

Research Report

Understanding Infrastructure Debt

July 2017

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1 Executive Summary

This paper is an introduction to infrastructure debt which discusses key benefits, risks¹ and performance characteristics of the asset class.

- **Market Opportunity:** With infrastructure funding needs rising globally, and most governments facing budget pressures, the private sector increasingly plays a critical role in closing the funding gap, and infrastructure debt represents an important part of this needed capital. Infrastructure debt has traditionally been a space occupied by banks, but in recent years it has gained popularity among investors, with the infrastructure fixed income and private loan markets becoming more prominent.

Globally, demand for infrastructure debt continues to grow, as historically low interest rates are causing investors to look for alternatives that offer attractive risk-adjusted returns, without diverging significantly from the risk profile of investment grade² and sovereign bonds. Driven by growing interest in this asset class, Deutsche Asset Management contributed to the development of the iBoxx Infrastructure listed corporate debt index family, filling the gap for a transparent benchmark³.

- **Credit Quality & Risks:** Cash flows generated by infrastructure assets tend to be predictable in nature and visible in the long-term due to the essential and quasi-monopolistic nature of services provided, which leads to a performance that can be resilient to the economic cycle. Infrastructure debt can expose investors to several risks, including for example market risk, technology and counterparty risk⁴. However, infrastructure debt has historically enjoyed higher credit ratings, lower default probabilities, and significantly lower ratings volatility compared with equally rated debt in other sectors, particularly during bearish credit cycles.

The hard-asset backed nature of infrastructure assets and the relative stability of asset valuations have historically translated into higher recovery rates for creditors in case of default. European regulators have recently recognised these benefits under the new Solvency II framework, leading to a reduction in capital charges for insurance companies investing in qualifying infrastructure debt⁵.

- **Duration & Diversification:** Infrastructure debt offers exposure to long-dated assets, and represents a valuable source of duration for long-term investors with longer dated liabilities including pension funds and insurance companies, who are focused on buy and hold strategies. Correlation coefficient levels also demonstrate that infrastructure debt can provide diversification benefits as part of a multi asset class portfolio.
- **Risk-Adjusted Returns:** Infrastructure debt has potential to provide strong risk-adjusted returns compared with other asset classes, as the long-term predictability of cash flows generated by infrastructure assets has historically translated into comparatively historically lower return volatility. Within long duration fixed income investment strategies, listed senior infrastructure debt offers exposure to a liquid portfolio of large, investment grade rated assets, operating mature businesses with limited 'greenfield' risk. Historically, for buy-and-hold strategies, comparatively lower loss given default (LGD) levels translate into a default-adjusted spread premium over corporate bonds at equal rating level and duration.
- **Private Infrastructure Debt:** Compared with listed strategies, private debt investment strategies are more complex and require expertise to be originated and managed, but are more pure-play and therefore significantly more popular. Private debt can capture an additional illiquidity premium over listed debt, and offers greater potential for diversification and alpha, for both corporate or project finance loans.

Private debt strategies can focus on senior investment grade debt, or move higher in the risk/return scale, investing for example in mezzanine debt, or in projects involving construction risk, while strong lender protections can be achieved via ad hoc structuring and covenants⁶.

¹ Deutsche Asset Management, Research Report, "Why Invest in Infrastructure", May 2017

² Investment grade debt is rated 'BBB' and above

³ IHS Markit, "Markit iBoxx launches infrastructure bond indices", 26 July 2016

⁴ Standard & Poor's: "Lessons Learned From 20 Years of Rating Global Project Finance Debt", October 2014

⁵ European Commission, "Press release – Capital Markets Union: Making it easier for insurers to invest in infrastructure", 1 April 2016

⁶ Past performance is not indicative of future returns. There is no assurance that investment objective will be achieved

2 Introducing Infrastructure Debt

2.1 Market Overview

While traditionally the route to infrastructure investment has been equity, in recent years the infrastructure debt market has developed rapidly, offering a wider set of opportunities to long-term investors. Institutional investors increasingly see infrastructure debt as a way to diversify their portfolios by investing in real assets with performance characteristics that are resilient to the economic cycle, and have the potential to provide duration, long-term cash flow predictability⁷, strong credit quality, and a yield premium over other fixed-income opportunities.

