Master Thesis

Are infrastructure assets experiencing a case of overvaluation, and can the asset class as a whole continue to deliver adequate risk-adjusted returns?

Analysis of the current valuation of infrastructure assets

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Abstract

Emerging from privatization programs in the United Kingdom and Australia in the 1980s, infrastructure assets has gained significant prominence as an investment opportunity, with governments across the world turning towards infrastructure and private sector investment to increase productivity and growth of their respective economies. Investors who have allocated capital to infrastructure since the onset have done well, leading to strong traction sourced from institutional investors in search of low-risk investment opportunities in the current economic context. Valuations have, overall, continued to move upward, buoyed by capital inflows and historically low-interest rates, among other value drivers. However, continued increase in valuations begs the question: is infrastructure now overvalued (meaning that the IRR does not compensate for the risks embedded in the assets or in the financial structure) or justified? The aim of this research paper is to begin by understanding infrastructure as an asset class, in order to analyze the drivers behind their rising valuations, to ultimately determine whether infrastructure assets are currently in fact overvalued and moving into a bubble-like territory, or indeed their values are rationally justified.

Introduction

Infrastructure is key to economic growth as well as social development – however, there is strong evidence that an 'infrastructure gap' exists in both the developed and developing world. Politicians around the world have responded to this pressure by promising new major improvements – with the Trump administration pledging $1 trillion of investment in roads, bridges, schools, and hospitals – to be largely funded through tax-incentivized private capital. Such commitments are mirrored around the world, with Theresa May's new UK administration sponsoring high-value investment into "infrastructure and innovation to boost productivity", Angela Merkel pledging to raise spending on roads, railways, and broadband with "no new debts", and the Chinese government setting aggressive targets to improve many key infrastructure sectors between now and 2020 (PwC).

This is coupled with a global desire to invest into infrastructure – significant amounts of capital have been made available by pension, insurance and sovereign wealth funds and, as a consequence, many owners of infrastructure assets – government and private alike – have taken advantage of the sharp rise in asset values by putting assets up for sale (PwC). As such, much of the world's infrastructure increasingly now rests in the hands of specialist private investors who have inherited it through acquisitions from governments in the form of take-private transactions (PwC). This trend of high investor appetite for private infrastructure continues to lead to record high valuations in core infrastructure segments. Investors justify paying these high valuations by praising the quality of the underlying assets and the long-term nature of infrastructure investment, a compelling argument in the continuous, low-yield environment (Lowe). However, with EBITDA multiples and debt-to-EBITDA multiples in recent deals reaching new highs, it is clear that as a result of rampant demand, the infrastructure sector may be in danger of suffering from a dual curse of overvaluation and excessive leverage – the classic symptoms of an asset bubble similar to the dot-com era. Taking to heart the following famous saying: "those who cannot remember the past are condemned to repeat it", we believe that understanding the performance and value drivers in infrastructure in the current macroeconomic context is essential to evaluate whether the infrastructure is overvalued or warranted.

The paper is structured as follows: Chapter 1 provides an overview of infrastructure as an asset class and its classification. Given the wide spectrum of investment opportunities, this chapter will also touch on the different risk/return profiles within the asset class, as well as the types of investment vehicles used to gain exposure to infrastructure. Chapter 2 focuses on the investor's standpoint, providing an overview of deal flow over the last few years, followed by an analysis on the appetite for infrastructure, from both a demand and supply perspective. Finally, Chapter 3 dives into the problematics of current infrastructure valuation, first by evaluating the performance of the asset class, followed by an analysis focused on airports, a sub-sector we deemed to be a prime target of overvaluation. This analysis with allow us to draw conclusions on our initial question: is infrastructure now overvalued or justified?

Chapter I: Overview of the infrastructure industry

1. Infrastructure as an Asset Class

Is infrastructure a type of financial asset? Over the past decade, infrastructure investments have been increasing in size and popularity, but this investment area remains relatively under-researched. While there is consensus that infrastructure is a relatively young industry compared with private equity and real estate, it is nevertheless possible to determine certain distinctive characteristics that establish its risk-return profile as an asset class and the corresponding attractiveness for investors.

1.1 Defining Infrastructure

The term 'infrastructure' typically refers to the structures that support a society, such as roads, bridges, water supply, sewers, electrical grids, telecommunications, and so forth, and can be defined as 'the physical components of interrelated systems providing commodities and services essential to enable, sustain, or enhance societal living conditions' (Fulmer). This remains a very broad and inclusive definition. From an investment standpoint, infrastructure can be defined as long-standing asset-based businesses that provide essential services, are generally costly and difficult to replace, that typically generate relatively stable cash flows that may be indexed to inflation, and incorporate many product types across geographic locations.

1.2 Asset Characteristics

As per its definition, infrastructure encompasses highly heterogeneous assets that can be categorized into several sub-sectors. However, the key factor for an investor is ultimately not the specific sector, but rather the asset's risk-return profile. This largely depends on the distinctive characteristics of the investment opportunity in question; as such, infrastructure can also be defined through the following economic and financial characteristics which are believed to be inherent to the asset class:

- **Public service:** Infrastructure assets provide essential services that support the functioning of society and the economy, such as the provision of water, energy, mobility, communications, education, security, culture or healthcare, making them a basic prerequisite for economic growth, prosperity and quality of life (Weber, 11).
- **Inelastic demand:** Owing to its indispensable nature, infrastructure assets enjoy a demand pattern that is relatively independent of macroeconomic cycles, even when prices increase (e.g. owing to inflation adjustment regulations). The demand for their services tend to be stable (i.e. subject to low volatility), generally predictable (e.g. due to long-term contracts) and consequently resilient to economic fluctuations (Weber, 11).
- **High barriers to entry:** Infrastructure assets typically require initial large-scale capital

investments which act as a strong barrier to entry that deters potential entrants from entering the market profitably. This generally translates into little or no competition. Thus, infrastructure assets enjoy a natural monopolistic or "quasi-monopolistic" market positioning (Deutsche).

- **Regulation:** Given its monopolistic advantage coupled with the essential nature of the underlying service, infrastructure assets can be subject to a high degree of regulation that inhibits them from exerting their monopoly power to charge users' excessive prices (Deutsche).
- **Inflation protection:** Infrastructure assets may provide a natural hedge against inflation because its revenues are often linked with an inflation-adjustment mechanism, such as inflation-indexed user tariffs, guaranteed yields, or any other form of contractual guarantees. Project income generated via user charges (e.g. toll roads, public utility plants) rather than availability payments is usually tied to GDP or the consumer price index (Weber, 12). However, it is important to note that for unregulated assets, full hedging may not always be possible.
- **Long Duration:** Infrastructure assets tend to be long-lived, often with service lives lasting over 100 years. When matched with appropriate commercial and/or regulatory environments, infrastructure investments can provide the preceding characteristics over a relatively long time horizon (RREEF)
- **Long-term cash flow predictability:** Infrastructure assets that possess the characteristics listed above generally have stable, predictable and in most cases inflation-adjusted long-term revenues that can survive economic downturns and cycles and support a significant credit burden (Weber, 12). The economic cycle can have more impact on unregulated services, such as airports and seaports, though the essential nature of such services mitigates this risk. As a rule of thumb when looking at different infrastructure asset types, the stronger and more predictable the regulation and contractual framework is for a certain asset, the lower its sensitivity to the economic context and the more stable its cash flows over the long-term.

Given the diversity and heterogeneity of infrastructure assets, these characteristics serve merely as a reference for potential features of an infrastructure investment. It is important to note that not all infrastructure assets will conform strictly to these characteristics. In fact, most will only meet them in part, nevertheless, they will still be considered as an infrastructure asset.

1.3 Classification of Infrastructure

Infrastructure assets can be classified according to various dimensions that are not mutually exclusive. The most common approach is in functional terms, that is, based on the uses of the facilities and the services provided by the underlying asset. Other classification approaches include the stage of asset

development, and as well based on the market conditions in which the asset is located. Overall, a distinct infrastructure opportunity needs to draw on the different elements in order to provide a relevant analysis. For example, a new social project in a mature market is very different from the privatization of an established economic project in an emerging market.

Economic and Social Infrastructure

Infrastructure assets are often divided according to the nature of the underlying service it provides: between economic and social infrastructure. Economic infrastructure assets are typically involved in the transportation and circulation of goods and essential commodities, as well as people and information. Social infrastructure assets provide structures for services society needs, including hospitals, schools, and other government buildings (Af2i & JPM).

Economic Infrastructure			Social Infrastructure
Transport	**Utilities**	**Other**	
Bridges Toll Roads Tunnels Airports Seaports Freight Rail	Gas Networks Electricity Networks Power Generation Water & Sewage Renewable Energy Communications Infrastructure	Parking Garages Storage Facilities	Educational Facilities Healthcare Facilities Correctional Facilities Public Transportation

Table 1.1 : *Classification of Infrastructure Assets*

Source: RREEF Research

From an investment perspective, social infrastructure tends to have lower risk-return profile as a result of its availability based model, which could limit the upside captured through user charge models. Such assets have traditionally been developed, owned, operated and funded by national or local governments but we currently see more asset managers investing in this sub-sector for diversification purposes.

In contrast, economic infrastructure presents more steady revenue streams through user fees, tolling, or ticketing, and thus a wider range of opportunities for private sector participation (Deutsche).

As this asset class is vast, this paper will consider only the latter – assets whose financing and operation involve private parties. Therefore, assets financed, owned and operated solely by public authorities are excluded from further analysis.

Greenfield and Brownfield Infrastructure

A distinction can be made based on different development stages, that is, greenfield versus brownfield assets, otherwise known as 'project development and operational assets' or primary and secondary projects respectively (Weber, 21). The term greenfield refers to new infrastructure that is constructed

for the first time and consequently will require all project phases including planning, development, construction, and the financing stage. In contrast, brownfield assets are already constructed with a history of operation that can provide sound visibility into revenue, usage rates and operating costs (depending on the infrastructure sub-sector's underlying features and the inherent characteristics of the project itself). These projects may involve the reconstruction, renovation or expansion of existing assets.

Brownfield assets in good condition with long-term contracts will ideally offer stable, predictable cash yield immediately after acquisition in the form of dividends or interest payments in a similar way to real-estate or fixed-income products (Weber, 22); as a result, they tend to be particularly suitable for yield-driven investors. Greenfield assets that have yet to go through the development phase are subject to additional risks, such as construction risk and ramp-up risk, and therefore require higher returns to compensate for this risk (JPM). Additionally, greenfield projects do not generally return a project on their investments in the first years of the development and construction phase, with the initial capital only returned when the respective facility is operative, resulting in a so-called J-curve, which is typical of cash flows from private equity investments. Such assets are more appropriate for capital-gain or growth-style investors who are prepared to take additional risk (Weber, 22).

Mature and Emerging markets

Another way to classify the broad opportunity set is to employ a geographic lens. As demand for and type of infrastructure varies across regions, a distinction can be made between infrastructure assets located in mature markets and those located in emerging markets. In developed countries where the population is mature and slow-growing, it is the combination of aging systems and deferred maintenance that predominantly drives the demand for infrastructure. By contrast, developing economies need new infrastructure to support their fast-growing populations and help increase productivity (Af2i & JPM). For instance, Asia has a high proportion of greenfield projects, as emerging economies require more new construction than do most mature OECD countries. It is important to note that investments in infrastructure in non-OECD countries are generally considered riskier, principally due to a legal, regulatory and political environment that poses a higher risk of uncertainty than within OECD countries. This is especially the case in jurisdictions with relatively shorter regulatory histories, where regulatory decisions may be inconsistent (JPM).

2. Risk-return profiles of infrastructure investments

2.1 Risk-return spectrum

As discussed in the previous section, whilst the infrastructure asset class is generally defensive in nature, the extremely broad range of assets means that the risk exposure varies significantly across sub-sectors, development stages, and geographies. Alike any asset, the expected return of an infrastructure

asset is related to its corresponding risk exposure. For example, some sub-sectors such as social infrastructure, which includes hospitals and schools, tend to have lower risk exposure and lower returns. Similarly, greenfield assets have a typically higher risk exposure and expected return than brownfield assets (McKinsey). As such, it is difficult to draw general conclusions about the investment profile of infrastructure investments without making a precise differentiation between the various possible investment types.

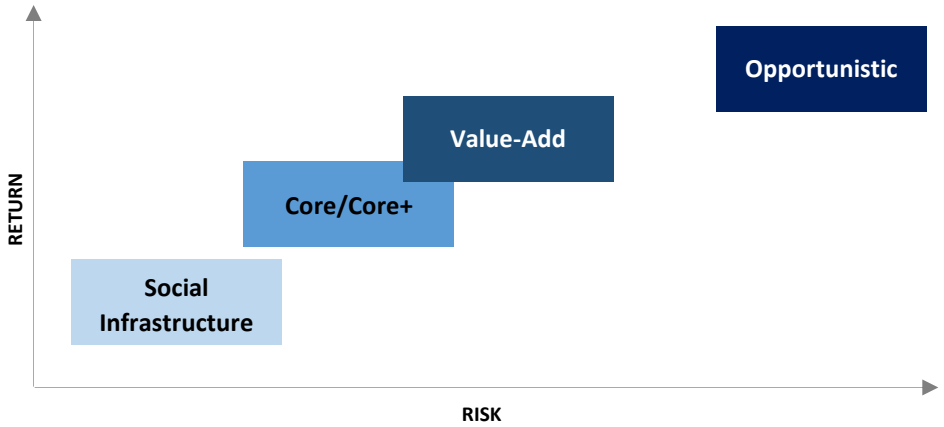

Figure 1.1: *Risk & Return across the infrastructure spectrum*

Source: BlackRock, February 2015

- ***Social infrastructure*** – refers to facilities and structures that are built to support communities, including hospitals, schools and education infrastructure. While traditionally under the jurisdiction of public authorities, there has been an active use of the Public-Private Partnership (PPP) model for new projects. In this model, the role of government is essentially transformed from that of project developer who retains and manages the risks of the construction, delivery, and operation and maintenance of a facility, to that of the long-term purchaser of the services provided by the project sponsors who are contracted to build and maintain the facility. Under this model, the government agency provides an availability-based payment in return for the facility being made available for public use (Grossman).
- ***Core assets*** – these assets are relatively stable in nature and often have high barriers to entry. As such, core infrastructure assets tend to be mature assets carrying low risk and providing most of their return through a healthy yield. Assets that fall under this category are usually strongly regulated utilities, businesses which provide essential services such as water supply, sewerage, electricity or other types of energy. These types of utilities tend to be regulated across most jurisdictions because of their essential importance to daily commerce and life and pricing is often set by the regulator. Performance of regulated utilities tends to be relatively resilient, regardless of the ups and downs of the economy, due to the essential nature of the services they provide. Core-plus assets may also be non-regulated, although they are much

more susceptible to demand risk. Assets that fall under this latter category tend to be transportation assets (Blackrock).

- ***Value-added*** – these types of assets reside higher on the risk/return spectrum and can range from less mature operating assets to greenfield or are operating in unregulated industries or markets. These higher risks are justified by the higher return targets these assets seek to generate through both yield and capital appreciation (Grossman).
- ***Opportunistic*** – these assets lie on the highest end of the risk/return spectrum, as they are subject to significant risk, notably demand-risk given their unregulated nature. This can include uncontracted merchant power generation, transportation asset with no history, some telecom investments or large greenfield projects. It also encompasses assets in growth or emerging markets, assets where the investment case relies heavily on the growth of the local economy (Blackrock).

Focus on Core Infrastructure

We have noted that infrastructure is an expansive asset class, covering a wide span in the risk-return spectrum. The risk, return, and cash flow expectations vary on multiple dimensions such as an asset's maturity, service area demographics, regulatory and political risks. As noted earlier, a core infrastructure asset occupies the lower end of the risk/return spectrum and can be characterized as an infrastructure asset for which the cash flows to equity owners is forecastable with a low margin of error. In that regard, core infrastructure consists of assets that are (i) mature beyond their demand ramp-up phases, (ii) functioning in established and transparent regulatory and political environments, (iii) serving demographically and economically sound service areas, and (iv) long-lived with minimal obsolescence or technology risks. Regulated utilities, energy assets with long-term contracts, and transportation assets with long-term concession agreements in the OECD economies can be defined as core assets, as long as they have the characteristics stated above (JPM).

In order to narrow the scope and form relevancy in our analysis, this paper will here on forward focus on core infrastructure.

2.2 Target Returns

What return can investors expect from core infrastructure investments and at what risk? As discussed earlier, the available data is still poor and history can offer little guidance. The following table, published by J.P. Morgan, depicts the illustrative returns of core infrastructure assets based on based on historical data and expectations.

Sector	Relative risk assessment	Avg. cash yield	Avg. expected return	Capital appreciation potential
Social infrastructure/PPPs	Low	4-5%	5-8%	Low
Contracted power generation	Low	5-8%	6-10%	Low
Regulated utilities	Low-medium	4-7%	8-10%	Low-medium
Toll roads	Low-medium	4-6%	8-12%	Low-medium
Airports	Medium	5-7%	10-15%	Medium
Seaports	Medium	5-7%	11-16%	Medium
Freight rail	Medium-high	6-8%	12-16%	Medium-high
Telecommunication infrastructure	High	5-9%	12-18%	High
Merchant power generation	High	0-4%	14-20%	High

Table 1.2: *Illustrative Returns for Core Infrastructure Assets*

Source: J.P. Morgan Asset Management, March 2015

3. Infrastructure investments

Infrastructure investments have gained much interest among investors given its potential to generate attractive and inflation-hedged total returns. As infrastructure financing increasingly moves towards private hands, investment opportunities in the asset class will continue to increase.

3.1 Private Sector Involvement in Infrastructure

Given the inherent public good nature of infrastructure, assets and projects have traditionally been within the purview of government ownership and public finance. However, public deficits, increased public debt to GDP ratios, and at times, the inability of the public sector to deliver efficient investment spending and optimal allocation of resources due to political interferences, have led to a reconsideration of the role of the state in infrastructure provision. This has shifted the role of the state to evolve from being owner and provider of public services to purchaser and regulator of them. The private sector comes in as financier and manager of infrastructure expecting attractive returns. Consequently, there has been a strong reduction of public capital committed to infrastructure (OECD). In fact, the OECD average ratio of capital spent in fixed investments to GDP fell from, above 4% in 1980 to approximately 3% in 2005.

As the share of government investment in infrastructures has declined, that of the private sector has increased, with privatizations being an important driver. Since the 1980s more than USD$1 trillion of assets have been privatized in OECD countries, with close to two-thirds of that accounted for by infrastructures, notably utilities, transport, telecommunications and oil facilities.

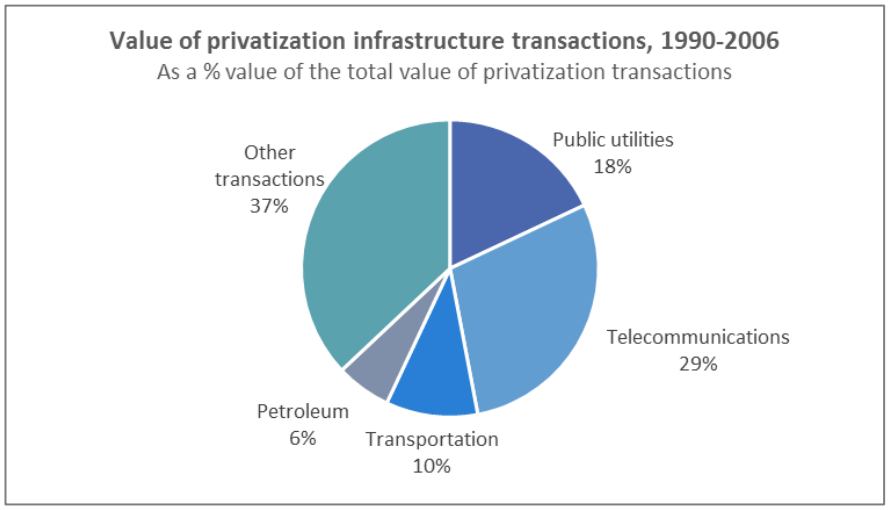

Figure 1.2: *Value of privatization infrastructure transactions, 1990-2006*

Source: *Infrastructure to 2030*, OECD

New business models with private sector participation, most notably PPPs and its variants have been increasingly used particularly in OECD countries, offering further scope for unlocking private sector capital and expertise.

Private sector participation has been characterized by the rise of institutional investors, with the likes of pension funds, insurance companies and sovereign wealth funds taking center stage. The emergence of such private institutional investors in infrastructure has been in response to a number of dynamic influences, including low-yield environment, heightened volatility and muted performance of equity markets.

Infrastructure investments are attractive to institutional investors such as pension funds and insurers as they can assist with liability-driven investments and provide duration hedging. These investments are expected to generate attractive yields in excess of those obtained in the fixed income market but with potentially higher volatility. Infrastructure projects are long-term investments that could match the long duration of pension liabilities. In addition, infrastructure assets linked to inflation could hedge pension funds liabilities' sensibility to increasing inflation. It is now widely agreed that large institutional investors with long-term liabilities and a low-risk appetite are natural investors in less liquid, long-term infrastructure assets.

