

Portfolio Infrastructure Investments: an Analysis of the European and UK Cases

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ABSTRACT

Infrastructure has been receiving much attention in recent years. Investment banks and fund managers are increasingly promoting the investment characteristics of infrastructure assets and they argue that investing in infrastructure should be ideal for institutional investors such as pension funds. However, the claim lacks empirical support. We suggest that the limited research on infrastructure is mainly due to scant empirical data. The objectives of this paper are to examine the significance of economic infrastructure as an asset class by assessing the investment characteristics and performance of infrastructure indexes in Europe and UK from 2000-2014, to analyse how an infrastructure portfolio should be constructed and to determine whether the private sector should invest in an infrastructure portfolio containing a variety of infrastructure sectors or if the private sector should invest in one specific sector only.

Keywords: Portfolio optimisation, infrastructure indices, diversification benefit, infrastructure sub-sectors, and mean-variance analysis.

Infrastructure has been receiving deserved attention in recent years. Investment banks and fund managers are increasingly promoting the investment characteristics of infrastructure assets and they argue that investing in infrastructure should be ideal for institutional investors such as pension funds. One key characteristic of infrastructure assets that distinguishes them from all other traditional assets, is that they usually operate as natural monopoly. Thus, infrastructure assets usually have one or more of the following characteristics: high barriers to entry, economies of scale, inelastic demand, and long duration. These characteristics convey many attractive investment features to the infrastructure assets such as: secure stable cash flows, low correlation to other assets, insensitivity to macroeconomic conditions, relatively low default rates and inflation hedging properties¹. However, all these claims have insufficient empirical support.

Nevertheless, the outlook for infrastructure deal flow in 2014 is particularly positive, with 71% of managers surveyed agreeing to deploy more capital than in 2013². European infrastructure assets have historically accounted for a higher proportion of deals per year than assets in any other region. Of the more than 3,700 infrastructure deals finalised since 2008, European assets have accounted for 47% of total deals on average per year³. Despite increasing demand for infrastructure, and particularly European infrastructure, research in this area is still limited. We suggest that the limited research on infrastructure finance is due mainly to scant empirical data. Existing research

1 Helm, D and Tindall, T. (2009), 'The Evolution of infrastructure and Utility Ownership and its Implications'. *Oxford Review of Economic Policy*, 25(3), pp. 411-434; Newell, G., Peng, H., and De Francesco, A. (2011), The performance of unlisted infrastructure in investment portfolios. *Journal of Property Research*, Special Issue: Infrastructure and Regeneration 28,1, pp. 59-74.

2 Preqin (2014) Preqin Special Report: Infrastructure Transaction Activity, London.

3 Preqin (2014) Preqin Special Report: Infrastructure Transaction Activity, London.

examines the performance of listed infrastructure characteristics, but usually without distinguishing between different infrastructure sectors⁴. The present paper is developed as a study of two main objectives. The first objective is to verify if the investment characteristics of infrastructure are shared by all infrastructure sub-sectors i.e. ports, airports, electricity etc. The second objective is to determine whether by investing only in one infrastructure sector only, a private investor will still be able to enjoy diversification benefits.

In the first part of the work, we take as our point of departure the argument that infrastructure should be treated by investors as a separate asset class. The objectives of the paper are twofold. The first aim is to verify if the investment characteristics of infrastructure are shared by all infrastructure sub-sectors. Specifically, the paper examines the significance of European Energy and Transportation sub-sectors (e.g. ports, airports, electricity, natural gas etc.) by assessing the investment characteristics and performance of listed infrastructure indexes in Europe from 2004-2014. The investment characteristics of infrastructure sub-sectors are then compared with traditional assets such as (e.g. government bonds, real estate and stocks). The second objective is to confirm the best approach to construct a European infrastructure portfolio and determine whether the private sector will enjoy diversification benefits by investing in only one specific sector.

Data for this research is collected from the Reuters Thomson Database. We collect weekly prices of European sub-sector listed infrastructure indices for the following listed assets: Ports, Airports, Toll Roads, Natural Gas, Electricity, Fossil Fuels, Renewable Energy, Bonds (Government bonds), Real Estate and Stocks, for over a timespan of 10 years, from 2004-2014. In this way we are also able to capture and analyse the financial crisis and therefore test the robustness of infrastructure compared to other assets when macroeconomic conditions are very low. Risk free returns for the same period are collected from the Kenneth R. French - Data Library in order to calculate the Sharp Index of each asset.

In relation to the first objective, European performance analysis among assets is evaluated on three aspects. First of all, this research compares the performance of all the assets for the period 2004-2014 by calculating the annual return, average volatility and Sharp Index of each asset. Secondly, we examine the diversification benefits among listed infrastructure sub-sectors by calculating the inter-correlation among the sectors as well as with other traditional assets. Lastly, we evaluate the robustness of the infrastructure sub-sector during the crisis by calculating the annual average return, average volatility and Sharp Index of each asset during the period of the recent financial crisis Q4.2007 to Q2.2009.