- **Growing Investment Needs:** In the past 40 years, government debt as a share of GDP has increased materially, and heightened fiscal scrutiny has led to a reduction of public investment, particularly since the financial and sovereign debt crisis.

As a consequence of falling public investment, infrastructure investment has been neglected in many advanced economies⁸. As fiscal constraints continue to put pressure on public budgets, private capital increasingly represents a pivotal source of funding for infrastructure investment, with debt markets expected to play a key role to close the funding gap.

Over the next 15 years global infrastructure investment needs account for about 3.8 percent of GDP, or about USD 3.3 trillion a year⁹. Under the conservative assumption that only 20 percent of investment needs will be funded privately¹⁰, at an average leverage of 60 percent¹¹, the potential size of the global infrastructure debt opportunity, excluding refinancing of outstanding debt, is ca. USD 400 billion per year, of which about one third, or ca. USD 150 billion is in developed markets, including Western Europe, the United States and Canada.

- **Banks Retrenching:** Banks account for the largest share of the private infrastructure debt market, but their appetite may continue to decline in the future. Given the long-term nature of infrastructure cash-flows, infrastructure debt generally takes the form of long-term debt, with maturities of bonds and loans typically in excess of seven years¹², which ideally match long-term, often fixed liabilities of institutional investors, including pension funds and insurance companies. Banking regulation (Basel III), planned to be fully phased in by year-end 2018, will lead to banks' diminished appetite for long-term lending, as regulation requires them to seek longer-term funding, which is generally more expensive, to better match assets and liabilities¹³.

Stricter leverage ratios and higher capital charges under Basel III will continue to drive a gradual shift in bank capital from long-term infrastructure lending to other sectors, and may lead to a potential widening of the funding gap and cost in the medium-term.

- **A New Role for Institutional Investors:** As banks retrench from long-term lending for regulatory reasons, or shift to originate-to-distribute" models (OTD)¹⁴, the decrease in available debt financing is driving demand for alternative funding sources, including capital markets and private debt markets. Infrastructure debt is therefore attracting non-traditional lenders, and is establishing itself as a capital efficient building block to long-term investors' portfolios, particularly in the case of private infrastructure loans.

Infrastructure debt allocations have grown over time, and as of December 2016 estimated average target allocations are all above current allocation levels for investors located in Europe and North America. We anticipate therefore both infrastructure capital markets and private debt markets to continue growing in the long-term as institutional investors look to increase their exposure to infrastructure debt, which will have the added effect of continuing to replace banks as a funding option for infrastructure corporate lending and project finance.

⁷ Deutsche Asset Management, "Why Invest in Infrastructure", May 2017. There is no assurance that investment objectives can be achieved

⁸ Oxford Economics, Research Briefing, "Public Investment Trends in Advanced Economies", August 2016

⁹ McKinsey Global Institute, "Bridging Global Infrastructure Gaps", June 2016

¹⁰ World Bank, "World Bank Group Support to Public-Private Partnerships: Lessons from Experience in Client Countries, FY 2002-12", February 2012

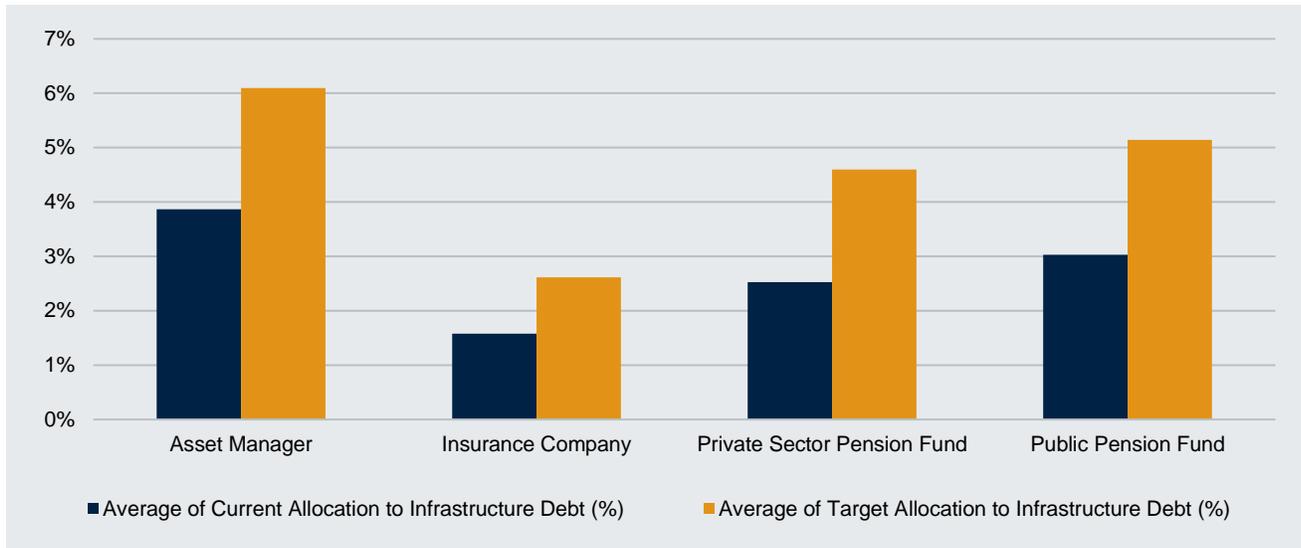
¹¹ Estimate based on Deutsche Asset Management proprietary database of infrastructure transactions, April 2017