3.2 Infrastructure gap

Shifting infrastructure financing from the public to the private sector poses important challenges. First, the amount of money needed to fill the infrastructure gap is far from being negligible. Second, financial markets and intermediaries are required to play an important role in shaping financial contracts and financial solutions able to attract the highest number of investors (OECD).

Infrastructure funding gap

As mentioned before, significant demand for investments in infrastructure exists because the underlying assets are considered as growth drivers for any economy. Although governments are responsible for investments in new and existing infrastructure assets, the combination of economic upturn, insufficient investment in these sectors and the inadequate, even most basic, maintenance of existing aging facilities over the past decades have led to a considerable imbalance between supply and demand when it comes to infrastructure assets. This has been exacerbated by population growth and an increased demand for constructing, modernizing or replacing existing assets, which in turn leads to higher costs. Data provided by different sources agree on the overall investment shortfall. For example, the OECD and McKinsey quantify the total global infrastructure investment requirements by 2030 for transport, electricity generation, transmission and distribution, water and telecommunications is about $57-67tn and $71tn respectively. The European Commission estimates that, by 2020, Europe will need between €1.5tn and €2tn of infrastructure investments (OECD). In the United States, the American Society of Civil Engineers (2013) quantifies a total current infrastructure investment gap of $1.7tn and a need for additional investments of about $3.6tn by the end of 2020.

3.3 Investment vehicles

In order to meet the demand for investments in infrastructure, different investment vehicles have been engineered in order widen the net to attract investors; hence there is an increasing, and sometimes overlapping, variety of investment vehicles available for infrastructure assets. How exactly does one obtain exposure to infrastructure? It is particularly important to distinguish between listed and unlisted investment vehicles, and direct and indirect investments. The following matrix summarizes the most common forms of infrastructure investment grouped into categories listed/unlisted, and direct/indirect. It also shows schematically the exposure to different risks associated with them:

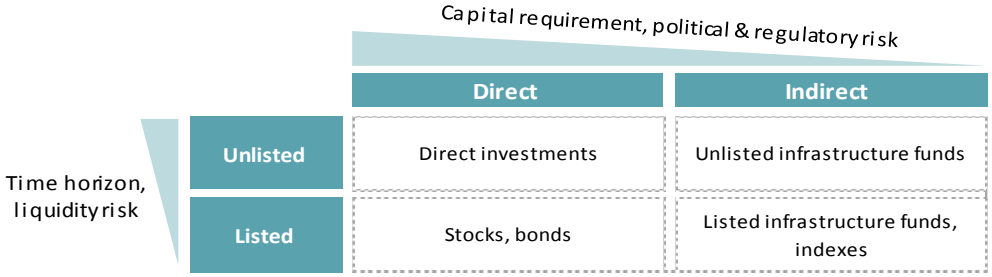

Figure 1.3: *Matrix of most common forms of infrastructure investment*

Source: *Investing in Infrastructure*, CAIA

The three primary methods of gaining exposure to infrastructure assets are:

Direct or co-investments in unlisted infrastructure companies/projects: this form of investment in infrastructure assets is the purest form of exposure. It typically requires significant amounts of capital

for a single purchase and hence often viable for only the largest of investors. The main advantage of a direct investment is control; to this end, an expertise to efficiently manage the asset is essential. Due to its size and hands-on nature, most direct investments will not be adequately diversified across a large number of assets, subjecting the investor to high investment-specific risk and little flexibility in terms of liquidity. This can be done through either leading or co-investing with partners in a particular asset. This approach can also be implemented by entering into a separately managed account with an experienced asset manager (Grossman).

Indirect investments via unlisted funds: This form of investment follow closely a private equity fund model. A limited partnership with a fixed term where capital commitments are drawn down by the manager over the investment period of the fund. Following capital deployment, the manager will attempt to create gains through sale or adopt a buy-and-hold strategy. A qualified fund manager sources infrastructure assets and enhances risk-adjusted returns for the fund's investors in return for annual management fees and a performance fee. This approach is typically the most costly method to access the infrastructure space. However, it does not require a large in-house team of infrastructure investment professionals (as would be required by direct investments). Also, the pooling of money from multiple investors should lead to a more diversified portfolio of infrastructure assets with smaller capital requirements per investors. Liquidity issues remain, although to a lower extent than in the context of direct infrastructure investments (Grossman).

this form of investment refers to a collection of publicly traded stocks and/or debt of companies whose businesses are directly related to infrastructure assets. Listed infrastructure vehicles also refer to the option of investing in investment funds which bundle several individual infrastructure assets and/or companies or debt. The primary advantages of listed infrastructure vehicles are (i) they are traded on an exchange, (ii) they are liquid, and (iii) they have extensive financial reporting requirements regulated by the various stock exchange (NBIM).

In general, listed infrastructure investment opportunities can gain greater diversification through investment across sectors and geographies, but also through the entire value chain, including project developers, building contractors, operators, suppliers, customers, utilities (Weber, 69). This approach is ideal for investors with significant liquidity requirements. While this is the lowest cost approach, these investments are subject to public market volatility and have the highest correlation to equity markets.

The Rise of Direct Infrastructure Investment

The unlisted infrastructure fund model has, almost by default, become the primary route to market for most investors over the past decade. However, as many of the larger and more sophisticated infrastructure investors look to grow their portfolios, there is a developing trend away from unlisted funds and towards direct investment strategies. These investors are turning to direct investments in order to gain closer control over the assets held in their portfolios, as well as to bypass paying high

management fees. It also allows assets to be held more easily over the long term rather than being restricted to the lifespan of an infrastructure fund. Many of the most significant infrastructure investors i.e. pension funds, now pursue direct investment opportunities (Preqin). Nevertheless, direct investment requires significant internal resources and capital available to invest, which is not an option for the vast majority of institutional investors. For an investor, the most feasible approach depends on the investor's strategy, liquidity requirements, budget, size, and experience of the in-house investment team (in the case of an institutional investor).

4. Performance of infrastructure investments

4.1 Yield-driven versus IRR-driven investors

When making infrastructure equity investments, investors generally pursue one of two financial objectives, or a combination of the two: 1) ensuring a stable, high level of current income (yield) and/or 2) ensuring the greatest possible return on equity. To this end, a distinction can be made between primarily yield-driven and IRR-driven investors (Weber, 22). As such, the Internal Rate of Return (IRR) and cash yield remain the key indicators LPs look to when assessing the performance of infrastructure funds. The weighting given to each of these differs by the type of LP investor. For example, pension fund LPs may be more focused on cash yield in order to service long-dated liabilities, while insurance company LPs will place a stronger emphasis on IRR, as they are generally required to market their investments (Deloitte).

4.2 Lack of data for unlisted infrastructure

Data available for unlisted infrastructure's performance and volatility have historically been limited for several reasons. First, investment statistics are usually proprietary and investment managers tend to not disclose it. Due to this lack of transparency, it is extremely difficult to find proper performance data of unlisted infrastructure. Moreover, unlisted infrastructure investments present a relatively short track history due to its status as a young asset class. This is accentuated by the heterogeneity of the industry, made up of a large number of subsectors each with rather unique profiles and performances, making it very difficult to compare the assets on an aggregate fund level (Weber, 34). Consequently, very few data have been collected and established to date, again owing to the still relatively short history of unlisted infrastructure investments and investment vehicles (Wiley, 34). Moreover, it is also important to note that there is limited performance data available for the industry also because very few funds have completed a full investment cycle.

4.3 Structuring a benchmark

A benchmark can be defined as the relevant market with which the performance of an investment is compared (Wiley, 40); accordingly, investors use benchmarks to compare the financial performance of

their investments with the market. Typically, a financial benchmark is an index of similar securities. In the case of listed infrastructure assets, the indices in the following table may serve as suitable benchmarks for investors depending on their specific investments.

Listed Indices	Period	Region
Dow Jones Brookfield Global Infrastructure Index	2003-2014	Global
Macquarie Global Infrastructure Index	2002-2014	Global
MSCI World Infrastructure Index	2000-2014	Global
S&P Global Infrastructure Index	1998-2014	Global
S&P Emerging Mkt Infrastructure NTR	2001-2014	Emerging markets
UBS Global Infrastructure & Utilities 50-50 Index	2002-2012	Global

Table 1.3: *Main infrastructure benchmarks*

Source: Weber, *48*

Listed infrastructure indices are essentially equity market sector indices. Looking at historical performance, they generally show superior performance over equity markets prior to the financial crisis, while the performance wanes in later years. As seen in the chart below, generally, they display high correlation with equity indices, with negatively skewed and fat tail returns. However, their applicability to unlisted infrastructure investment is limited. Historically, performance analysis of unlisted funds has generally been limited to Australian funds (Inderst).

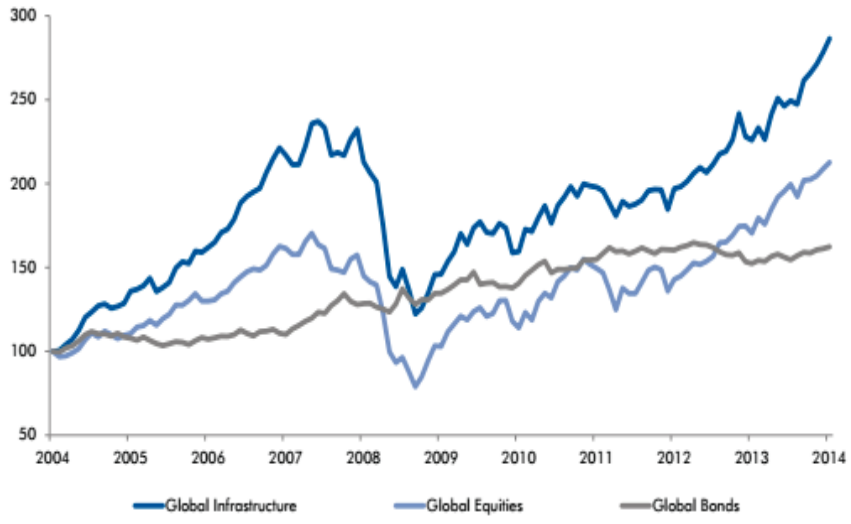

Figure 1.4: *Historical Returns vs. Global Equities and Bonds (cumulative, USD)*

Source: Bloomberg, UBS Global Infrastructure & Utilities 50-50 Index, J.P. Morgan Global Bond, MSCI World Equity Index

For unlisted infrastructure, there is not currently a standard global infrastructure Index commonly used, although data collectors such as Preqin or IPD have developed proprietary indices. Hence, when unlisted infrastructure is concerned, there is also the possibility of using a selected benchmark based on goals of the investor. Given its distinctive characteristics as an asset class discussed in the previous

section, investors use infrastructure for a variety of different roles in portfolio management, therefore different types of benchmarks based on such performance goals can be structured. Unsurprisingly, different strategic approaches necessitate different benchmarks, this means there is no single 'right' way to benchmark the asset class. A simple, straightforward approach is benchmarking infrastructure investments against absolute return expectations and/or inflation, usually CPI, plus a margin (AMP Capital [1]). More sophisticated approaches also exist that considers overall asset allocation goals, investment strategy, risk profiles of underlying assets, performance expectations, etc., when specifying a benchmark (Weber, 44). These can include:

- Real estate (index) + margin
- Bond yield + margin
- Peer group
- Listed infrastructure + margin
- Inflation plus risk premium
- Hybrid approaches

The variety of benchmarks used reflects not only the lack of long–term time series data for the asset class, but more particularly the different roles infrastructure can be expected to play in portfolio management. Unsurprisingly, different strategic approaches necessitate different benchmarks. Despite the differences, there does appear to be a consensus among institutional investors that infrastructure fits somewhere between regular equities and fixed income on the risk-reward spectrum (AMP Capital).

4.4 Listed versus unlisted infrastructure

As discuss earlier, unlisted assets are investments that are not listed on the stock exchange. They can include direct infrastructure (roads, power grids and airports) and private equity infrastructure funds. Listed assets, on the other hand are valued daily by the stock market, while the values of unlisted assets are based on the underlying value of the asset. Listed assets tend to perform very differently their unlisted counterparts, as they are affected my market sentiment which can be very volatile. Therefore, although the underlying returns of listed and unlisted infrastructure can be expected to converge over the medium term, over the shorter term there are structural differences relating to liquidity and volatility. These differences can be summarized in the table below:

	Listed	Unlisted
Geographic Diversity	Very high	Low
Asset Diversity	Very high	Low
Liquidity	Very high	Low
Daily Valuations	Yes	No
Control	Low	Low to Very High
Volatility of valuation	High	Low
Transaction cost	Low	High
Portfolio Turnover	High	Low
Investment horizon	Medium term (~5 years)	Long Term (~10 years)

Table 1.4: *Characteristics of listed and unlisted infrastructure*

Source: AMP Capital

These distinctions between listed and unlisted assets give rise to variation in their respective performance returns and volatility. We can observe this by looking at the infrastructure assets in Australia – where the asset class it's the most mature and developed and with the best data. We looked at how returns of the S&P/ASX 300 (a Total Return Index), fluctuates compared to an Unlisted Infrastructure Fund - the Mercer Unlisted Infrastructure Fund, between the years 2001-2012.

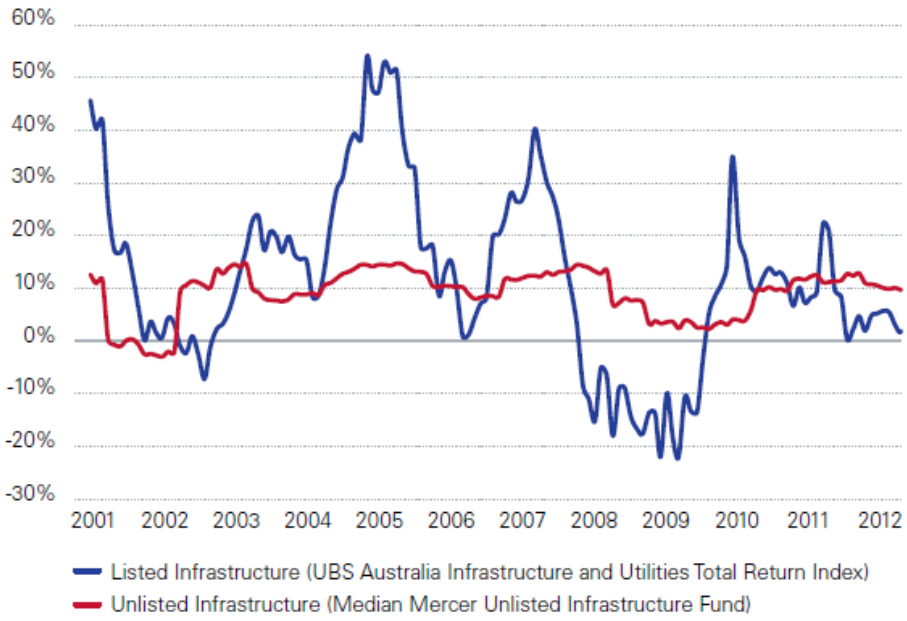

Figure 1.5: *Rolling 12-month returns from listed and unlisted Australian infrastructure*

Source: *Fact sheet*, AustralianSuper

The chart shows there is a high level of variability in the returns of the listed infrastructure, while unlisted infrastructure tends to be much less volatile and far more stable in the investment returns they provide. The resilience of unlisted infrastructure is especially noted during the period of the financial crisis of 2008.

Other academic and industry sources also reflect the same trend. We can note in the table below that unlisted funds carry a lower annual return with lower volatility, while listed funds tend to have higher returns in return for greater volatility.

Type	Source	Institution/Author/Index	Period	Region	Annual Return (%)	Volatility (%std.dev)
Unlisted Funds	Academic	Peng and Newell (2007)	1995-2006	Australia	14.1	5.8
		Finkenzeller, Dechant and Shepherd (2010)	1994-2009	Australia	8.2	3.8
		Hartigan, Prasad and De Francesco (2011)	1998-2008	UK	6.5	n/a
		Newell, Peng and De Francesco (2011)	1995-2009	Australia	14.1	6.5
	Industry	Macquarie	1995-2002	Australia	19.2	n/a
		Colonial First State	1996-2006	Australia	13.5	n/a
		Colonial First State	2001-2010	Australia	11.0	n/a
		Mercer/CFS	1995-2013	Australia	11.8	5.9
		J.P. Morgan	1995-2014	Global	7.0	7.5
Listed Funds	Academic	Peng and Newell	1995-2006	Australia	22.5	7.9
	Industry	Duet Group	2004-2014	Australia/NZ	10.7	29.4
		Cohen & Steers Infrastructure Fund	2004-2014	Global	9.6	26.4
		Lazard Global Listed Infrastructure Fund	2005-2014	Global	11.1	14.8
		Macquarie Infrastructure Corporation	2004-2014	Korea	15.0	63.5
		Macquarie Korea Infrastructure Fund	2002-2014	Korea	7.5	18.7

Table 1.5: *Return and volatility of listed vs. unlisted funds*

Source: Weber, 35

Notably, Peng and Newell (2007) were among the first in the academic field to solidly, comparatively analyze listed and unlisted infrastructure investments in Australia. Over a period of 10 years (1995–2006), they compared the risk-adjusted performance of 16 listed infrastructure companies (with assets of A$55 billion), 16 listed infrastructure funds (with assets of A$27 billion) and 19 unlisted funds (with 144 infrastructure assets of A$4.5 billion). They found that for listed infrastructure the average return was 22.5% and the volatility was 7.9%, which compared to a 14.1% return and a 5.8% volatility for unlisted infrastructure (Weber, 36).

Chapter II: Appetite for infrastructure assets

1. Deal flow within the infrastructure asset class

The following analysis on trends and development within the infrastructure asset class is largely based on data provided by Preqin's Infrastructure Report.

In terms of deal volume, the number and aggregate value of infrastructure deals remained resilient throughout 2016. This follows a period of growth where investment in global infrastructure assets increased from $177bn in 2009 to a record of $413bn in 2016. Yet, the number of deals has held relatively steady since 2013, suggesting that there is a "surplus of money chasing too few projects". The demand for infrastructure has increased over the last decade, resulting in greater competition for assets – especially brownfield assets located in mature economies that are already generating stable revenues (Preqin). It is therefore consequential that asset valuation and average deal size has continued to rise, with the latter growing to a record $364m in 2016.

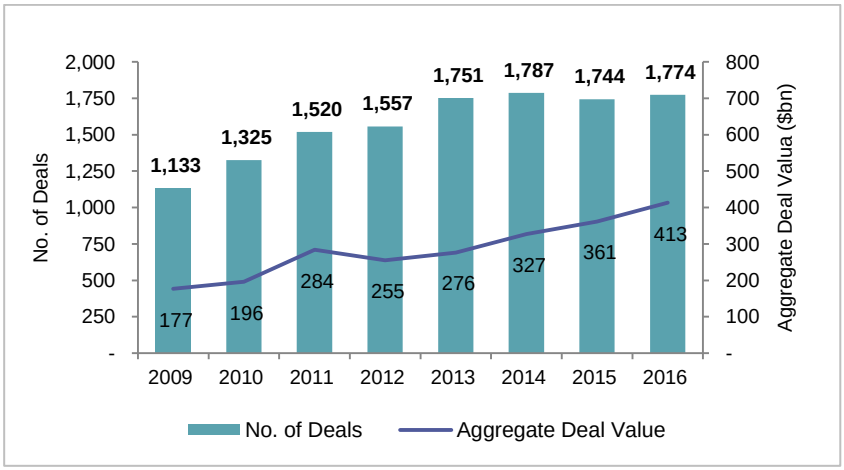

Figure 2.1: *Number and Aggregate Value of Infrastructure Deals Completed Globally, 2009-2016*

Source: Preqin Infrastructure Online

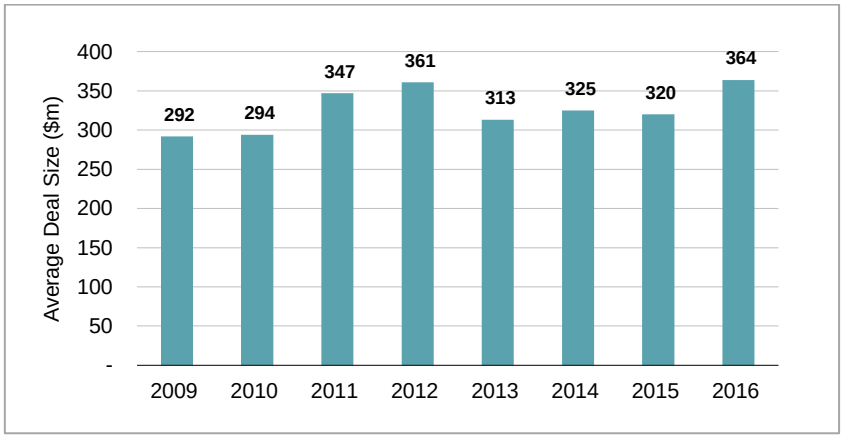

Figure 2.2: Average Annual Infrastructure Deal Size, 2009-2016

Source: Preqin Infrastructure Online

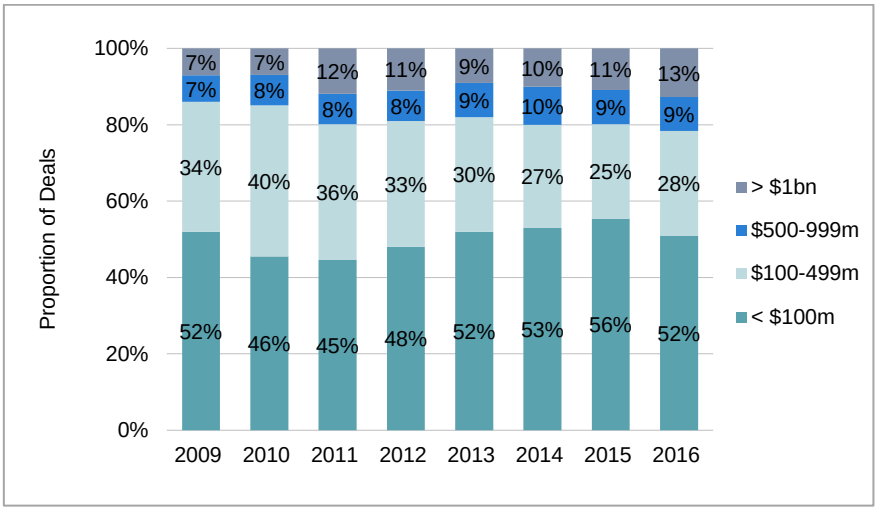

Figure 2.3: *Infrastructure Deals by Transaction Value, 2009-2016*

Source: Preqin Infrastructure Online

The growth in asset valuation and average deal size is reflected in the rising proportion of deals falling into the larger size categories – it can be observed that deals completed for $500m or more accounted for a growing proportion of transactions between 2009 and 2014. More recently, this proportion has remained relatively steady at 20% in both 2014 and 2015, and 21% in 2016. Deals over $1bn in size represented 13% of completed deals in 2016, up from 11% in 2015 (Prequin).

