,850
Nbr of participants at EDHEC-Risk Indices & Benchmarks seminars	391
Nbr of participants at EDHEC-Risk Institute Risk Management seminars	419
Nbr of participants at EDHEC-Risk Institute Executive Education seminars	356

About EDHEC-Risk Institute

The EDHEC-Risk Institute PhD in Finance

The EDHEC-Risk Institute PhD in Finance is designed for professionals who aspire to higher intellectual levels and aim to redefine the investment banking and asset management industries. It is offered in two tracks: a residential track for high-potential graduate students, who hold part-time positions at EDHEC, and an executive track for practitioners who keep their full-time jobs. Drawing its faculty from the world's best universities and enjoying the support of the research centre with the greatest impact on the financial industry, the EDHEC-Risk Institute PhD in Finance creates an extraordinary platform for professional development and industry innovation.

Research for Business

The Institute's activities have also given rise to executive education and research service offshoots. EDHEC-Risk's executive education programmes help investment professionals to upgrade their skills with advanced risk and asset management training across traditional and alternative classes. In partnership with CFA Institute, it has developed advanced seminars based on its research which are available to CFA charterholders and have been taking place since 2008 in New York, Singapore and London.

While EDHEC-Risk makes important public contributions to the advancement of applied financial research and the improvement of industry practices, the insights drawn from EDHEC-Risk's "Indices & Benchmarking", "ALM and Asset Management" and "Derivatives and Asset Management" research programmes over the past several years have led to a series of indices and benchmarks that provide more efficient or more academic-based solutions to investors' needs than current offers available on the market.

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Notes

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