¹² Estimate, based on Deutsche Asset Management Infrastructure Research internal transaction database, May 2017

¹³ OECD, "Infrastructure Financing Instruments and Incentives", 2015

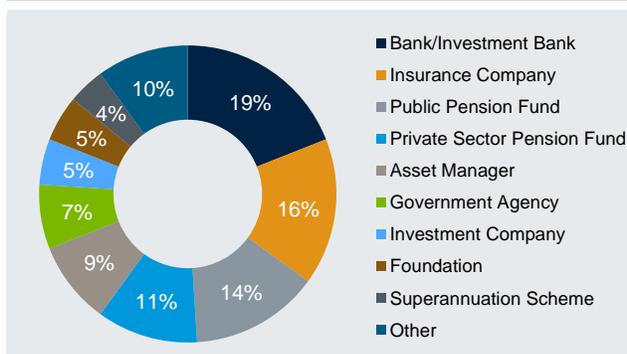
¹⁴ S&P Global, "Infrastructure Finance Outlook, Q1 2017 Issue", April 2017

Allocation to Infrastructure Debt by Investor Type (December 2016, Estimate, %)



Source: Deutsche AM, Preqin, December 2016. The estimate includes only investors based in North America and Western Europe that are already investing in infrastructure debt. Past performance is not a guide to future results.

Institutional Investors with a Preference for Unlisted Infrastructure Debt (by Type)¹⁵



Source: Deutsche AM, Preqin, September 2016. Past performance is not a guide to future results.

Investors look at infrastructure debt as an option that can offer¹⁶ a risk-adjusted yield premium compared to equally rated debt in other sectors, without diverging significantly from the low-risk proposition and high credit quality of sovereign bonds.

In our view, a growing market, rising allocations and a continued capital influx to infrastructure debt are increasing the level of complexity and competition in the industry. For this reason, we believe that sophisticated deal sourcing, origination and credit analysis skills, supported by an in depth understanding of the asset class are essential factors to consider when investing in infrastructure debt.

2.2 Private and Listed Debt Markets

Investors looking at infrastructure debt can consider entry points with different liquidity and risk/return profiles, including private debt and capital markets. Today, institutional investors are predominantly focused on private infrastructure debt strategies, offering access to pure-play assets supported by long duration, strong credit quality, and the possibility to capture an illiquidity premium. However, investors may increasingly look at infrastructure capital markets in the future as a complementary strategy to get exposure to some of the benefits offered by private infrastructure debt, while simultaneously retaining the advantages of liquidity. This is particularly true after the recent call by the European Commission encouraging insurance companies to reduce the amount of capital that they need to hold under Solvency II also when they invest in infrastructure corporates¹⁷.