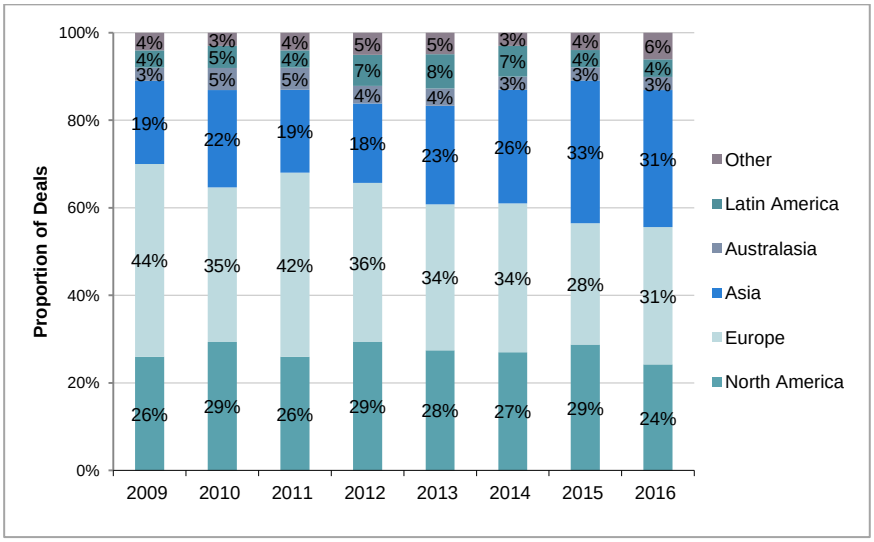

Figure 2.4: *Infrastructure Deals by Region, 2009-2016*

Source: Preqin Infrastructure Online

In terms of deal activity by region, Asia's share of global infrastructure deals has increased substantially from over the years, reaching an all-time high of 33% in 2015, and dipping to 31% in 2016; this is still up from just 19% back in 2009. Europe accounted for the same proportion of deals as

Asia in 2016. While Europe's solid history of private sector investment and relatively stable political and economic landscape has propelled the infrastructure industry, a crowded and competitive market has driven asset prices higher and forced some investors to look for alternative investment opportunities. The result has been a gradual decline in deal activity in the region as a proportion of global deal activity. Similarly, North America has experienced a decline in their share of total infrastructure deals, falling to 24% in 2016, its lowest level since 2009 (Preqin). The proportion of deal activity focused on the rest of the world remained relatively constant in 2016.

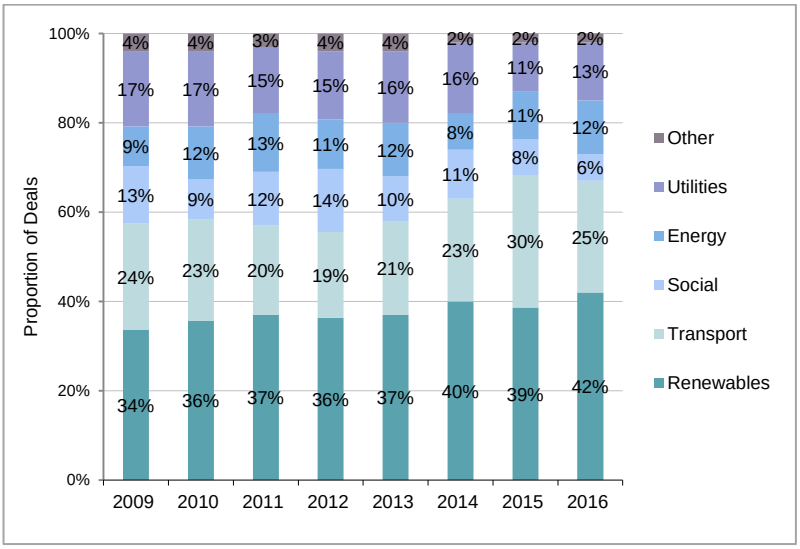

Figure 2.5: *Infrastructure Deals by Industry, 2009-2016*

Source: Preqin Infrastructure Online

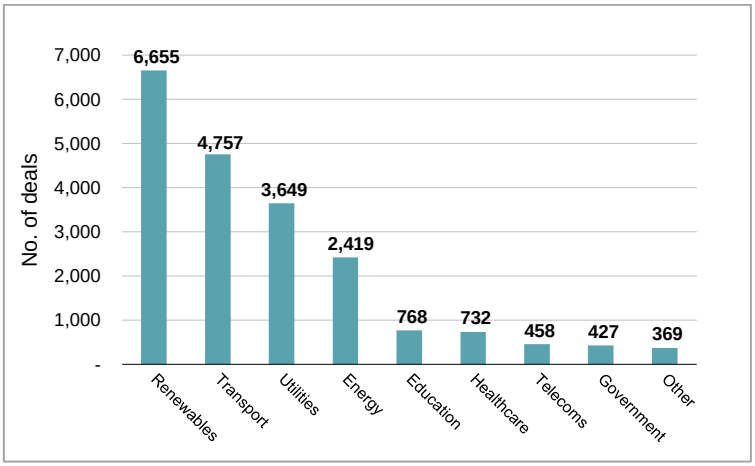

Figure 2.6: *Number of Private Asset Transactions by Industry, All Time*

Source: Preqin Infrastructure Online

In terms of deal activity by industry, core infrastructure industries, including renewables energy, transport, energy and utilities, continue to be popular with investors targeting the asset class. In fact, they accounted for 86% of deals completed in 2016. Renewable energy maintains its first position

accounting for 42% of all deals completed in 2016, up from only 34% in 2009. This is largely due to the global push towards alternative energy sources that has continued to increase demand for capital in the renewable energy market. The popularity of renewable energy assets is further noted by looking at the distribution of private sector infrastructure transactions by industry on an all-time basis. Note that renewable energy has the largest number of assets, at 6,655, which accounts for 33% of the total, followed by transport and utilities.

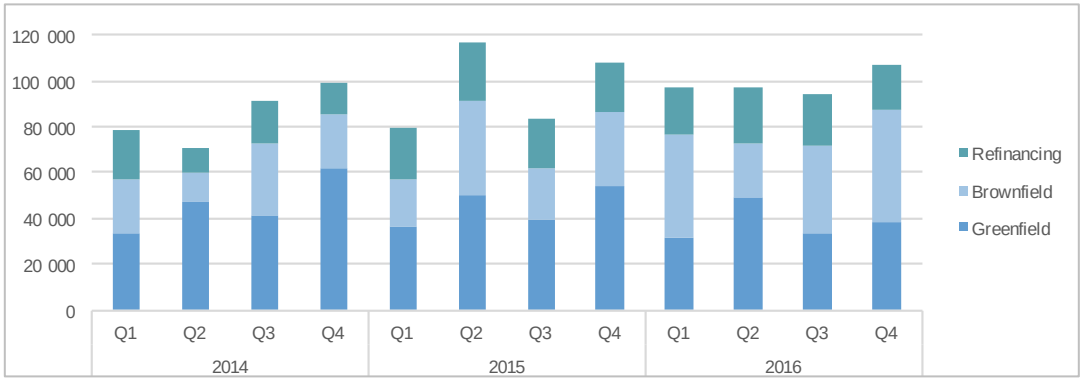

Figure 2.7: *Global Infrastructure Volumes by Project Stage, 2014 - 2016 (USDm*)

Source: InfraDeals League Table

In terms of deal activity by project stage, we note that institutional investors and fund managers tend to favour mature and established infrastructure assets i.e. brownfield assets, as they are less willing to be exposed to construction risk associated with greenfield assets. Consequently, we can observe that brownfield assets and refinancing deals have accounted for the vast majority of completed transactions over the period of 2014-2016.

2. Evolution of the investors universe

With the emergence of infrastructure investments as a separate asset class, the infrastructure market is currently experiencing many changes, notably in terms of dedicated allocations, followed strategies (co-investments, direct investments, etc.) and geographies selection.

2.1 Assets under Management (AuM) and Dry Powder

The evolution of the infrastructure AuM since 2005 as shown in Figure 2.8, clearly shows the growth in this new industry. As of H1 2015, the allocation to infrastructure as an asset class has reached c.$309bn of AuM, of which $201bn was held by companies as unrealized value in infrastructure assets and the remaining, $108bn, as dry powder (the capital committed to funds that have not yet been called up by fund managers). North America accounts for the largest proportion of global infrastructure AuM followed by Europe and Asia.

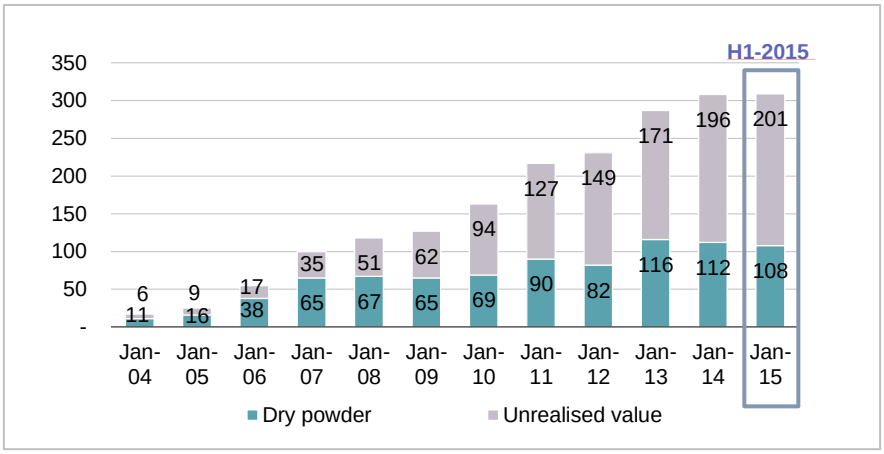

Figure 2.8: *Unlisted infrastructure AuM (Dec, 2004-Jun, 2015)*

Source: Preqin Infrastructure Online

Despite the rising Dry powder, its level is not symmetrically split between regions; funds focusing on North American investments have experienced a significant increase in Dry Powder: from $1bn at end 2014 up to $53bn by 2015. Although the figure for other regions are less important, they contribute to the overall growth of the infrastructure industry.

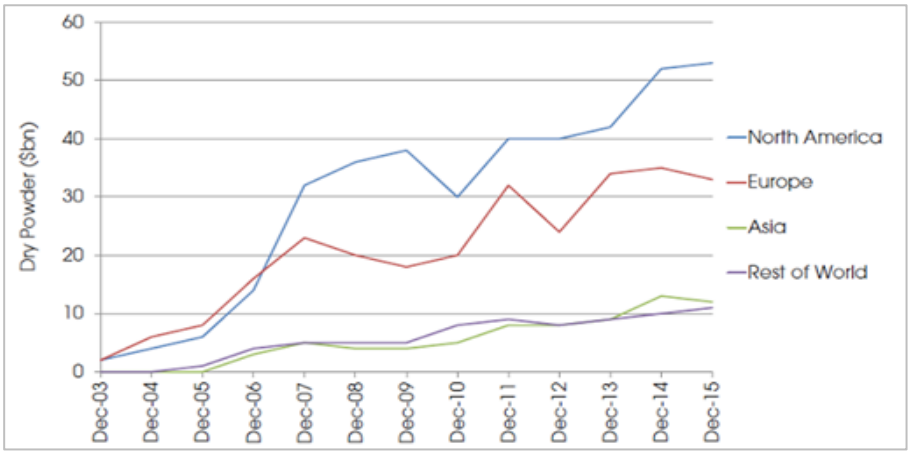

Figure 2.9: *Unlisted infrastructure dry-powder by primary geographic focus (Dec, 2003-Dec, 2015)*

Source: Preqin Infrastructure Online

2.2 Investors' allocations to Infrastructure

Investors allocations to infrastructure assets have increased in the last years, as shown in Figure 2.10, compared to historical levels. This trend witnesses the rising prominence of this real asset class among investment portfolios (as a percentage of AuM) and other alternative investments.

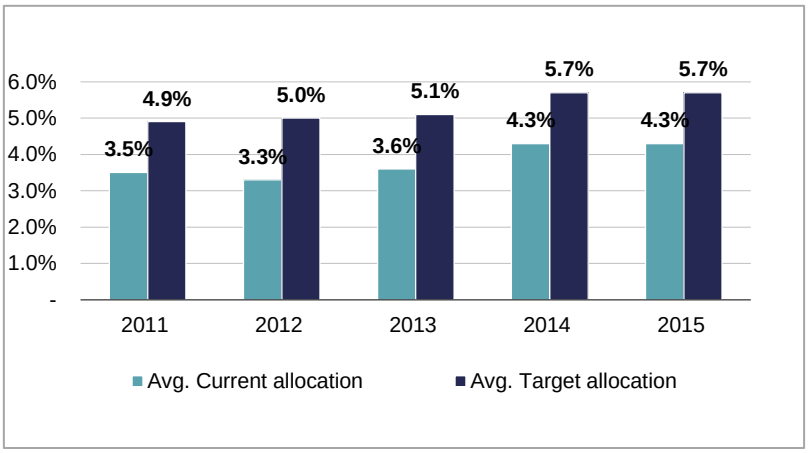

Figure 2.10: Average allocation to infrastructure as % of AuM (Dec, 2011-Dec, 2015)

Source: Preqin Infrastructure Online

However, the allocations and the degree of exposure to these assets vary depending on the type of investors (Figure 2.11). For instance, Superannuation schemes (based in Australia) have the highest average allocation (current and target) to infrastructure given the more dated history of this asset class in Australia and the expertise of the asset managers.

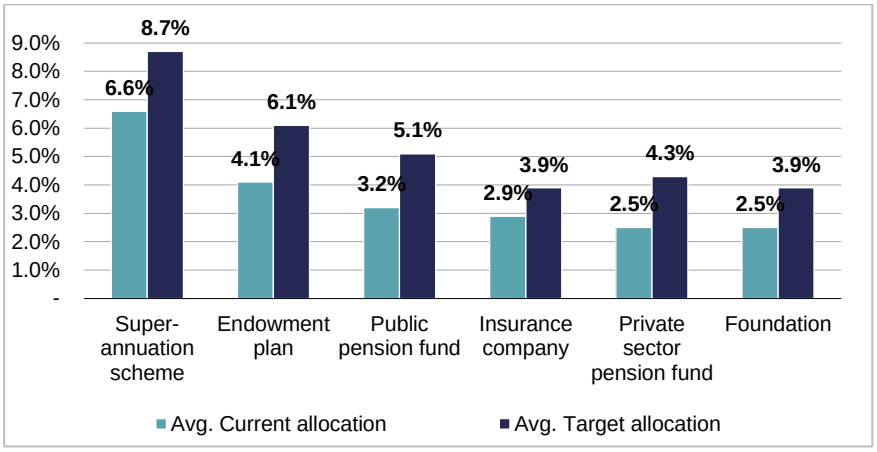

Figure 2.11: *Average allocation to infrastructure by type of investor*

Source: Preqin Infrastructure Online

According to Preqin, as of end 2015, 63% of investors are below their long-term target weighting to the infrastructure asset class. The gap is expected to be filled in the next years by investing additional capital in the industry in order for investors to match their strategic targets. Further, it is expected that 52% of the investors will increase their investments in infrastructure in the long-term reflective of the increasing recognition of the potential of infrastructure assets to generate stable cash flows matching investors requirements.

Evolution of Limited Partners (LPs) panel

An increasing number of investors has shown interest for infrastructure investments in the last years; according to Preqin, over 2,600 institutional investors worldwide are investing or intend to invest in infrastructure assets over the next years. This figure might seem very low in absolute terms compared to investors in the alternative investments sphere, such as private equity or real assets (excluding infrastructure assets), but this is due to the recent development of this asset class, which did not explicitly exist before 2005. However, the exposure to these assets is increasing on a yearly basis as demonstrated above.

This emergent appetite for infrastructure investments is the result of a combination of factors/ characteristics that made these investments an adequate match for investors' requirements in the current macroeconomic environment.

Nevertheless, we can observe a significant variation in appetite from different types of investors. Over the last years, pension funds have demonstrated the greatest appetite for infrastructure investments (circa 33%), with public pension funds generally more active than their private sector peers, followed by private wealth entities (11%) comprised of wealth managers, multi-family offices and single-family offices, and insurance companies (10%). These investors are also the ones with the largest ticket size investing in the infrastructure asset class. This breakdown is not surprising as these investors are looking for long-horizon investments and steady yields to match their long-term liabilities, which are provided through infrastructure investments.

Furthermore, in addition to the traditional investors from mature markets (North America, France and Australia), a number of investors are emerging from Asia (mainly Japan, Korea and China) and are increasing significantly their investments in the sector.

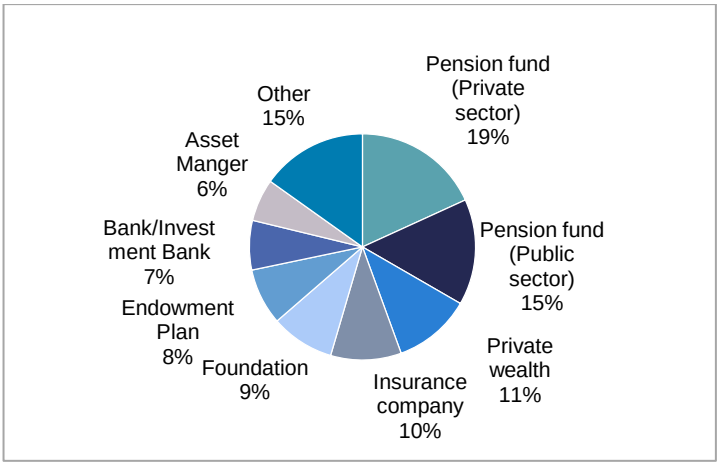

Figure 2.12: *Breakdown of institutional investors by investor's type*

Source: Prequin Infrastructure 2015 report

2.3 Access to the Infrastructure Market

When it comes to investments in unlisted infrastructure assets, several solutions are offered to institutional investors to invest in these assets. The main routes being closed-ended funds, direct investments, co-investments, Funds of Funds or managed accounts.

In general, the preferred routes to infrastructure investments is direct investment, unlisted funds and listed funds. As illustrated in Figure 2.13, between 2012 and 2014, investors were favouring direct investments (29% investors in 2012 vs. 56% in 2014) versus investment through unlisted funds (91% in 2012 vs. 65% in 2014), which could be explained by the tendency for large sophisticated institutional investors, with qualified teams in place able to source, invest and monitor a portfolio of infrastructure assets, to club investments avoiding by this paying management fees to a general partner. We note, however, that this is the case for big institutional investors with large capital and resources. Nevertheless, in 2015, the appetite for unlisted infrastructure is coming back (70% for unlisted funds vs. 48% in 2014). This flip-flop has been explained by the concerns over the recent valuations for the infrastructure assets and the ability of some General Partners (GPs) to source assets at attractive prices. Nevertheless, the trend towards direct investments is likely to pursue especially for established institutional investors.