In the second objective we use the GAMS modelling tool to examine how is best beneficial to construct a portfolio with infrastructure investment and evaluate the significance of including one specific infrastructure sector in traditional portfolios. We use the traditional Markowitz's mean-variance analysis in the following two portfolio scenarios:

Portfolio 1 specialises only on Energy sub-sector assets within a traditional portfolio. The assets included are European government bonds, real estate, stocks, natural gas, electricity, fossil fuels and renewable energy.

Portfolio 2 specialises only on Transport sub-sector assets within a traditional portfolio. The assets included are European government bonds, real estate, stocks, ports, airports and toll roads.

The results of the objective 1 show that Listed infrastructure sub- sectors vary widely in terms of performance. Ports and Electricity indices demonstrates the most superior performance among economic listed infrastructure sub-sectors while; Fossil Fuels and Renewable Energy demonstrates the worst performance of all the sectors. When compared with more traditional assets all listed infrastructure sub- sectors except Fossil Fuels and Renewable Energy outperform Stocks and Real Estate as indicated through a higher Sharp ratio. There are some infrastructure sub-sectors that outperform Government Bonds however; this is due to higher returns. Government bonds are less volatile than all other assets.

The claim that infrastructure has low correlation with traditional assets is confirmed partially. All infrastructure sub-sectors show diversification benefits with Government bonds. However, all infrastructure sectors have significant correlation with Stocks and Real Estate. Additionally, our inter-correlation matrix shows that there are portfolio diversification

4 Oyedele, (2013). Performance and Significance of UK listed infrastructure in a Mixed Asset Portfolio [pdf] See: http://eres.architexturez.net/system/files/pdf/eres2013_14.content.pdf

;Peng, H., and Newell, G. (2007), The Significance of Infrastructure in Investment Portfolios. Pacific Rim Real Estate Society Conference; RREEF (2007a). "Performance Characteristics of Infrastructure Investments". RREEF Research.

benefits even within one specific sector. However, our results indicate that in the Transportation sector there are greater diversification benefits than in the Energy sector. The results showed that there are low correlations between ports, airports and toll roads, indicating the presence of diversification benefits, even if specialising in a single sector, i.e., Transport.

Last but not least, when the data is contracted to the period of the financial crisis, in order to examine the robustness of infrastructure sub- sectors, it's observed that even though all assets are negatively affected by the recession; all of the infrastructure sectors were less negatively impacted than Stocks and Real Estate during the crisis.

In the second objective the results of both the European Energy and Transport sub-sector analysis indicate that specialising in one infrastructure sector within a traditional portfolio can still offer diversification benefits. In both cases constructing a portfolio of merely government bonds, stocks and real estate offered only modest diversification benefits. However, when infrastructure sub-sectors was added in the portfolio you could achieve a higher return for the same level of risk. In both the Energy and Transportation case, adding infrastructure into the portfolio boosts returns rather than lowers risk. Furthermore, the results showed that in both the Energy and Transportation sub-sector portfolios, one could still enjoy diversification benefits. In portfolio 1, the portfolio invests in the Energy sector within a traditional portfolio. The portfolio that maximises the Sharp Index invests in Government Bonds, Natural Gas and Electricity offering a modest diversification benefit of 3.5%. On the other hand, greater diversification benefits are observed in our Portfolio 2 scenario where the private investor invests only in Transportation within a traditional portfolio. The portfolio that maximises the Sharp ratio shows a diversification benefit of 15.6% and invests in Ports, Airports and Government Bonds.

The results of the performance analysis showed that each listed infrastructure sub- sector has its own historical performance. This is important since if performance of listed infrastructure sub-sectors varies significantly, this implies that good knowledge of the specific sector is required. The results of the minimum-variance portfolio analysis indicate that when the infrastructure sector is combined with other traditional assets, the portfolio often yields a Sharp ratio higher than any single asset. Nonetheless, infrastructure should not be considered as an asset on its own, but rather it is only beneficial when infrastructure assets are included as a subset of a traditional portfolio. This highlights the role of government as catalyst for resources, in particular government's vital role in attracting the private sector to invest in infrastructure. Governments need to be more active and introduce more policies to attract private sector participation if they want to observe any increases in the investments of institutional investors. Last but not least, this research showed that by specialising in one infrastructure sector only, it is still possible to obtain many diversification benefits. Thus, fund managers can specialise on an infrastructure sector and not only they will gain diversification benefits but they will be able to create deep understanding of that sector's performance and idiosyncratic risks.