- **Private Debt:** Private infrastructure debt offers opportunities varied by geography, sector, size and seniority to investors with a long-term buy and hold strategy. It offers access to a wider sector and credit spectrum

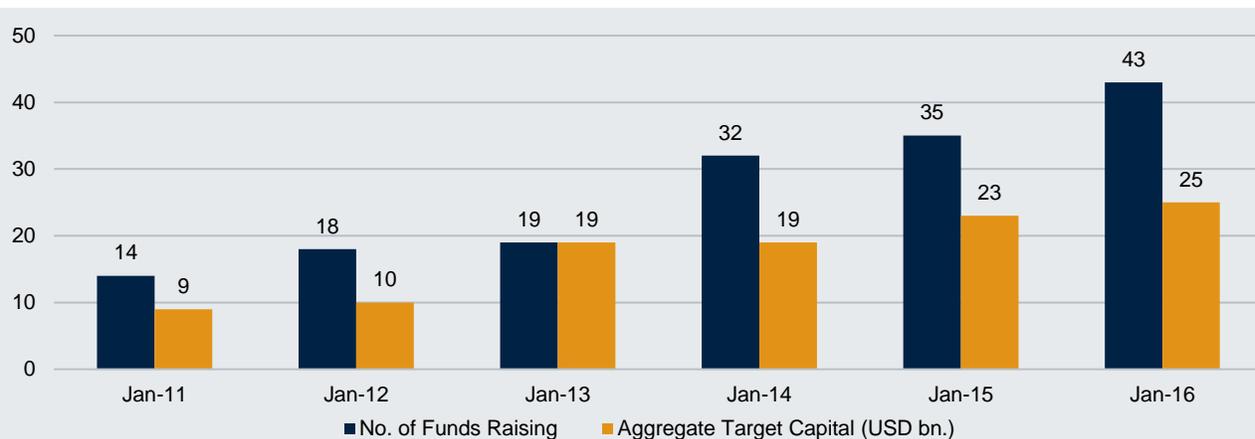
¹⁵ Preqin, "Preqin Special Report: Infrastructure Debt", September 2016

¹⁶ There is no assurance that investment objectives can be achieved

¹⁷ Investment & Pension Europe, "Commission calls for Solvency II rule change to boost infra pending", 8 June 2017

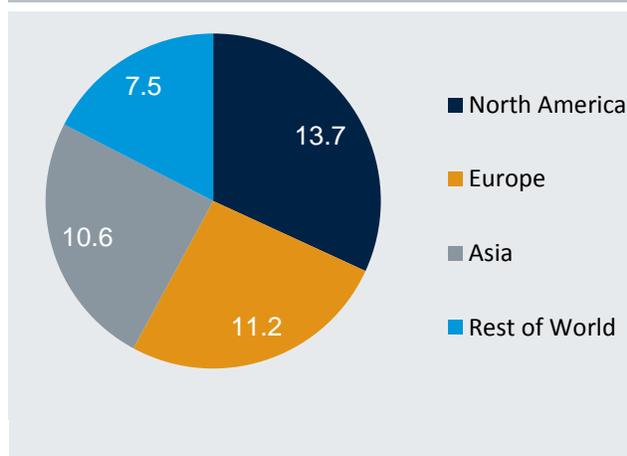
compared with listed infrastructure debt, including opportunities both on the investment grade and high yield markets¹⁸. Moreover, private infrastructure debt can be more pure-play and offer stronger diversification benefits compared with listed infrastructure debt. Particularly at origination it can offer a yield premium over listed infrastructure debt¹⁹, potentially compensating for the relative illiquidity. However, we observe that an active secondary market for private infrastructure loans is continuing to develop, supporting its liquidity profile.

Unlisted Infrastructure Debt Funds in Market over Time, (January 2011 – January 2016)



Source: Preqin, September 2016. Past performance is not a guide to future results. Data as at August 2016.

Unlisted Infrastructure Debt Aggregate Capital Raised by Primary Geographic Focus, (USD bn. 2009 – 2016 YTD)



Source: Deutsche AM on Preqin database, September 2016.

In recent years, private infrastructure debt has become an increasingly important component of the unlisted infrastructure industry, with globally over USD 187 billion of bank debt and USD 62 billion of public private partnership (PPP) debt closing in 2015. In 2015, project finance volumes reached around USD 430 billion, continuing to grow steadily from about USD 300 billion in 2009²⁰.

According to Preqin, since 2009, 89 unlisted infrastructure debt funds focusing on private debt have reached a final close, raising an aggregate USD 43 billion. North America-focused infrastructure debt funds have raised the most capital since 2009 with USD 13.7 billion, supported by the large pipeline of energy transactions, followed by Europe at USD 11.2 billion and Asia with USD 10.6 billion²¹.