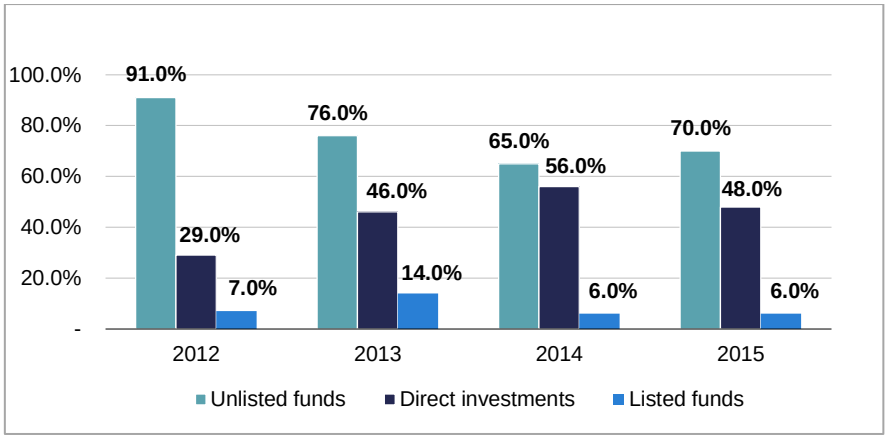

Figure 2.13: *Favourite routes to infrastructure investments*

Source: Preqin Infrastructure Online

2.4 Reasons for the increasing interest on infrastructure assets

- **Substitute for real estate investments**

Unlisted infrastructure investments are perceived as low-valued compared to "similar" asset classes such as Real Estate, especially during the 2007 bubble and considered as having low volatility and low correlation (and built-in inflation protection).

	Composite infrastructure	Listed infrastructure	Toll roads	Airports	Utilities	Unlisted infrastructure	Real estate	Listed equity	Bonds
Composite infrastructure	1.00								
Listed infrastructure	0.86*	1.00							
Toll roads	0.85*	0.99*	1.00						
Airports	0.38*	0.40*	0.26	1.00					
Utilities	0.82*	0.42*	0.42*	0.14	1.00				
Unlisted infrastructure	0.31	0.36*	0.36*	0.26	0.16	1.00			
Real estate	(0.08)	0.03	(0.01)	0.36*	(0.21)	0.26	1.00		
Listed equity	0.15	0.21	0.14	0.54*	0.01	0.06	0.14	1.00	
Bonds	0.57*	0.38*	0.38*	(0.03)	0.57*	0.17	(0.12)	(0.21)	1.00
Inflation	(0.20)	(0.22)	(0.22)	(0.23)	(0.12)	(0.17)	0.10	(0.09)	(0.25)

***Table 2.1**: Inter-asset correlation matrix (Q3-1995; Q2-2006)*

Source: Peng & Newell (2007)
Note: * Significant correlation (p<5%)

According to *Peng & Newell (2007)* analysis of a sample of unlisted infrastructure quarterly data series over the period (1995–2006), unlisted infrastructure assets returns proved to be low correlated with other assets (Table 2.1): 26% against real estate, 6% against equity and 17% against bonds, however, these correlations are statistically insignificant at the 5% level.

Furthermore, the correlation between the infrastructure sub-sectors is also low, e.g. 26% correlation between airports and toll roads. This result has been somewhat endorsed by the findings of *RARE (2013)* based on daily 10-year time series of listed infrastructure assets; the correlation coefficient for the studied sub-sectors is contained in the range [45%;65%], excluding communication sector which shows lower correlations with the different sectors (Table 2.2).

	Airports/ports	Communication	Electric	Gas	Logistics	Utilities	Railways	Seaport	Toll road	Water
Airports/ports	1.00									
Communication	0.30	1.00								
Electric	0.63	0.26	1.00							
Gas	0.52	0.14	0.77	1.00						
Logistics	0.58	0.40	0.61	0.47	1.00					
Utilities	0.41	0.17	0.79	0.75	0.47	1.00				
Railways	0.55	0.22	0.59	0.62	0.50	0.49	1.00			
Seaport	0.65	0.18	0.62	0.64	0.49	0.45	0.61	1.00		
Toll road	0.69	0.35	0.64	0.61	0.52	0.46	0.58	0.69	1.00	
Water	0.45	0.19	0.53	0.59	0.36	0.49	0.36	0.51	0.48	1.00

***Table 2.2:** Cross sector correlation matric (2000-2012)*

Source: RARE (2013)

APM Capital (2014) also demonstrated through the analysis of 10-year series that the correlation between infrastructure and other assets is low. Additionally, while the correlation between returns for listed and unlisted infrastructure assets is of 36% for *Peng and Newell (2007)*, it is lower for *AMP Capital* and it is at 26% (Table 2.3). Hence, investors view in this low correlation a path for further diversification for their portfolios investment strategies.

	Unlisted/Direct infrastructure	Global listed infrastructure	Infrastructure Mix 50/50
Infrastructure			
Unlisted/Direct infrastructure	1.00		
Global listed infrastructure	0.26	1.00	
Infrastructure Mix 50/50	0.73	0.82	1.00
Bonds			
Australian Bonds	0.09	(0.14)	-
International Bonds (AUD hec	0.10	0.13	0.16
Real estate			
Australian direct property	0.37	(0.01)	0.19
Australian listed property	0.16	0.63	0.52
Equity			
Australian shares	0.17	0.75	0.59
International shares(AUD hec	0.14	0.76	0.58

Table 2.3: Infrastructure return correlation with other asset classes over 10 years

Source: APM Capital, 10 years to 31 dec-2011

Note: Based on A$ correlation. Past performance is not a reliable indicator of future performance

JP Morgan Global Real Assets Research (2015) conducted a similar daily 12-year analysis over the period 2001-2013 (Table 2.4). However, the results are slightly divergent from the conclusion deducted from *Peng & Newell* analysis, which prove the impact of the time period on the regression analysis. The results suggest that global listed infrastructure assets have positive and high correlation against US Equities and negative correlation against US bonds. The unlisted infrastructure assets are not correlated, with Equity nor with Bonds.

	US bonds	US equities	Listed infrastructure	Hedge funds	Private equity	US core real estate	OECD core infrastructure
US bonds	1.0						
US equities	−0.7	1.0					
Listed infrastructure	−0.3	0.8	1.0				
Hedge funds	−0.6	0.8	0.8	1.0			
Private equity	−0.4	0.8	0.9	0.8	1.0		
US core real estate	−0.2	0.1	0.3	0.2	0.4	1.0	
OECD core infrastructure (unlisted)	−0.2	0.0	0.1	0.2	−0.1	0.2	1.0

Table 2.4: *Infrastructure inter-asset correlation matrix (2001-2013)*

Source: JPM GRA estimates

Problem with correlation

Most studies conducted in this regard show a limited correlation in returns between listed and unlisted infrastructure and endorsing the diversification potential of unlisted infrastructure. However, we need to bear in mind that these results may be biased by the frequency of measurement. Explicitly, the use of daily data points for listed infrastructure tend to generate higher correlations than when the data used is quarterly, semi-annually or annually.

Additionally, the fact that unlisted infrastructure assets are valued based on mark to model (vs. mark-to-market for listed infrastructure) can intensify the impact of autocorrelation and smooth the returns profile.

RARE (2009) studied the impact of measurement frequency on correlation (Graph 2.5) and exposed that the correlation coefficient widely appears when the valuation frequency decreases.
Note: unlisted infrastructure is usually valued on a quarterly basis (mark-to-model), while listed infrastructure are valued on a daily basis (mark-to-market).

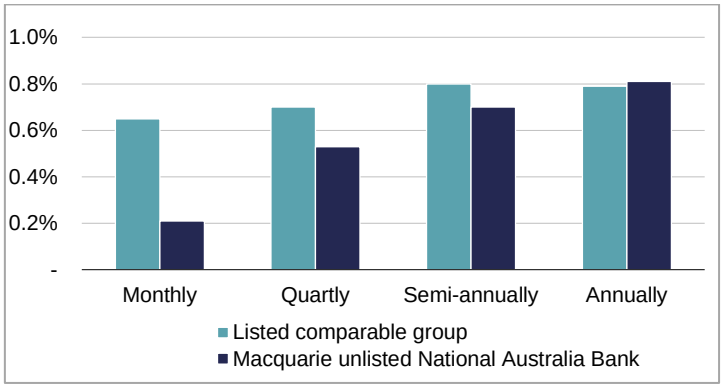

Figure 2.14: *Correlation of listed and unlisted infrastructure with the MSCI World (2002–2008)*

Source: RARE (2009)

- **Flight to safety (post-crisis) and diversification potential**

Following the financial crisis (2007-2008), many investors were looking for "safer" investments that have demonstrated resilience to the crisis and limited downside risk during market turmoil compared to traditional investment classes.

Infrastructure investments have shown historically a Sharp ratio above 1 and greater resilience during market turmoil. *JP Morgan Asset Management (2015)* has studied the resilience of the infrastructure asset-class to market turmoil by analysing the impact of price increase in some energy sectors on the demand for these energy commodities/service. Figure 2.15 shows the independence of demand for natural gas (driven by temperature) from the economy cycles.

Extensively, they have tested the stability of the revenue performance level during the great recession, and demonstrated that it has virtually no impact on regulated utilities and only limited temporarily impact in transportation volumes.

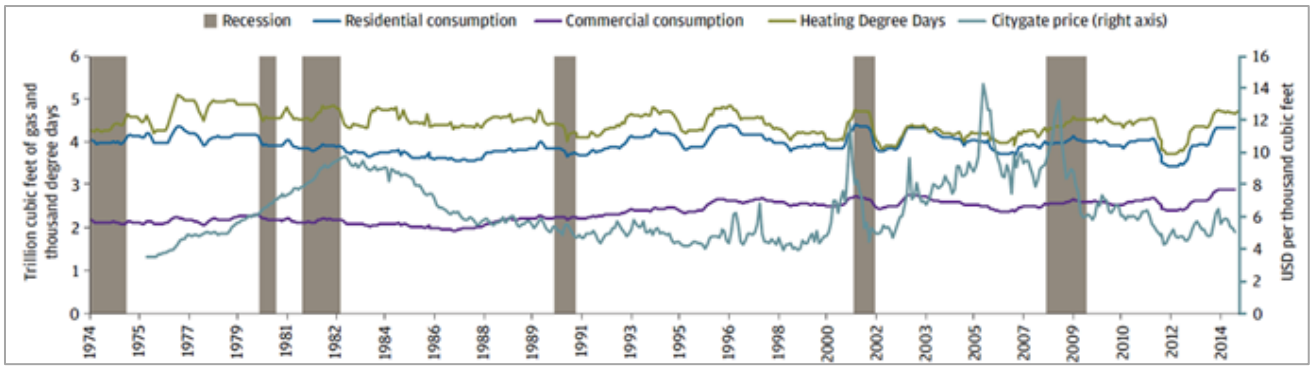

Figure 2.15: *Resilience of infrastructure assets to economic cycles*

Source: EIA and JPM AM, Jan-2015

JP Morgan has also demonstrated the diversification benefit from adding infrastructure assets to an investment portfolio during both normal cycle and market turmoil (including the financial crisis years) by analysing the impact of adding different percentages (2%, 5% and 10%) of a diversified unlisted global infrastructure allocation to the risk-return profile of a traditional portfolio. The results of this analysis, displayed in Table 2.5 and Figure 2.16, show a significant increase in portfolio return and the Sharpe ratio at a constant volatility with the growing allocation of unlisted infrastructure allocation, allowing for an attractive portfolio risk-adjusted return.

	Existing portfolio allocation	Additional allocation to global infrastructure (%)		
		+2%	+5%	+10%
Global equities	30%	30%	30%	30%
Global bonds	60%	58%	55%	50%
Real estate	5%	5%	5%	5%
Alternatives	5%	5%	5%	5%
Global Infrastructure	-	2%	5%	10%
	100%	100%	100%	100%
Expected return	4.2%	4.4%	4.7%	5.2%
Expected income	2.0%	2.0%	2.1%	2.2%
Historical return	7.0%	7.1%	7.3%	7.7%
Historical volatility	7.5%	7.5%	7.5%	7.5%
Estimated Sharp ratio	0.36	0.39	0.43	0.49

Table 2.5: *Impact of different allocations to an existing portfolio*

Source: Bloomberg, MSCI, Barclaysn Burgiss PE, CBRE, IPD, UBS and JPM AM GRA. 2015

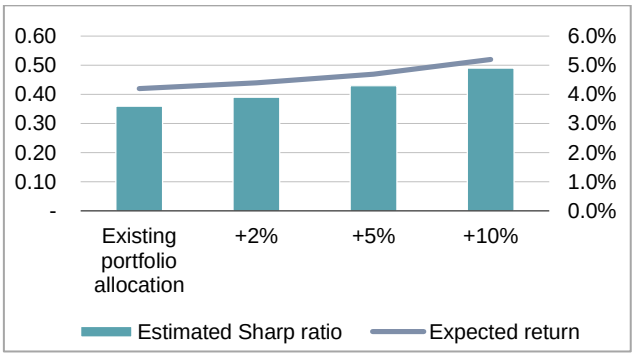

Figure 2.16: *Effect of infrastructure allocation on expected return & estimated Sharp ratio*

Source: JP Morgan (2015)

- **Low-interest rate environment**

Infrastructure investments are currently viewed as alternative secured assets to fixed income investments due to historically low-interest rates. Indeed, the historically low-interest rates maintained in advanced economies have made investments in treasury bonds a non-sound investment when alternative investments with the same adjusted risk-return are available.

"With ultra-low bond yields and equities limited by constrained growth prospects, infrastructure, particularly on an unlisted basis, is attractive for investors looking to diversify their portfolios." says Shane Oliver, Head of Investment Strategy and Economics and Chief Economist at AMP Capital.

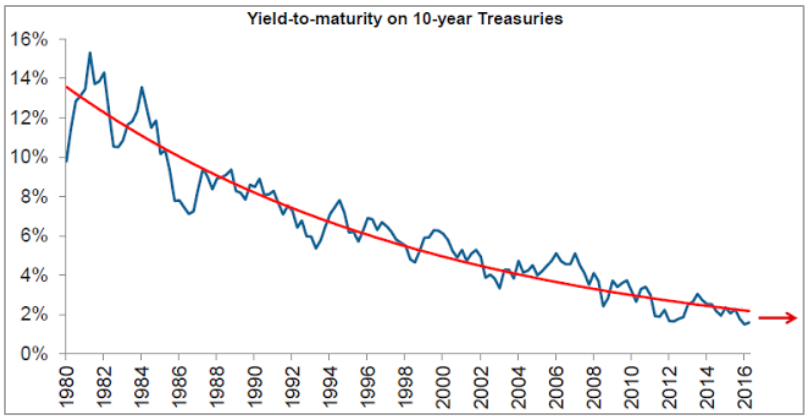

Figure 2.17: Yield to maturity on 10-year treasuries

Source: FRED, JPM AM, 10-year US treasury. Sept-2016

When it comes to asset-only investors with no asset-liability management, the decrease in interest rates (cost of debt), thus in discount rates, has entailed a decrease in cost of equity, thus in expected returns for core infrastructure investments.

For institutional investors, e.g. pension funds, for which the asset-liability management is a chief concern, discount rates have largely decreased beside liabilities, but the spread between core infrastructure discount rates and government bond yields remains stable as exhibited in Figure 2.18 (Bloomberg & JPM GRA estimates, 2015). Therefore, the recent low-interest rate environment (close to zero) has favoured infrastructure allocations for pension portfolios, who are in a position to benefit from the spread.

If the current low interest rate environment persists or rates increase moderately and gradually, investments in infrastructure assets, made with reasonable leverage, will continue to provide attractive yields and downside protection for investors.

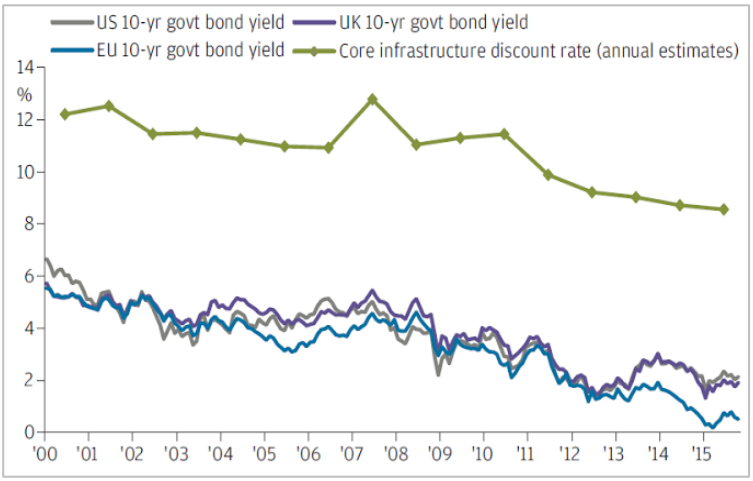

Figure 2.18: Increase in core infrastructure values

Source: Bloomberg & JP Morgan GRA estimates, 2015

- **High and steady cash-ins**

Investors looking for relatively stable cash-flows over the long term horizon have been attracted by the protection offered by infrastructure (inelastic demand, barriers to entry, resilience to downside risk, etc.) and the solid long term yield.

Yields for infrastructure vary widely depending on the sub-sector (but also depending on the characteristics of the project itself). Table 2.6 shows the average yield range for different infrastructure sub-sectors. This yield level is considered high when compared to government bond yields, which range zero (or slightly below) and 2%.

The low volatility of these assets is often linked to their indexation to inflation and periodic based valuations.

Infrastructure type	3-year equity IRR	Expected cash yields	Risk
Social	9% - 11%	4% - 12%	Medium
Regulated	11% - 12%	6% - 10%	Low
Rail	12% - 13%	8% - 12%	Medium
Airports/ports	11% - 13%	5% - 10%	Medium
Power generators	12% - 14%	4% - 12%	High
Toll roads/Greenfield	13% - 15%	3% - 5%	Medium/High

Table 2.6: Illustration to returns and risks for some typical infrastructure assets

Source: KPMG, ASFA, for illustrative purposes only

The Figure 2.19 shows the increasing level of distributions made by infrastructure funds to limited partners during the last years. The capital distributed has peaked in 2014 and reached c.$34bn and the trend is expected to continue for 2015 (H1 2015 distributions exceeded the full year distribution recorded in 2012).

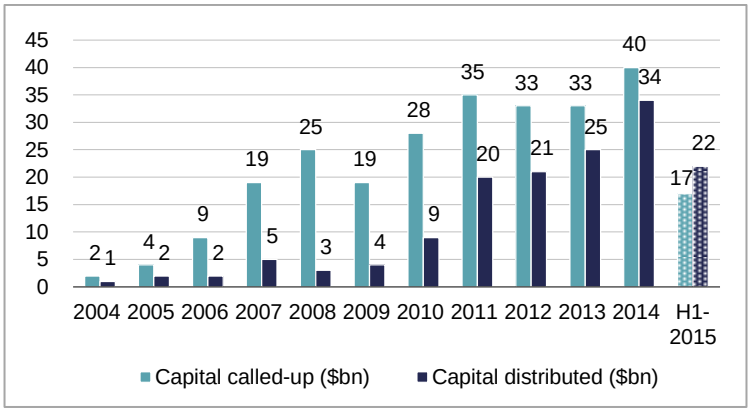

Figure 2.19: *Annual capital called & distributed by unlisted infrastructure funds*

Source: Preqin Infrastructure

3. Availability of funds

3.1 Fundraising

The fundraising market for unlisted infrastructure investments is the place per excellence to secure committed capital from investors. 2016 has registered a record performance with a total capital raised of $58.0bn. While the unlisted fund market is getting crowded (>179 unlisted funds), the fund managers should be conscious of the changing attitudes of investors: capital is becoming more polarized and concentrated among a smaller panel of fund managers.

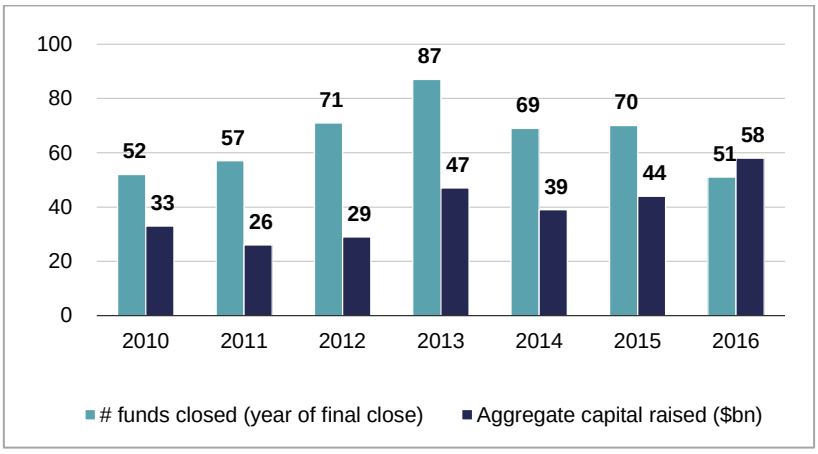

Figure 2.20: *Global annual unlisted infrastructure fundraising*

Source: Preqin Infrastructure Online

The high level of the capital committed could be maintained in the next months as many investors expect to increase their allocations to infrastructure assets and look forward to reinvest capital back into the industry (Preqin).

Geographic Focus

North America and Europe remain the traditional markets for infrastructure investments. Funds focusing in Europe succeeded to secure the largest portion of capital committed worldwide.

In 2015, 18 funds with a European strategy reached the closing phase with an aggregate capital of €14.2bn and 11 North America-focused funds closed aggregating $13bn capital. Further, all the closed funds have successfully reached and even exceeded their initial target size signaling the remarkable confidence of investors in the infrastructure assets.

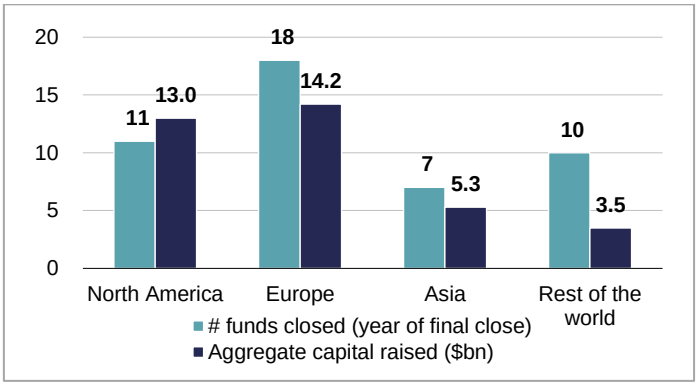

Figure 2.21: *Breakdown by primary geographic focus of unlisted infrastructure funds closed in 2015*

Source: Preqin Infrastructure Online

It is to mention that one fund accounts for almost 43% of the capital raised for the North America-focused strategy. In 2016, European-focused fundraising reached unprecedented levels. 20 funds reached a total record fundraising of €36.1bn, where five funds account for the 74% of the capital raised. This, however, shows the high concentration and the increasing allocation of capital to a limited number of fund managers (Table 2.7).

The fundraising outlook for 2017 appears promising as other fund managers are expecting to close their on-going fundraisings while others seeking to attract new investors.

Fund	Vintage	Team (# years)	Final size (bn)	Target size (bn)	Geographic focus	Target net IRR
Globbal infrastructure partners III	2016	10	$16	$12.5	Global	15%
Brookfield infrastructure Fund III	2016	12	$14	$10	Global	12%-15%
Macquarie European infrastructure Fund 5	2016	12	€4	€3	Europe	10%-12%
Antin infrastructure Partners III	2017	10	€3.6	€3.63	Europe	12%
North Haven infrastructure Partners II	2017	12	$3.6	$4	Global	8%-11%

Table 2.7: *Notable unlisted infrastructure funds to close in 2016/Q1-2017*

Source: Preqin Infrastructure Online

3.2 Infrastructure debt

Historically, banks were the main source of financing for most infrastructure projects. Following the global financial crisis and the progressive implementation of Basel III and Solvency II requirements, the availability of long-term bank debt has decreased for infrastructure deals. This swing led to the emergence of an alternative source of debt so-called infrastructure debt.

The infrastructure market has witnessed the development of unlisted infrastructure debt funds who are increasingly seeking more aggregate capital. Since 2006, c.$42.5bn of capital has been raised through c.95 unlisted funds (Figure 4.22).

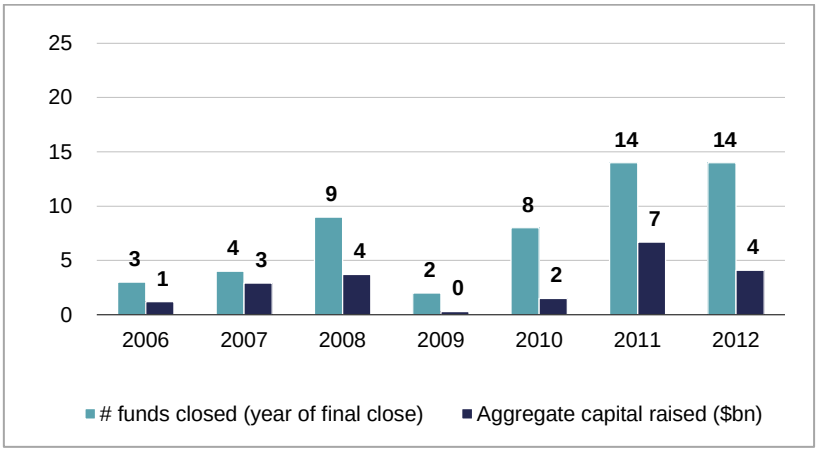

Figure 2.22: *Annual unlisted infrastructure debt fundraising*

Source: Preqin Infrastructure Online

Debt Funds in Market

According to Preqin (Figure 2.23), as of the beginning of 2016, an aggregate capital of c$21.2bn is targeted by 35 funds, of which 12 have already reached financial close.This figure represents the highest number of infrastructure debt funds active in the market since 2006, which suggests that the market for alternative funds for infrastructure players has strengthened and that general partners are forecasting a further growth with a rising competing climate for debt fundraising.

Most of these debt funds have different investment strategies varying based on the development stage of the project, debt and equity or only debt focused-funds, global vs. regional scope, etc. Among the 35 debt funds raising capital as of January 2016, 51% are purely debt-focused funds (vs. 49% targeting both debt and equity capital) and 46% are aiming at investments in both greenfield and brownfield assets as well as in the secondary market.

"Infrastructure debt is becoming an increasingly prominent component of the infrastructure industry. Regulation has affected the levels of capital traditional lenders have been able to allocate, and this

has created a significant niche for unlisted managers to provide debt financing for infrastructure projects," reported Tom Carr, head of real assets products at Preqin.

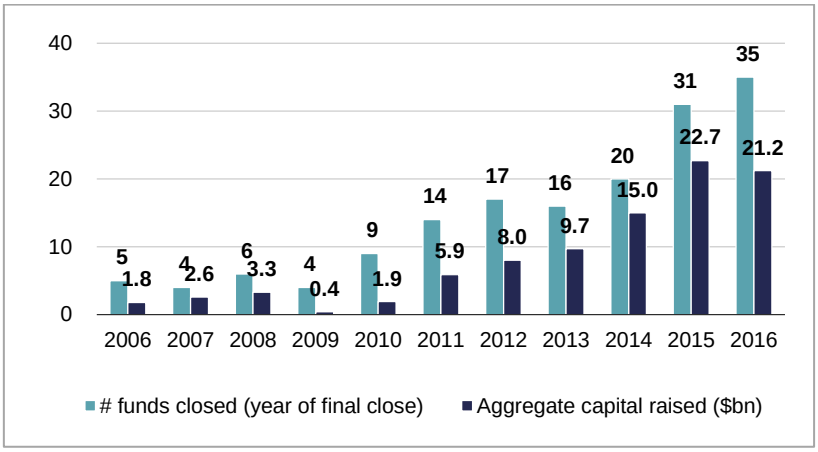

Figure 2.23: *Unlisted infrastructure debt funds in the market over time (2006-2016)*

Source: Preqin Infrastructure Online

As mentioned previously for the infrastructure equity market, the infrastructure debt market is also concentrated among a few investors type given the fact that the industry is still young. The majority of the capital raised is done through larger institutional investors; while over 55% of them hold c.$10bn in AuM, c.18% accounts for more than $100bn in infrastructure assets.

The recent development and growth of the debt infrastructure opportunity comes as the result of banks disintermediation in Europe. Institutional investors targeted debt funds as a substitute for fixed-income yields.

The investment maturity (long-term) combined with the fixed rate investments and the Solvency II requirements applied (similar standard model treatment as corporate bonds) matched the institutional investors (pension funds, insurance companies) requirements. Furthermore, the illiquidity of infrastructure debt also provided a liquidity premium (High spread) compared to traditional fixed-income income investments (Figure 2.24).

"Sovereign debt used to provide the returns required in long tenors, but as banks have retreated from long-term lending and project finance, institutional investors have stepped in to finance infrastructure assets. ()...Several factors are great catalysts for the strategy: diversification being one of them, low correlation another, and the yield pickup from the illiquidity premium makes it attractive." says Philippe Benaroya, co-head of infrastructure debt at BlackRock.

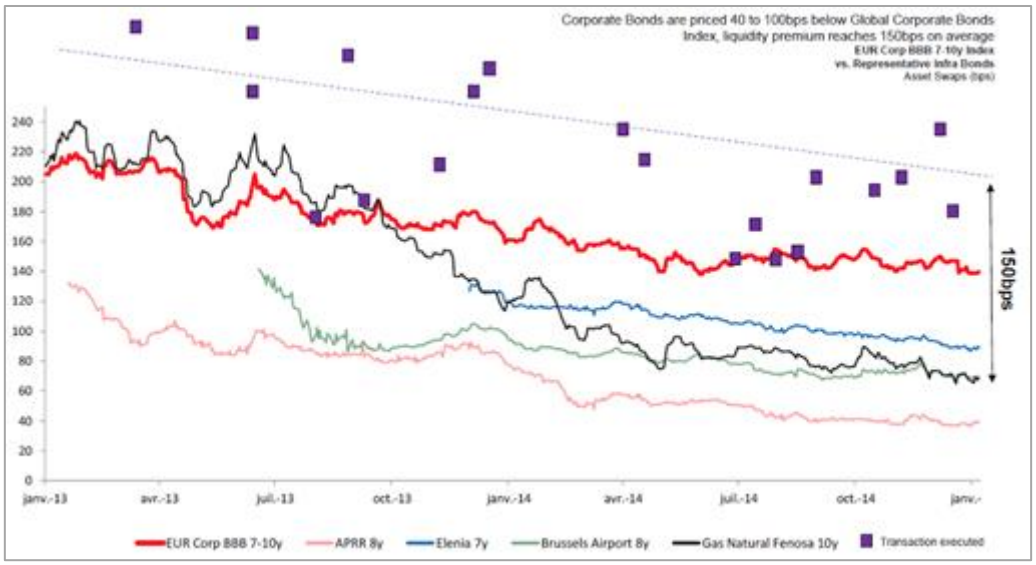

Figure 2.24: *Liquidity premium of infrastructure debt*

Source: Bloomberg, BofAML

In terms of creditworthiness, infrastructure debt benefits from a strong position; the average annual default rate is estimated to 1.5% for project finance debt vs. less than 1.8% default rate for providers of corporate debt.

Looking forward, the need for infrastructure capital in both emerging and developing countries will further push for further capital in this market allowing to partially address the financing gap in the infrastructure market.

Chapter III: Assessing the performance and valuation of infrastructure assets

As demonstrated in the previous chapters, the interest for infrastructure transactions has increased significantly over the last years. Deals are on the rise, providing new investment opportunities for investors all over the world. This trend is quite common among many infrastructure sub-sectors but more appealing for core-infrastructure assets. But with the emergent demand for this asset class, a trend towards higher valuations has been observed in the market, notably with airports transactions. In order to analyse this development, it is essential to understand the overall landscape and the mechanics behind the drivers of valuation for these assets.

In this chapter, we will focus on airports as one of the major core infrastructure assets. We will be discussing the current overall performance of listed infrastructure assets, with a focus on airports operators and conglomerates. Then, the subsequent analysis will start by explaining briefly the economics of the airport business for investors, their valuation and followed by a discussion on the valuation of some of the recent transactions. Finally, we will examine the main drivers of airports value through a regression and benchmark analysis in an attempt to explain the currently observed valuation levels.

1. Listed infrastructure performance

In the current environment, infrastructure stocks have proved to be a great place for investors to be in. They have proved their resilience to economic cycles and the potential to deliver more value creation for their shareholders in the current low-interest rate environment. The trend continues in the first quarter of 2017, where the performance of listed infrastructure stocks rebounded strongly ahead of global equities and global bonds.

1.1 The performance of infrastructure stocks

To illustrate the performance of infrastructure stocks, we will look first at the historical performance of the aggregate stock price performance of four different infrastructure sub-sectors: airports (AdP, Fraport, Flughafen Wien, Flughafen Zurich, Save), toll roads (Abertis, Atlantia, Vinci, Eiffage, Ferrovial), Ports (DP World, Asciano, Cosco Pacific, ICTSI, Hamburg) and utilities (EDF, Engie, Enel, Iberdrola, RWE). The aggregate, for each sub-sector, has been calculated as the arithmetic average of the stock price of relevant stocks/ companies in the market (Figure 3.1).

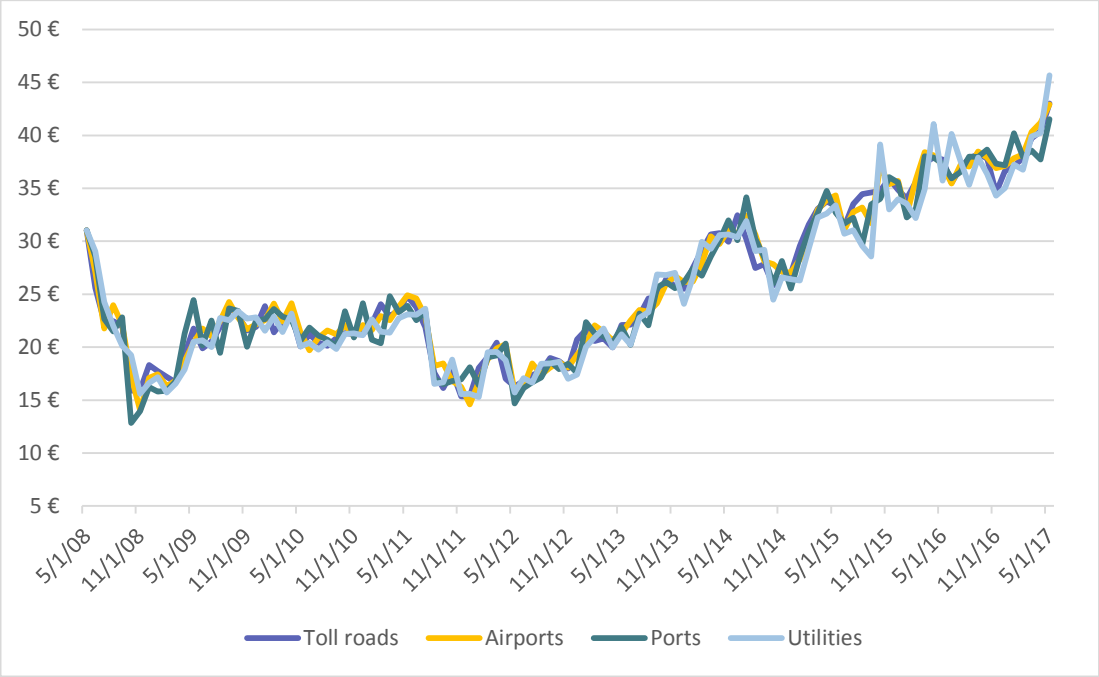

Figure 3.1: *Share price performance for infrastructure sectors (2008-2017)*

Source: Datastream, Bloomberg

In aggregate terms, some infrastructure sectors performed quite well over the period compared to others. This is mainly due to the embedded characteristics and the business model of each sector. Roughly speaking, toll roads and airports have been performing well following the financial crisis and were able to encounter the crisis impact on traffic (more for airports than for toll roads, which took some time to recover). For utilities, as a historical infrastructure asset, the story is quite different as this sub-sector has been hit by the liberalisation of the energy markets in Europe and the climate change directives that put massive pressure on the utilities traditional business models and deteriorated their market capitalization.

Another way to track the performance of publicly-traded infrastructure stocks is by looking at listed infrastructure indices. Today, five main global infrastructure indices are used to assess the performance of listed infrastructure securities: S&P Global Infrastructure Index, Dow Jones Brookfield Global Infrastructure Index, FTSE Global Core Infrastructure Index, MSCI World Core Infrastructure Index and Thomson Reuters Global Infrastructure Index.

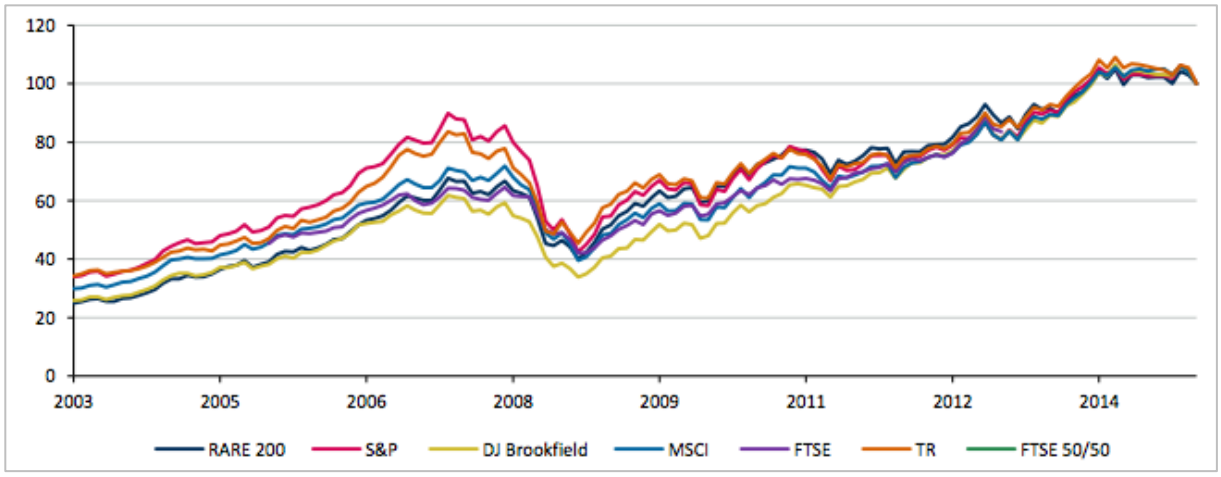

Figure 3.2: *Infrastructure index performance (2003-2015; Base= 2015)*

Source: Factset data, Rare (2015)

Note:

- Rare 200 is not an index but rather an investment universe; it includes the largest and most liquid stocks
- The use of 2015 as a base year is due to the lack of Data for all indices for the whole period. Hence, the better performing indices are the ones appearing at the lower down of the chart
- The composition of the indices is not the same (different geographical exposure and asset exposure)

Despite the difference in the composition of these indices, there is a clear correlation between the returns of the indices. A strong performance has been witnessed during the period 2003-2007, curbed by the global financial crisis (high correlation with equities (beta) compared to unlisted infrastructure) and then rebounded subsequently with the market recovery.

The impact of the macroeconomic environments on listed infrastructure performance can vary from one sub-sector to another but on average it has outperformed the global equities market. Table 3.1 illustrates the results of a statistical study conducted by Deutsche Asset Management (2016), which shows how macroeconomics affected the infrastructure stocks over the period 2008-2016.

Indeed, following an interest rate fall, an increase in credit spread or an above average inflation, infrastructure securities outperformed equities by more than 5% on annualised basis. This reflects the bond-like characteristics of infrastructure since under these scenarios, the bonds market usually outperforms the equities market.

	Above Average GDP Growth	Below Average GDP Growth	Rising Interest Rate	Falling Interest Rate	Increasing Credit Spreads	Decreasing Credit Spreads	Above Average Inflation	Below Average Inflation
Global Infrastructure	○	○	↓	↑	↑	↓	↑	○
Oil &Gas Storage& Transportation	○	○	○	↑	↑	○	↑	○
Transmission & Distribution	○	○	↓	↑	↑	↓	↑	○
Airports	○	○	○	↑	↑	↑	○	↑
Toll Roads	↑	↑	↓	↑	○	○	↓	○
Water	○	○	↓	↑	↑	↓	↑	○
Communications	○	○	↓	↑	↑	○	↑	○
Diversified	○	↑	○	○	○	○	↓	○

↑ Outperforms by more than 5% annually ○ Similar performance ↓ Underperforms by more than 5% annually

***Table 3.1**: Benchmark of the impact of macroeconomic environments on listed infrastructure stocks*

Source: Dow Jones and Deutsche Asset Management analysis, Bloomberg, Oxford Economics, Thomson Reuters

The main drivers for this performance are quite similar to those exposed previously (Chapter I) for unlisted infrastructure assets (same underlying assets). While an investor can invest in infrastructure assets either through listed or unlisted funds, the underlying investment decision can be driven by many considerations. As a way to explain the performance of listed infrastructure securities, we will recall some of the features (pros and cons) of listed infrastructure compared to unlisted one.

Advantages

- Liquidity: Fast access to the market and easy to liquidate with low transmission costs
- Price transparency: Mark-to-market valuation
- Diversification: easily investable in a diverse set of industries, geographies and currencies
- Leverage: less exposure to interest rates as result of the low Debt/EBITDA ratio

Disadvantages

- Beta: Higher correlation with the stock market, hence lower risk mitigation and higher volatility

Based on what has been presented in the current and previous chapters, global listed infrastructure should not be considered a perfect substitute to unlisted infrastructure investments at least in the short-medium horizon. In fact, these two investments have different risk-return profile and may behave differently to short-medium term macroeconomic stresses. However, these investments have similar behaviour over the long run since they give access to the same underlying.

1.2 Trading benchmark

We will focus on this section on European infrastructure conglomerate (airports, toll road, energy) and

pure airports operators to illustrate the current valuation of some of the main listed infrastructure core assets.

Pure airports operators

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	EV/ EBITDA LTM										
Airports											
ADP	10,8x	11,6x	8,4x	9,3x	8,6x	7,4x	8,6x	10,5x	11,6x	11,2x	10,5x
AENA	--	--	--	--	--	--	--	--	--	12,0x	12,1x
FRAPORT	8,6x	9,6x	6,3x	8,9x	9,3x	7,8x	8,4x	10,9x	9,6x	9,8x	7,3x
SAVE	17,1x	12,9x	6,2x	7,3x	8,0x	6,4x	7,9x	15,0x	15,4x	13,5x	14,8x
Flughafen Wien	10,7x	10,1x	5,7x	8,2x	10,4x	6,6x	7,3x	7,9x	8,5x	7,8x	8,0x
Flughafen Zurich	9,7x	9,7x	6,2x	7,1x	7,4x	6,2x	8,8x	7,7x	8,9x	10,1x	10,7x
Average	**11,4x**	**10,8x**	**6,5x**	**8,2x**	**8,8x**	**6,9x**	**8,2x**	**10,4x**	**10,8x**	**10,7x**	**10,5x**
Median	**10,7x**	**10,1x**	**6,2x**	**8,2x**	**8,6x**	**6,6x**	**8,4x**	**10,5x**	**9,6x**	**10,7x**	**10,6x**

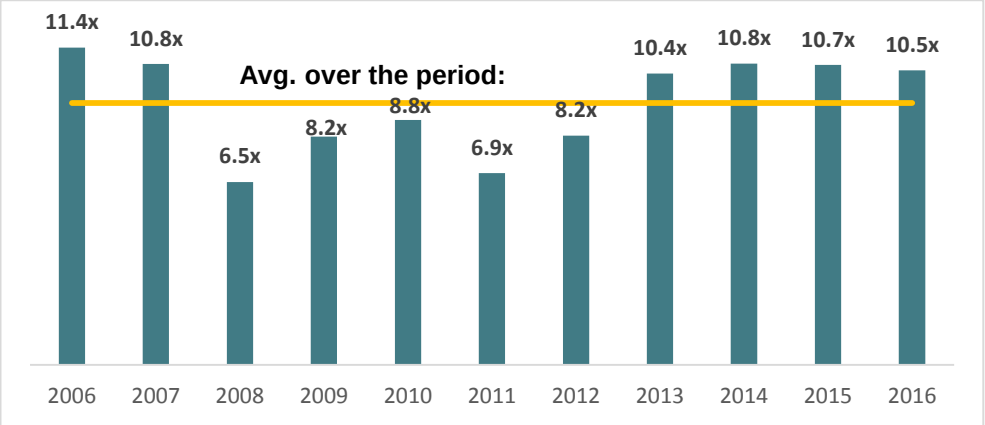

***Figure 3.3**: LTM EBITDA Multiples of major airports (2006-2016)*

Source: Bloomberg

Infrastructure conglomerates

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	EV/ EBITDA LTM										
Groups											
Vinci	15,8x	8,9x	6,1x	7,2x	7,1x	6,0x	6,2x	7,5x	6,5x	8,5x	8,8x
Atlantia	11,6x	12,7x	8,9x	9,7x	8,3x	7,8x	9,5x	10,9x	10,3x	10,7x	10,5x
Ferrovial	26,2x	27,8x	10,0x	15,0x	6,9x	13,7x	13,9x	15,5x	19,3x	17,8x	14,1x
Eiffage	11,7x	9,5x	8,2x	9,7x	9,5x	8,4x	9,0x	8,4x	8,0x	8,5x	8,2x
OHL	9,2x	6,7x	6,4x	8,2x	8,2x	10,6x	8,8x	8,1x	12,0x	8,8x	34,1x
Average	**14,9x**	**13,1x**	**7,9x**	**9,9x**	**8,0x**	**9,3x**	**9,5x**	**10,1x**	**11,2x**	**10,8x**	**15,1x**
Median	**11,7x**	**9,5x**	**8,2x**	**9,7x**	**8,2x**	**8,4x**	**9,0x**	**8,4x**	**10,3x**	**8,8x**	**10,5x**

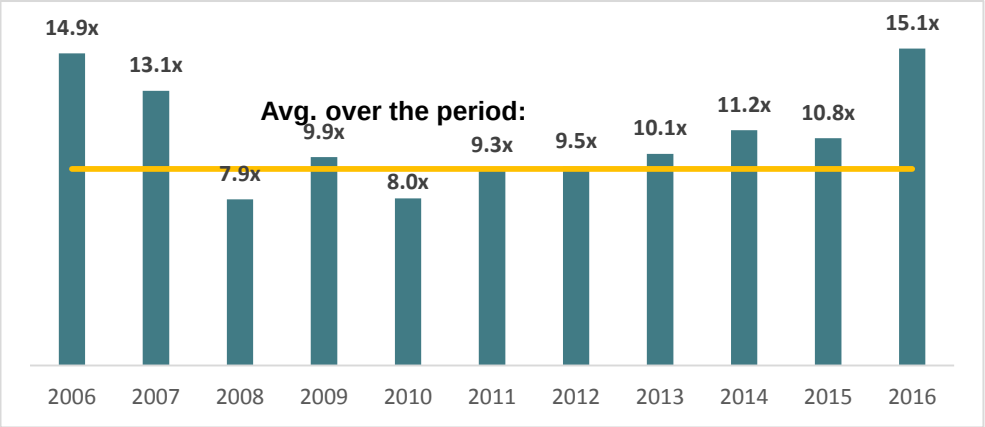

***Figure 3.4**: LTM EBITDA Multiples of major conglomerates in the infrastructure sector (2006-2016)*

Source: Bloomberg

At the European level, the infrastructure sector trades in line with historical average EV/EBITDA multiples. Large capitalisation (largeCap) infrastructure continues its outperformance and the drivers are the same as for the last five years: lower interest rates, positive traffic outlook, attractive dividends distribution, operating expenditure efficiencies and the flexibility of free cash flows deployments (deleveraging, M&A, etc.).

This performance has attracted more and more investors towards this asset class, who become more aware of its benefits.

The dividend income or the yield from infrastructure stocks is at high level versus 10-year government yields and accounts for over one-third of S&P Global Listed Infrastructure Index total return over the last 10 years. Additionally, the source of these dividends is considered by analysts' consensus to be well covered than in the past thanks to strong Free Cash Flow generation and lower leverage at the largeCap level. Thus, this offers investors a captivating investment opportunity in the current low interest rate environment.

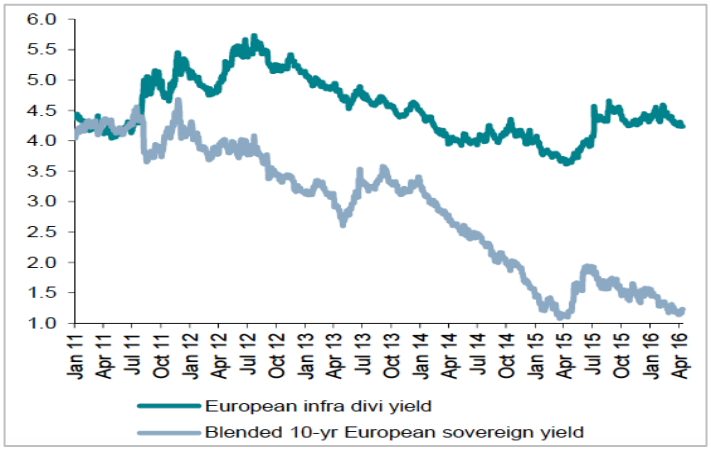

***Figure 3.5**: European infrastructure dividend yield vs. blended 10-year sovereign yields (2011-2016)*

Source: Bloomberg, Exane BNP Paribas

Another potential benefit may come from the inflation–indexed nature of infrastructure revenues. Many companies operate under concession or contractual contracts that contain escalators tied to inflation. For example, an operator of toll roads may be permitted to increase its tolls with the Consumer Price Index (CPI). Operators of airports and ports, whose operations are exposed to GDP growth, may also witness their revenues move with inflation.

The main advantage of the inflation indexation is that listed infrastructure companies were historically able to deliver dividend growth outpacing the CPI (Figure 3.6).

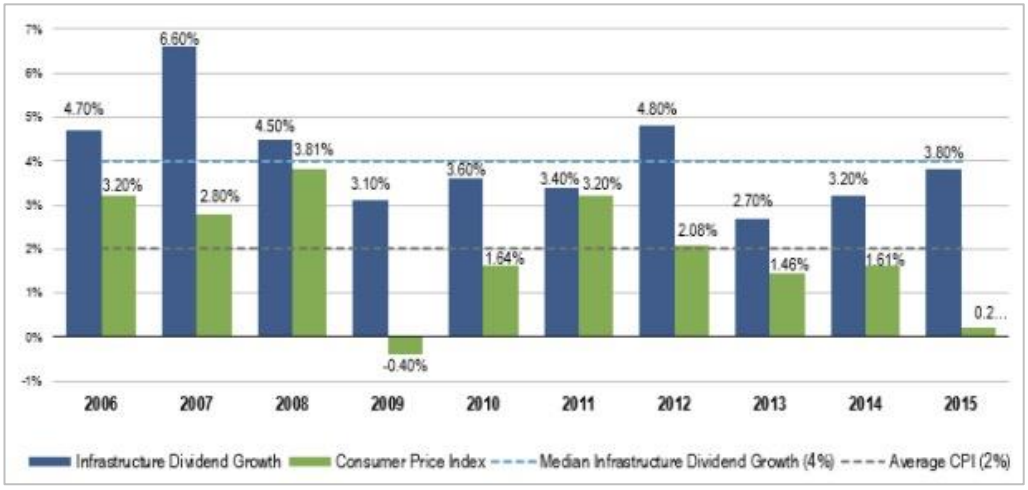

Figure 3.6: *Listed infrastructure dividend growth per share vs. CPI (2006-2015)*

Source: Franklin Templeton Investments

2. Airports economics

AMP Capital Global Head of Infrastructure Equity Boe Pahari (2017) said: *"Infrastructure is a defensive asset class that's highly competitive. This competition will continue to intensify as more funds are launched by a greater number of managers. There is more money than ever before to invest in infrastructure. In addition, we are seeing a growing preference from large investors, particularly sovereign wealth funds and pension funds, to invest directly in infrastructure assets. This increased activity across the asset class is putting upward pressure on pricing across most sectors, particularly large energy, utilities and transport assets."* A notable sub-sector experiencing this upward trend is airports.

2.1 Airports characteristics

For the last two decades, airports have gained prominence and acceptance as core infrastructure assets. Airports are indeed protected by high barriers to entry, robust cash flows and regulatory safeguards. They also benefit from ancillary income streams, from non-aviation sources such as car parks and retail shops. These sources of income, along with the aeronautical revenues received from the airlines for the use of runway and terminal infrastructure can also provide a valuable

hedge against inflation. Nevertheless, airports do carry certain risk, as they are part of the sometimes turbulent aviation industry – airports are heavily influenced by international considerations, such as the global economic environment or security concerns. Consequently, they have been subject to certain vulnerabilities in recent times, for example, during the financial crisis of 2008 or isolated external effects such as epidemic outbreaks or terrorist attacks (Weber, 134). Aviation remains, however, a long-term growth market. Passenger traffic growth has picked up momentum since the aftermath of the financial crisis, and is expected to grow over the next 15 years by around 5.5% annually (Airbus), thereby outperforming world GDP growth. These forecasts are primarily based on the growing private and commercial demand for mobility around the world. As such, airports generally represent stable infrastructure assets with great potential upside, and hence very appealing to investors.

Airports can be broken down into primary and secondary airports, with the former they are often considered hub or transfer airports, while secondary airports are generally origin and destination airports (Weber, 135). While primary airports taking a more important role in international air traffic, secondary airports have also experienced considerable growth over recent years, benefiting from the strain on capacity at primary airports as well as the rise of low-cost carriers that favour point-to-point journeys. Another important characteristic to consider in the context of potential returns, is whether the airport is regulated or unregulated – the former is considered stable but limited and may not offer very high growth, while unregulated airports have greater control and flexibility, and, therefore, often can anticipate faster growth (Chong).

In terms of ownership, international airports general fall within the government's jurisdiction, owned either directly or indirectly by the respective government, region or municipality. Indirect ownership means an airport is administered by a superior public institution that is responsible for a number of airports. At the same time, various airports around the world have either been partially or fully materially privatized (Weber, 135).

2.2 Private Sector Involvement in airports transactions

In line with other sub-sectors of the infrastructure asset-class, private-sector investments in airports are increasingly widespread around the world. Since the late 1980s, when the UK government publicly listed the British Airport Authority (BAA), now known as Heathrow Airport Holdings Ltd, to raise funds as part of a wider effort to monetize government-owned assets, the business of airport privatization has grown, matured and diversified to meet the objectives of government, investors and passengers alike. Europe has been at the forefront of airport privatization activity, as many airports in the UK, and some in Italy, Belgium and Denmark have been sold or partly privatized in the past 25 years. This trend is expected to continue, with 22 countries currently looking to let concession at least 40 assets (PwC). The new private owners include large airport operators, infrastructure funds, and

notably large institutional investors. These projects are undertaken in various forms from PPP and concessions to partial and full privatization (table 3.2).

Full private ownership	Long-term concession	Partial privatisation
The ownership is fully transferred by the government to the private sector	A long-term concession (25+ years) is provided to the airport operator (often on a revenue share basis)	Privatization of the airport but a significant share is kept by the government

***Table 3.2**: Airports privatization models*

Source: Oliver Wyman

Investors generally see airports as relatively safe assets: they offer stable cash flows with the potential to realize significant capital gains on disposal, satisfying yield and IRR investors alike. There are two general categories of investors: financial and strategic buyers (PwC)

In the context of financial investors, there has been a rising interest from institutional investors such as pension funds and insurance companies, who are attracted to the stable cash flows airports offer, but also, they often invest with their eye on the long term as many focus on the internal rate of return (IRR). Financial investors or funds will try to enhance value and return by implementing optimal financing structures (PwC).

Trade buyers (such as large airport operators) on the other hand, will focus on trying to improve operational efficiencies; for example, by increasing commercial yields and by expanding the airport's route network. According to PwC's research, there is an increasing trend of airport operators forming consortia with financial investors with the aim of boosting value through operational and financial structuring improvements.

The current trend is toward teaming up through consortia to bid for airports' transactions. The underlying idea is to benefit from the operational capabilities of strategic partners and the financial expertise of financial investors, while ensuring the long-term performance of the airport (Chong).

The recent privatization of French regional airports is a pure example of this model. To ensure that the final selected bidder will commit himself to operate the airport on the long-run and ensure to increase its operational efficiency as opposed to holding it for only few years and exited to achieve a capital gain, the French state required the potential bidders for Nice and Lyon airports to form consortia with strategic operators with a minimum number of years of experience (ACI Europe).

3. Valuation of airports

3.1 Overview of valuation practices in the sector

The valuation process of unlisted infrastructure and likewise, airports, is challenging since there is no

daily quotes that are readily available, as in the case of traded securities. Instead, transaction multiples can provide useful valuation benchmarks. Analysts at investment banks and credit rating agencies often refer to earnings ratios such as EV/EBITDA in an attempt to undertake a valuation. However, this comes with its own challenges due to each airport's specific operations and individual growth prospects. Behind these key earnings multiple, there is number of key factors impacting an airport value (the main factors will be further analysed in the following sub-section), including but not limited to (PwC):

- Maturity of the airport: Most large, mature airports have less potential to increase traffic than smaller regional airports and may trade at a lower multiple. For a small regional airport starting from a low passenger base, its ability to grow is a prospect that is often reflected in transaction multiples
- Potential for yield improvements: Airports with non-aeronautical revenues can boost their earnings by enhancing their auxiliary income streams, that is, more retail offerings, parking and other services. This potential for better earnings can also be reflected in transaction multiples
- Regulatory environment: different airports are subject to different regulatory environments depending on their respective jurisdictions; regulated airports' risk/reward profile differs from those of unregulated airports—for example investors see regulated airports as stable but potentially vulnerable to changes in regulatory regimes, while unregulated airports may be perceived as having more flexibility and control on their revenue streams
- Demand: airport valuations are predicted based on expected future cash flows, which are in turn underpinned by passenger demand for travel
- Other drivers include: competition (other airports or modes of transportation), economic growth, dependency on an airline, catchment area, mix of passengers, type of privatization, etc.

Given the number of circumstances affecting an airport's value and the heterogeneity across countries and jurisdictions, investors need to carefully assess airports' comparability and adjust transaction multiples where appropriate. This implies that a standalone EBITDA multiple may only be meaningful in combination with other ratios. As such, the multiples approach should merely provide an indication of relative pricing. Instead, a primary approach to valuing airports may be the discounted cash flow method (DCF). The DCF essentially discounts the project's projected free cash flow at a rate that reflects the risk associated with the asset under consideration. This is appropriate to airports because they generally have long-term projections that offer cash flow visibility. The DCF approach is also suitable for differentiating between an airport's revenue streams (aviation, retail, external operations etc.) and the various regulatory mechanisms under which airports operate (PwC).

The common practice (as for many other sectors) is to confront the valuation outputs from different valuation methods to avoid any bias that may emerge from aggressive or conservative assumptions.

3.2 The increasing appetite for airports deals

Trends

The last years have demonstrated a strong ongoing interest in the airport sector. Many transactions took place globally creating a diversity in the type of deals conducted: Privatization, PPP and M&A (including secondary market transactions).

According to the reports published by Airports Council International, the landscape of European airports ownership has evolved substantially over the past six years, with private sector participation nearly doubling since 2010. ACI's research also reveals 41% of European operations (205 airports) have some form of private ownership, up 19% from 2010 with 39% (79 airports) being fully private and 61% (126 airports) structured as PPPs through a wide-range of public and private structures. As suggested by the sheer volume of recent European transactions (both primary and secondary), this trend is far from slowing down - if anything, it appears to be picking up pace (Modalis).

Historically, listed airports have traded at 6-8x EBITDA and transactions of private airports trade at 14-16x (IPE). Factors such as majority control or a minority stake, regulated or unregulated entities, and growth prospects will influence the price of an airport. Recent transactions, however, show that investors are prepared to pay for what they believe is a "uniquely" attractive infrastructure asset, or what can be referred to as a "trophy asset". This trend is further highlighted as market conditions are such that there is a limited number of airport acquisition targets, and consequently has led to an increasingly competitive environment, which is driving deal multiples and respective valuations upwards (Rzasa).

Evolution of airports' transactions multiples

The transaction market for airport keeps showing strong activity in 2016 as it was the case in 2014 and 2015 despite the longer timing for deals to come to market. The strong growth in air traffic worldwide combined with investors' demand for higher yield investments have stimulated investors interest and increased this sub-sector attractiveness. Additionally, the growing need for capital and the pressure on government budgets will maintain the positive outlook for airport transactions (Modalis).

Historically, the greater availability of credit and passenger traffic growth witnessed in the late 2000s contributed to reaching high EV/EBITDA transaction multiples (above 25x EBITDA for European airports). Nevertheless, despite the resilience of airport sector to previous economic downturns, the global recession exercised significant shocks on passenger traffic and growth outlook. These shocks have been reflected in airports valuation through low transaction multiples after 2008. Indeed, between

2007-2010 the airport deals declined significantly in terms of volume and value due to a shortage in financing solutions, reduced traffic demand and uncertainties over economic growth (Figure 3.7).

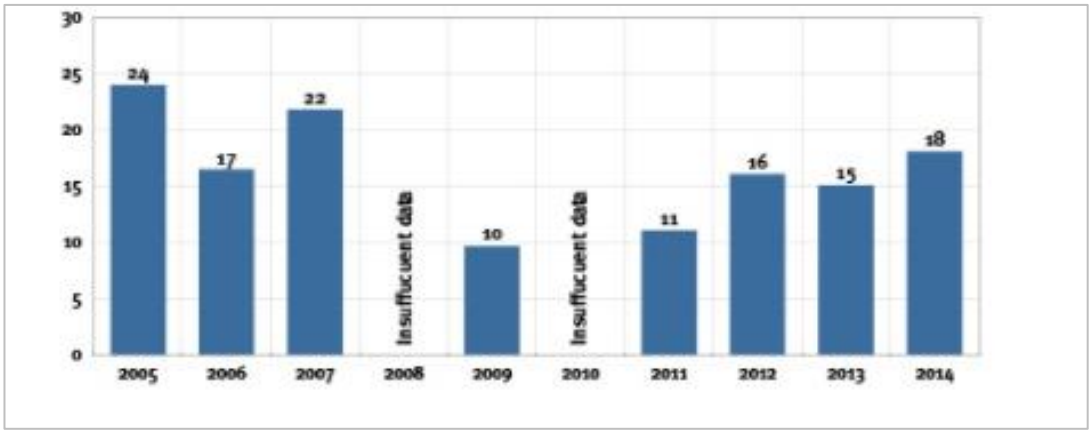

Figure 3.7: *Weighted average EV/EBITDA multiple post and pre-crisis (2005-2014)*

Source: MergerMarket

Beyond 2010 and despite the negative economic outlook, airport deals started emerging again in the market with higher deal values, thanks to passenger traffic demand recovery and increasing number of transaction in emerging countries (Brazil and Portugal), enabling the average transaction multiples to rebound to higher values (Figure 3.8).

It is important to mention that there are obvious challenges when it comes to comparing airports transaction multiples given each airport's specific characteristics (regulation, operations, growth potential), nevertheless, this valuation method provides useful valuation benchmarks.

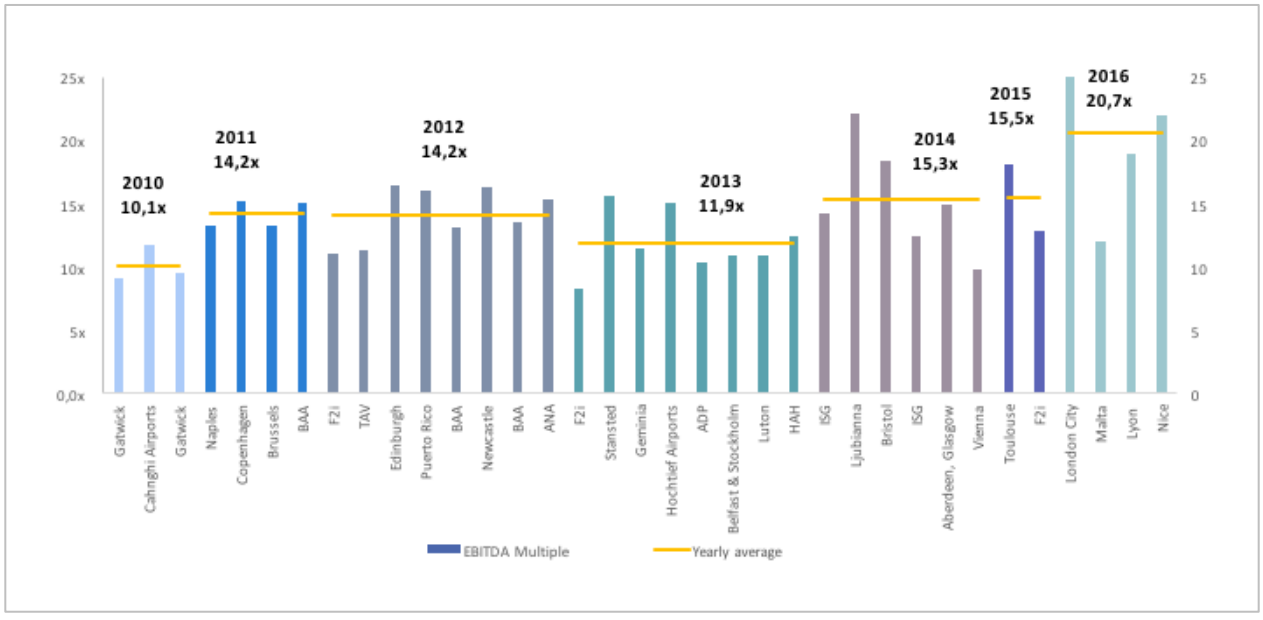

Figure 3.8: *EBITDA Multiple for selected airports transactions (2010-2016)*

Source: InfraDeals, MergerMarket, Press release

3.3 Airports as trophy assets: Example of recent transactions

A trophy asset describes assets of high-quality that attracts many potential bidders. Over the last few years, there have been a number of high-profile transactions in the European airports space, which are among the aforementioned trophy assets. These airport sales have offered control stakes in major city airports, with strong catchment areas, attractive airline and passenger profiles and opportunities for commercial revenue enhancements (Rzasa). The 2014 sale of Toulouse Airport in south-western France to a Chinese-led consortium for €308m, was based on a multiple of 18x EBITDA. In the same year, the sale of Glasgow, Aberdeen and Southampton airports in the UK to Macquarie and Spain's Ferrovial was based on a multiple of 15x EBITDA (RDC Aviation). Market sentiment has further intensified since these deals were closed in 2014, and competition has reached new heights, with more institutional investors entering the race. Industry observers note that sale of London City Airport in 2016 to a consortium including Canadian pension fund Ontario Teachers' Pension Plan (OTPP), and Borealis Infrastructure at 30x EBITDA, one of the highest multiples ever seen in airport transactions (RDC Aviation). Also in 2016, there was the high-profile sale of France's 60% stakes in one of the country's busiest airport – Nice Cote d'Azur. The airport was marketed to provide investors relatively stable assets in a sector that increased passenger numbers by more than 5% last year to 3.21 billion (Reuters). Investors of all types, ranging from pension funds such as OTPP, sovereign wealth funds of Singapore and the UAE, GIC Special Investments and the Abu Dhabi Investment Authority respectively, infrastructure fund managers and airport operators, were all in the competition. Considered as a trophy asset, the French Riviera airport was valued at 1.6bn euros, and the 60% stake was finally sold to Italy's Atlantia for 1.2bn euros, implying a 22x EBITDA multiple (Modalis). This transaction activity demonstrates that good-quality airport assets are now achieving multiples at the upper end of, and sometimes above, the historical EV/EBITDA valuation range.

Overall, recent airport transactions can be summarized by the following: "*You've got a situation where, as an asset class, airports have become increasingly attractive*," says Damian Stanley, principal and head of global airports group at AMP Capital. "*There is also a greater quantum of capital chasing these assets. You also have more debt capital available again to support these transactions. Banks are more prepared to lend on assets with robust, long-term income*." This last part refers to the fact that cost of borrowing is cheaper, and hence direct institutional investors can afford to pay relatively inflated asset prices due to their lower overall cost of capital. The very availability of cheap debt allows small amounts of equity to appear to be able to support substantial levels of gearing.

2017 pipeline and beyond?

The industry's growing need for capital, pressures on government finances, and infrastructure investors seeking higher yield investments will likely continue to drive new deals across the market. The table below summarizes some of the deals that are expected to come to market in the next year.

As shown, the pipeline is strong with activity all around the globe. Deals of 2016, such as the sale of the London City Airport and aforementioned French airports, may set pricing benchmarks.

Airport	Country	Deal structure	Date	Note
French Regional Airports	France	Privatization	2017 and beyond	Bordeaux, Montpellier, Saint Denis, Strasbourg, Fort de France, Marseille
Brussels	Belgium	Secondary sale	2017 and beyond	Macquarie sale
Copenhagen	Denmark	Secondary sale	2017 and beyond	Macquarie sale
Gatwick	UK	Secondary sale	2017 and beyond	GIP sale
Kastelli	Greece	Privatization	2018	Expected to become Greece's second-biggest airport
Vilnius, Kaunas and Palanga	Lithuania	Privatization	2018	Concession of 25 years

Table 3.3: *Pipeline of on-going transactions in Europe*

Source: Aviation Economics

4. The drivers of airports' valuation

4.1 Analytical consideration of the main value drivers

During the last years, airports market has been one of the most dynamic sectors thanks to a combination of different factors including strong demand, limited supply and the availability of relatively cheap financing. The apparently perceived high valuations may have been the result of competitive auction processes but this may not justify the profitability of such deals for investors, which lead us to question the drivers of this willingness to pay high prices for airport assets.

We will try in the following section to provide some insights and analysis of what we believe may be the main drivers for the airport's current valuation levels.

- **The Expected passenger/traffic growth**

One of the main drivers at which investors look at when analysing an airport investment is the potential passenger growth of the airport. The forecasted growth is considered as a driver for revenues generation.

Thus, the expectations of high long-term passenger traffic are factored into the price paid for airports deals and reflected in increasingly higher transaction multiples.

It is to note however that passenger volume growth as a value driver may be quite different in mature versus developing markets as well as in large/mature versus regional airports. The potential of most mature airports to increase traffic is less important that regional airports, thus, it may trade at a lower multiple. Nevertheless, large airports benefit from a large airline base, which reduces their customer concentration and hence their operational risk.

Reciprocally, the ability of a regional airport to transform its business model is a prospect that could be factored in the transaction multiple.

By analysing the transaction multiples and the passenger traffic growth over the same period, we can observe a common trend between the two. Indeed, during the pre-crisis era (before 2008), passenger growth was expected to continue growing at similar rates observed in the preceding years rather than reverting to a mean level, this has been reflected in increasingly higher multiples paid. Similarly, during the crisis years, when the likelihood of traffic growth expectations to materialise was low, investors were bidding at lower multiples. Today, while the sector is experiencing a substantial traffic recovery and greater visibility over passenger growth, multiples are taking off again.

By regressing the EV/ EBITDA multiple of the last airport transactions in Europe (2008-2016) against the passenger compounded annual growth rate (CAGR), we can say that potentially 37% of the multiple level could be explained by passenger growth expectations (Figure 3.9).

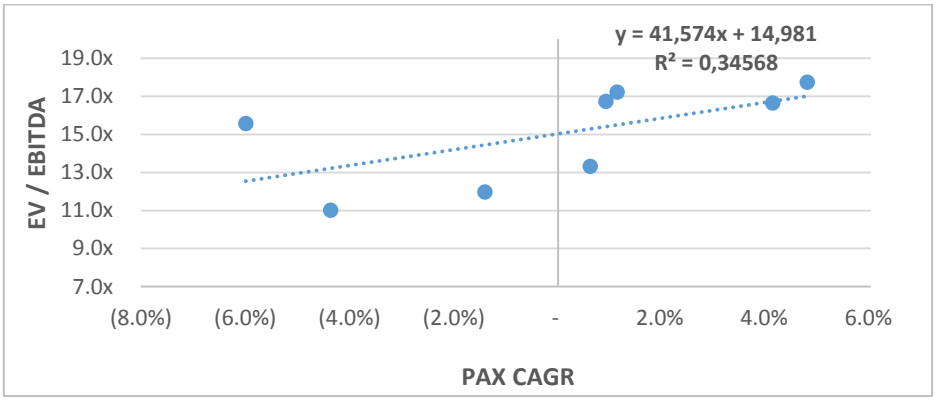

Figure 3.9: *Regression analysis, EV/EBITDA multiple vs. Passenger CAGR (2008-2016)*

Source: InfraDeals, MergerMarket, Press release, Companies information

- **The maturity of the airport/ concession life**

As a way to monetize state-owned assets, many governments decided to privatise state-owned airports to retrieve some value. Therefore, the airport privatisation business has undergone a number of interesting changes recently and has grown significantly with the most substantial activity seen in South America (i.e. Brazil), the Middle East (i.e. Jordan) and Europe (UK, French airports).

The global nature of airport transactions increased the diversity of privatisation models but three models are prevailing

- Full private ownership: the ownership is fully transferred by the government to the private sector
- Partial privatisation: The airport is privatised but the government keep a significant ownership stake

- Long-term Concession: the operator has the right to operate the airport for the duration of the concession

Aside from privatisation deals, the market is driven by secondary trade rather than primary trade. Most of the secondary trades are done in Europe, where investors are either divesting their investments (i.e. infrastructure funds with closed-end funds), looking to refinance their investments or to completely exit the market.

These changes in the structural nature of the deals can be observed in the following figure (Aviation Economics), which shows pricing trends and valuation multiples in major airport transactions since the first airport privatisation in the 1980s (BAA). We remark that as more and more airports becoming private, the balance between IPO and secondary trade is changing.

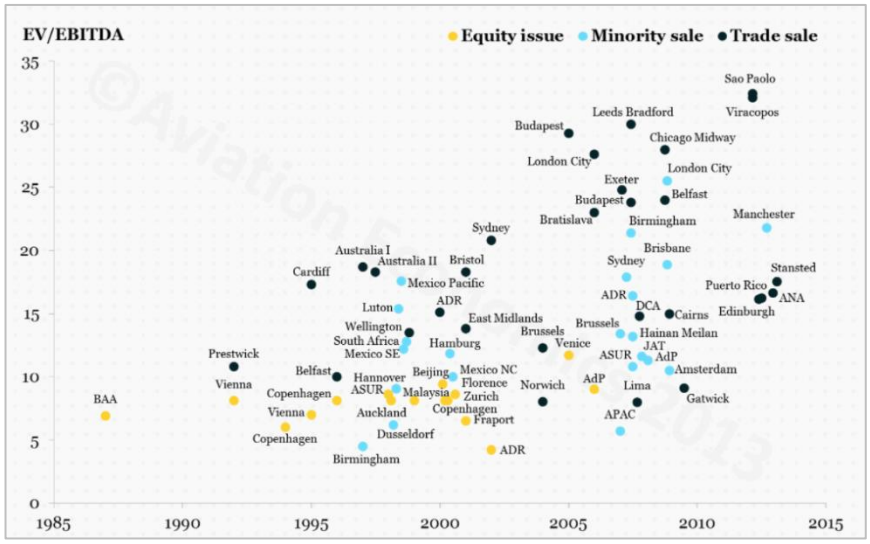

Figure 3.10: *EBITDA Multiple for selected airports transactions (2010-2016)*

Source: Aviation economics

Most of the recent privatisations were done through concession or lease contracts, enabling the state to keep long-term control over such strategic assets. The full-life of the concession in the case of greenfield airport project or its remaining life for brownfield projects is a critical driver for the price paid. Indeed, the longer the concession/lease, the higher the willingness of investors to pay as they will expect to operate the business and generate earnings for a longer period of time without renegotiating concession contract terms.

From the analysis of the terms of historical airport deals, potential buyers will generally target a lease term of at least 10 years, and would prefer 20 years or plus. In addition to the concession length, the terms of the lease are also important; i.e. rent escalators, guaranteed extensions tied to capex, etc.

To evaluate their investments, airport investors will conduct a typical exercise to calculate the value of

each additional year of the concession/ lease. This will enable them to assess whether they will need to negotiate an extension of the concession through capex improvement.

Figure 3.11: *Representation value of lease extension*

By regressing the remaining concession life against EBITDA multiple over our historical airport transaction sample (2008-2016), we find out that an R2 of 38%, meaning that the variation in the multiple can be 38% explained by the remaining concession life.

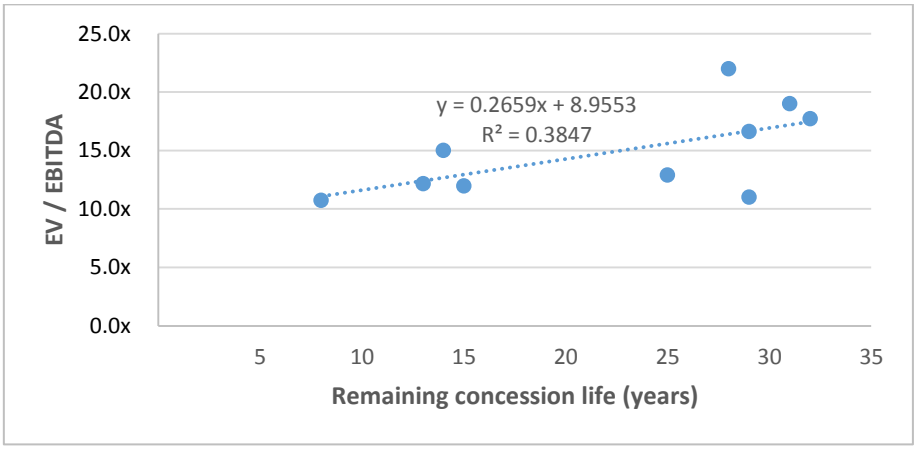

Figure 3.12: *Regression analysis, EV/EBITDA vs. remaining concession life*

Source: InfraDeals, MergerMarket, Press release, Companies information

- **The non-aeronautical revenues**

Regardless of their ownership nature, today airports are regarded as a multi-product firm and run as modern businesses especially in developed countries. The traditional view of an airport as a public utility has been transited from providing only access to aeronautical services to customer-oriented services (both airlines and passengers).

Therefore, airports revenues are today generated through aeronautical services (passenger revenues, aircraft landing and parking revenues, taxes, etc.) and non-aeronautical revenues (retail and commercial activities, real estate, car parks, etc.).

With the growing number of airport privatizations and the change of airports ownership from public to private, economic regulation is seen necessary by governments due to the monopolistic nature of

airports.

We distinguish roughly three regulatory tills for airports:

- ***Single till***

Profits derived from airport non-aeronautical activities are used to cover the fixed cost of the airport's transport-related infrastructure such as runways and terminals (aeronautical services).

Advantages	Disadvantages
- Airport charges may be lower: they cover both costs of aeronautical and non-aeronautical revenues (lower) - Easy administration - Encourages more passengers and airlines to use the airport - Reduces incentives to introduce new charges to circumvent price cap	- Reduces incentive to undertake efficient commercial activities - Caps the airport's valuation to its regulatory asset base (RAB)

Example: Heathrow, Gatwick, Munich, Lyon airport

- ***Adjusted till***

Aeronautical services are regulated, as well as some non-aeronautical. It is a transitory state from single to dual till

Advantages	Disadvantages
- No strong increase in tariffs due to the exclusion of profitable activities from the regulated perimeter - Stable airport charges - Incentive to develop retail and diversify real estate activities, which have been excluded from the regulated perimeter - Share some of the commercial costs between airport and airlines, as the commercial activities are traffic-linked	- Less clarity for investors due to the complexity of the regulated perimeter - Uncertainty for investors due to lack of visibility over the development of the regulatory regime (transitory regime)

Example: ADP, Zurich airport

- ***Dual till***

separate the aeronautical services from non-aeronautical services by ensuring that infrastructure (aeronautical) charges are sufficiently high to fully cover airport infrastructure cost.

Advantages	Disadvantages
- More efficient - No obligation for airlines to undertake investments in non-aeronautical activities - More efficient use of the airport capacity due to the higher charges - Easier estimation of the cost of capital - Maximise the airport valuation: no constraints on the return of non-aeronautical activities	- Increased sensitivity of the aeronautical charges in case of substantial capex development

Example: Fraport, Schiphol, SAVE, Sydney airport

What distinguish airports from other infrastructure investments is their dual-revenue stream; they generate revenues from aeronautical and non-aeronautical activities. Therefore, contrary to an investment in a toll road where there is no room for manoeuvre when traffic drops, airports provide many levers to tap (i.e. cutting capex, increase car parking charges). *"We love airports because they pay a steady income for our retirees, protect against inflation and are a diversifier,"* reported Andrew Claerhout of the Ontario Teachers' Pension Plan (OTPP).

From a valuation point of view, investors are willing to pay high prices for non-regulated airports or dual-till regulated airports than for single till airports. This is a pure result of the potential of non-aeronautical activities to lever significantly the expected return for airports investors/ operators as they are left with more creativity to generate additional revenue.

From the regression of EBITDA multiples of our airports' transaction sample against the CAGR of non-aeronautical revenues, we can deduct a significant linear correlation between the two parameters (R2=53%). This relationship is justified by the potential upside that investors expect from investing in airports with a significant portion of unregulated non-aeronautical activities.

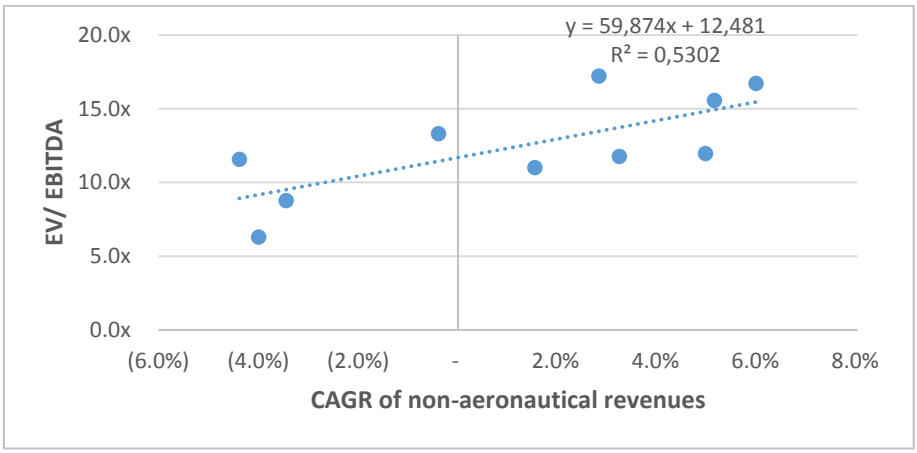

Figure 3.13: *Regression analysis, EV/EBITDA vs. CAGR of non-aeronautical revenues*

Source: InfraDeals, MergerMarket, Press release, Companies information

- **The EBITDA margin**

The airport profitability is one of the main drivers of an airport value. The higher the expected future EBITDA margin and EBITDA growth, the higher would be the price a bidder is providing. Prior to any investment or valuation exercise, investors assess meticulously the airport business model and should demonstrate the potential of the airport to increase its revenues through both aeronautical and non-aeronautical services (if applicable), while improving its competitiveness and optimizing operational costs and capital expenditures. Investors will also rely on the ability of the management to accomplish the meet the business model.

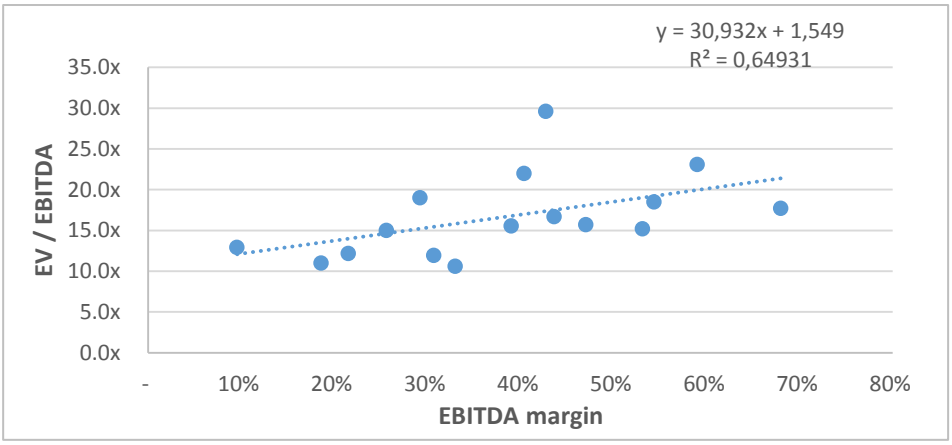

Figure 3.14: *Regression analysis, EV/EBITDA vs. EBITDA margin*

Source: InfraDeals, MergerMarket, Press release, Companies information

- **The leverage effect**

In the light of the low interest rate environment, the use of leverage is a common tool for fund managers to deliver the return required by their investors and to afford being competitive bidders during bid processes. Despite the high level of leverage used in some recent airports transactions, i.e. Nice airport, the leverage in airport deals tend to be lower compared to the pre-crisis period.

Indeed, funds managers are factoring the outcomes of the financial crisis into their strategies and are taking more long-term views on these assets (Fitch). Direct investors have preference for lower leverage and longer investment horizons in contrast to the high leverage used before the crisis, which relied on refinancing before exit and improving the performance of the asset.

The market has also been pooled by equity and cash coming from institutional investors, who are looking for alternative investment strategies to remedy to the low returns available in sovereign and corporate bonds.

"*From what we have seen, the assets are less leveraged this cycle, perhaps because there is more infrastructure focused equity there."* said Dixon, managing director of Global Infrastructure Group at Fitch.

From the strategic side, airports operators manage to improve their free cash flow generation (capex under control, opex efficiencies, traffic rebound, etc.), which allowed them to use less leverage on average compared to pre-crisis period and trending towards under-leverage (Figure 3.15).

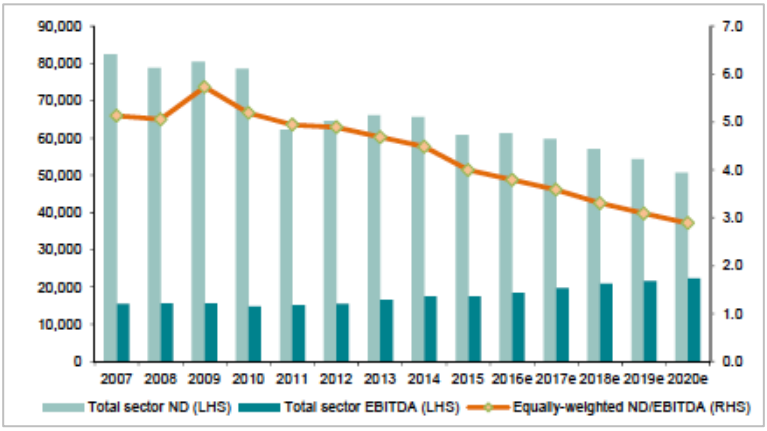

Figure 3.15: *Sector leverage - ND/EBITDA*

Source: Exane estimates (2016)

- **The low interest rate/ Discount factor analysis**

The increasing demand for core infrastructure assets (see Chapter 2) combined with the prevailing low interest rate environment have led the infrastructure asset prices to increase substantially since 2010. JP Morgan Asset Management estimates the decrease in average valuation discount rate for core infrastructure assets to approximately 3% to 3.5% between 2010 and 2015 (JPM AM, GRA, 2016). Under the assumption of steady cash flows and stable leverage level, the corresponding average price increase ranges between 30% to 40%.

Based on a sample of main European airports, we computed the average corresponding WACC for the airport sector. The analysis (figure 3.16) shows that following the financial crisis, the cost of capital (WACC), thus the discount rate, has decreased steadily as result of the low interest rate environment (low risk free). Hence, there is no doubt regarding the favourable impact of low interest rates on valuations. Further, fund managers and/or corporates using leverage were in position to benefit from the low cost of debt and enhance their equity returns, leading to higher valuations.

Additionally, many investors and especially institutional investors, have lowered their return expectations as those are based on the level of interest rates. Therefore, the prices of airports assets have increased dramatically as result of these low return expectations (the discount factor).

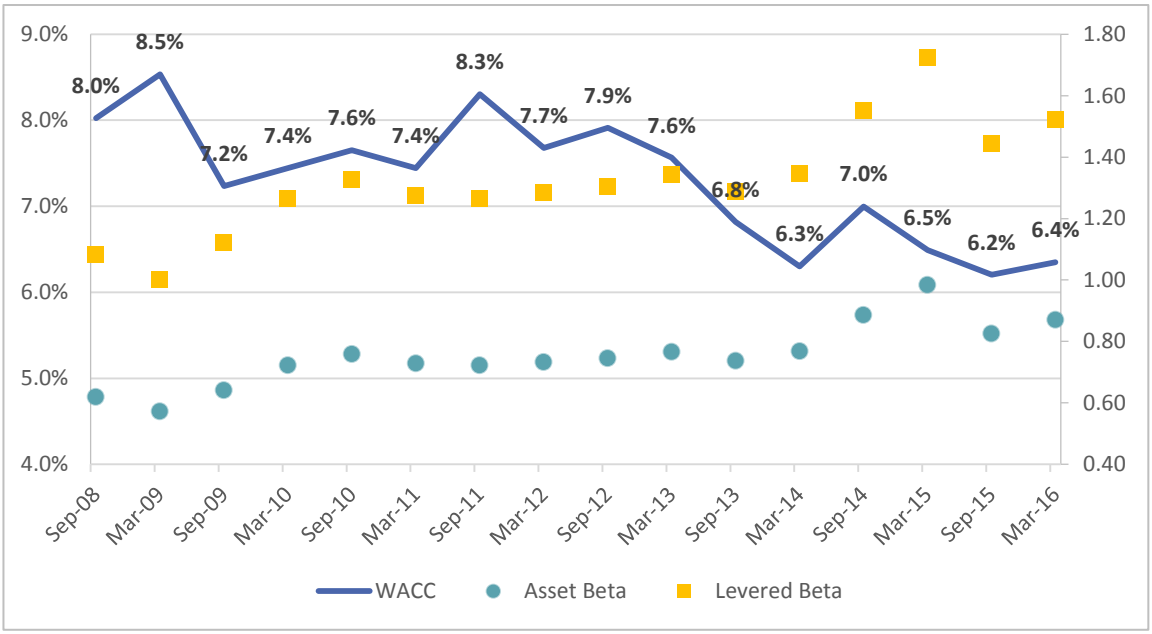

Figure 3.16: *Evolution of historical WACC and Beta*

Source: Companies information

4.2 Potential explanations for the current pricing (general to infrastructure assets)

In the mid to late 2000s, against a backdrop of greater availability of credit and sustained passenger traffic growth, EV/EBITDA transaction multiples for European airports reached 25x or above. This was largely buoyed by strong passenger traffic growth forecasts at the time of these transactions. Despite being marketed to be relatively resilient to economic fluctuations, the airport cash flows took a hit during the global financial crisis, owing to a lack of financing, reduced confidence in air traffic travel demand, which led to a decline in airport transaction multiples. Since then, average multiples have modestly rebounded, and valuations have, overall, continued to move upward, driven by capital inflows and historically low interest rates. In this section, we attempt to understand and analyse the underlying dynamics that drive this the current pricing of airports and de facto, of core infrastructure assets.

Low-yield environment

Since the global financial crisis, bond yields in developed economies across the world have been driven down to historic lows due to weak economic growth and excess liquidity (as a result of global quantitative easing programs) – this has created two key forces which both have buoyed valuation:

1) Valuation mechanics: Unlisted infrastructure valuations are prepared at the outset using a DCF analysis of forecast future cash flows. As such, bond yields are an important input, as they are in practice, used as a proxy for risk free rates and impact both the cost of debt and equity. Consequently, ceteris paribus, rising rates will mechanically lower asset valuations by

increasing the discount rate. Granted, some unlisted infrastructure investors are thinking ahead and instinctively expect a "mean reversion" in bond yields and have embed an additional 'alpha factor' in discount rates. This can help created a buffer and moderated the rise in unlisted valuations (AMP Capital).

2) Global search for yield: Due to the effects of the low interest rate environment it has been challenging for institutional investors such as insurance companies and pension funds to generate sufficient returns via traditional asset classes to meet their guarantees to policyholders and pensioners. As such, they are seen to be accelerating efforts to seek better returns by further venturing into alternative investments, notably infrastructure. It is also important to note that as these large Investors increase their allocation, they have turned to opt for direct or co-investment models rather than relying solely on traditional infrastructure funds.

The net effect of the high demand from institutional investors for infrastructure assets and prevailing low bond yields has cause infrastructure asset prices to increase steadily since 2010. According to JPM's estimates, the average valuation discount rate for core infrastructure investment has declined on average by approximately 300 to 350 basis points from 2010 to 2015. Assuming steady cash flows and leverage levels, such a decline in discount rates translates to an average price increase or capital appreciation of approximately 30-40% (JPM).

Changing investor landscape

In order to understand the pricing premiums of airports, it is important to understand the investors behind the valuation. The airport investor landscape in Europe has evolved quite significantly. In the past, airports operators and construction companies were the main players in this space. Today, major players also include a wide range of financial investors, from infrastructure funds up to previously conservative pension funds that are investing indirectly or directly in airports, along with insurance companies, sovereign wealth funds and private equity houses.

The appetite for infrastructure investments has increased significantly in the last years (as analysed in Chapter II) with institutional investors looking for attractive returns relative to fixed income and lower volatility relative to equities. The high cash accounts these investors hold enable them to allocate high tickets to infrastructure investments while requiring lower returns compared to other investors. These capital allocations may either be made indirectly through mandates or directly through direct investments (in-house investments for large pension funds), enabling them to avoid paying high management and performance fees hence improving further their target returns.

The flood of capital towards infrastructure resulted in perceived high bidding prices coming from institutional investors investing directly into this asset-class. Partners Group (2015) refers to this phenomenon as asset price inflation. A survey conducted by Infrastructure Investor (2014) stated that

"Infrastructure assets in countries perceived to be well regulated and creditworthy, i.e. UK, have become expensive".

According to a study published by Deloitte, secondary sales of assets to direct investors, mainly due to the obligation to exit a transaction as the closed-end fund reached its end, are expected to increase. Figure 3.17 presents the breakdown of the bidders (acquirers) for the airports transactions closed since 2008: the portion of direct pension funds investors is significant and the chronological breakdown over the last years demonstrates the increasing share from successful deals these types of investors are winning over the years.

This pattern can already be observed in the market, with one of the most recent transactions being the sale of London City Airport by GIP and Oaktree to a consortium predominantly consisting of direct institutional investors.

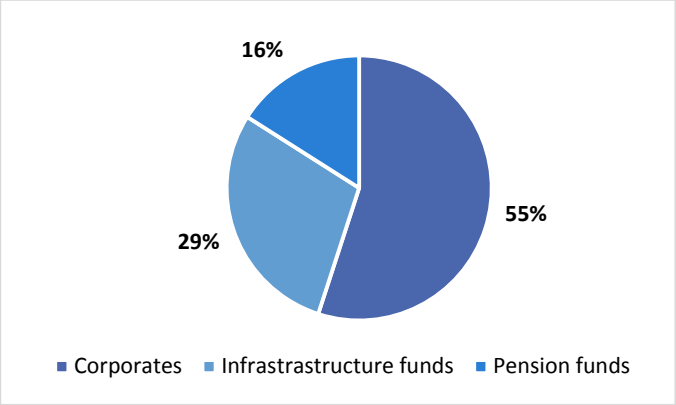

Figure 3.17: *Profile of airports' selected bidders for transactions completed since 2008*

Source: Companies information, MergerMarket, Infra Deals

Scarcity of assets

Private involvement in Europe's airports has nearly doubled since 2010 – driven by a mix of deliberate policy choices, State budgetary constraints, and the need to promote air connectivity by investing sufficiently in the development of airport infrastructure (ACI Europe). Alongside the significant increase in private participation in Europe's airports, there is a second clear trend identified: private participation is more focused on the larger airports. This reflects the fact that larger airports are more suitable for private investment, whereas smaller airports tend to be subject to a more limited range of private operation models due to their susceptibility to be structurally unprofitable. This pattern is noted by observing recent trends and transactions as well as the upcoming pipeline of activity, where major capital-city airports have become a very desired "trophy" asset. As such, they are attracting a lot of potential bidders, including pension funds, sovereign wealth funds, infrastructure funds and airport operators alike. "We love them because they pay a steady income for our retirees, protect against

inflation and are a diversifier," says Andrew Claerhout, senior vice president at the Ontario Teachers' Pension Plan (OTPP), which is to date, an investor in five European airports.

However, inherent to all high-quality goods, there is currently a limited supply of airports in the market. Respecting the forces of demand and supply, the rise in demand for assets coupled with a limited availability of those same assets have pushed prices up, slowly moving away from airport fundamentals. However, it would seem the strong interest in this asset and the significant pricing premium offered by some investors can be warranted. For example, while the London City Airport 30x EBITDA valuation caused concerns, it is clear that this particular asset has always attracted the attention of investors more than its competitors for its strategic position in London (ACI Europe). Looking forward, demand from investors will likely continue to exceed supply for the foreseeable future, creating persistent upward pressure on prices. Although, researchers at PwC expect privatization activity to continue growing apace as airport sales remain attractive to cash-strapped governments seeking to realize cash through asset sales, and thus lead to some improvement in unlisted asset availability in the future. This will be supported by the activity between private players, with closed-ended infrastructure funds of older vintages looking cash out and to realize value, thus keeping supply and deal volumes flowing.

Excessive leverage

Leverage is the strategy of using debt to increase return on an investment. As such, high gearing levels can be structured in the purchase of infrastructure assets thanks to the stable, inflation-proof cash flows that can sustain high levels of debt. Their strong cash-generative characteristics means acquisitions can be funded with large amounts of debt (Hughes). However, this is will depend on credit market conditions that impact the amount, cost and terms of credit available to infrastructure assets, as such this is further encouraged due to the availability of cheap debt. Consequently, in the bidding process of airports, potential investors may be willing to propose to pay higher prices, while benefiting from enhanced IRR thanks to leverage.

We have observed a relatively increasing level of leverage in the last airports' deals and we will be sharing the case of one of the last French regional airport privatization, i.e. Nice airport privatisation, to illustrate this.

Nice Airport privatisation

The privatisation of the airport was initiated by the French State to sell its stake (60%) in the airport and has resulted in the sale of 64% of Nice airport (60% from the State and 4% from the local Department Altes-Maritimes) to a consortium called Azzurra Aeroporti, which comprises Atlantia (65%), its subsidiary Aeroporti di Roma (10%) and EDF Invest (25%).

The price paid by the consortium for the acquisition reached €1220m, i.e. 22x 2015-EBITDA), 2x

EBITDA higher than the second selected bidder, reflecting the aggressiveness of the bid. This price could not be sustained by the bidder should it be paid using pure equity.

In fact, the investment vehicle met its debt requirements using a €653m debt provided by five Italian banks (Unicredit, Banca IMI, Banca Monte dei Paschi di Siena, Cassa di Depositi e Prestiti and Japan's BTMU). One of the big French banks working on the deal (confidential), disclosed to us following some interviews with some directors, that they refused to participate in the underwriting of this debt as they perceive the deal to be highly leveraged and mentioned that they consider the price to be "very aggressive".

The syndicated debt is a bullet 5-year loan of an initial 175bps margin over Euribor that steps up after 3 years. Thus, the consortium should refinance its debt in three years at the latest before the higher rate kicks in, which gives the investment vehicle three years to come up with a strategy to finance the airport on the long-run. One potential alternative for the refinancing is a public or private bond issue with a maturity equal or close to the concession's maturity (28 years).

Aggressiveness of the business model

While the capital need for infrastructure investments is increasingly inflowing, investors may encounter obstacles to find appealing and attractive infrastructure assets to invest in. This demand/ supply mismatch combined with the current low interest rate environment may incentivise investors to bid at higher prices in order to secure some deal flows and meet their target performance. More particularly, asset managers may be attempted to bid aggressively when they manage closed-end funds, with a defined investment period, as they have to deploy the committed capital as soon as possible, otherwise they lose their management fees.

In that case, managers may be factoring unrealistic assumptions in their business models to justify the prices they are willing to provide to match the expected returns that the asset is to generate. Following an interview by Infrastructure Investor (2017), Ian Simes, senior vice-president for Brookfield Asset Management (2017) stated: "*We're seeing core infrastructure equity at sub-10 percent IRRs and that doesn't seem to put very much return on risks like regulatory changes or exit multiples. If you're a 10-year closed-ended equity fund and you buy something today at a very high multiple, and you're expecting to sell it in 10 years' time for that same high multiple, if discount rates are higher and general values have come down for whatever reason, then you may not achieve the IRR you were expecting."*

Infrastructure Investor (2017) also reported (following one of its recent interviews) that a senior member of a recognised infrastructure fund, who is known to have a fairly conservative risk appetite, clearly stated that to lock a deal, its team is now including in base case scenarios all the elements that previously was exclusively reserved for the upside scenario (Infrastructure Investor, 2017).

Conclusion

In the last years, infrastructure assets have gained significant popularity and has become a recognisable asset-class attracting increasingly financial investors, especially institutional investors. Thanks to their desirable investment characteristics (cash flows visibility, indexation to inflation, risk-adjusted returns, etc.), and the widespread need for yield-generating assets, institutional investors are increasingly looking to commit more capital into this asset-class in order to diversify their traditional multi-asset strategies (alternative strategies) and to match their long-term liabilities, specifically in the current low-interest environment. Going forward, the attractiveness of the risk-return of infrastructure assets is expected to engender an increasing capital allocations.

With this increasing demand and the relatively low supply of "attractive" core infrastructure assets (the majority is publically held), an evident macro-economic result would be an increase in the prices paid for such assets. The analysis of the last infrastructure closed deals (since 2008) in mature countries has reflected the "increasing" valuation for infrastructure assets in general and more particularly for some specific core infrastructure sub-sectors such as airports, on which we have focused our analysis.

As we have presented in the introduction, the purpose of the thesis was to analyse the current valuation levels for core infrastructure transactions, to analyse the main drivers for these valuations and to attempt to explain what would be the reasons for an overvaluation of these assets, which may occur when the IRR does not compensate for the risks embedded in the assets or in the financial structure.

Infrastructure is a relatively young asset-class and lacks significant data compared to real estate investments or private equity. The lack of standardised performance data for unlisted funds is one of the main challenges infrastructure investors face when considering infrastructure investments. This was also one of our main challenges while working on this thesis, which make the analyse and the parallel assessment of the price paid for infrastructure deals and the performance delivered (IRR) to investors very challenging. Thus, we focused our analysis on the statistical significance of different value-drivers as variables that could justify the price level that may be offered for the acquisition of an infrastructure asset.

The analysis of our data sample, collected from the screening of the last private and public airports transactions conducted since 2008 in mature countries (developed countries with limited/ no political risk), enables us to assess how different drivers can impact the value (measure by EV/EBITDA) offered for an airport and the level of this impact. We've noted that the main drivers include revenue drivers such as expected passenger growth and the presence of non-aeronautical revenues, as well as asset features such as the maturity the airport in question, and finally financial drivers including the EBITDA margin and capital structure of the asset.

However, the question remains whether the valuation paid, once justified by the quantitative value-drivers and the business model expectations, is reflected in the IRR that would be delivered by the investment. The answer is quite "tricky" as this would depend mainly on the strategy of the investor.

Broadly speaking, if we consider a buy and hold strategy (the case for pension funds), the value may be justified thanks to their long-term investment strategy that will enable them to end up delivering the expected IRR and hence justify the price paid for their investments. If we consider in particular the case of airports, this value could be considered deliverable thanks to, among others, the long-term profile of the investment (concession life), the upside that may arise from non-aeronautical revenues (highly impacted by the airports regulation) and the potential to increase the airport capacity and benefit from an increasing air-traffic (passenger growth).

However, in a bullish market for core assets, IRR, hence the price that an investor is willing to pay, largely depends on the exit strategy (lifetime IRR lower than Exit based IRR). It's relatively similar to the Leveraged Buyouts, prices could increase up to a point where it collapses (bubble?), so it is a question of market timing as well. Thus, investors could take that bet of buying at high price to sell at higher price, but it is a risky strategy, i.e. factoring unrealistic assumptions into their business models (speculating?).

Acronyms

AuM	Assets under Management (sum of dry powder and unrealized value of portfolio assets)
DCF	Discounted Cash Flows
EBITDA	Earnings Before Interest, Depreciation & Amortization
EV	Enterprise value
GPs	General partners
IPD	Investment Property Databank
IRR	Internal Rate of Return
JPM	J.P. Morgan
JPM AM	JP Morgan Asset Management
LPs	Limited Partners
OTPP	Ontario Teachers' Pension Plan
PPP	Public Private Partnerships

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- Deutsche Asset Management reports
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- PwC airports market report (2016)

Databases

- Prequin
- InfraDeals
- Bloomberg
- Datastream
- Infrastructure Investor
- MergerMarket
- Thompson One
- Capital IQ