The majority of private infrastructure debt funds in the market have a size of less than USD 500 million, as investors would initially invest smaller ticket sizes, as the asset class track-record gradually improves. Therefore, the size of unlisted infrastructure debt funds is forecast to continue increasing, along with investors' experience with the asset class²².

- **Capital Markets:** Capital markets play an important role in financing infrastructure, and provide investors with access to a wide range of liquid infrastructure bonds across different sectors and geographies. Bonds are traded on established markets and provide a return in the form of fixed, periodic interest payments. While stocks are only issued by public companies, bonds are issued by both public and private companies. Moreover, while a company usually issues only a single series of common stock, it may issue a variety of bonds, each with specific

¹⁸ High yield debt is rated 'BB' and below

¹⁹ There is no assurance that investment objectives can be achieved

²⁰ Preqin, "Preqin Special Report: Infrastructure Debt", September 2016

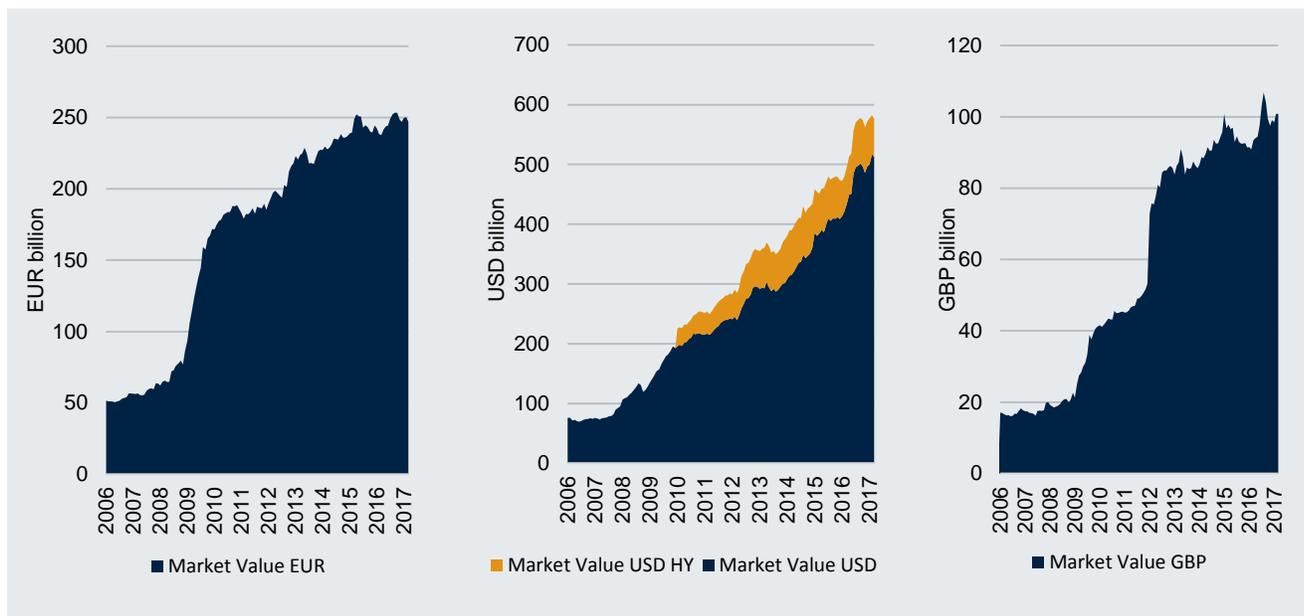
²¹ Preqin, "Preqin Special Report: Infrastructure Debt", September 2016

²² Preqin, "Preqin Special Report: Infrastructure Debt", September 2016

characteristics and maturities. Some infrastructure bonds are amortising, but most bonds are ‘bullet’, returning capital at maturity, and exposing issuers to potential refinancing risk. Bond investors have in general no, or very low appetite for construction, demand and project specific risk. Today, infrastructure bonds are therefore issued mainly by large corporations, offering exposure to large, diversified, operational businesses.

Global debt capital markets totalled USD 5.3 trillion in 2015, and corporate bonds issued by infrastructure corporates, including for example utilities, airports and ports, typically represent 20 to 30% of the market²³. Infrastructure related capital markets debt volumes continue to grow, outpacing other investment grade rated debt, with over USD 33 billion of new infrastructure bonds issued in 2015²⁴ and aggregate iBoxx infrastructure index qualifying debt (denominated in dollar, euro and sterling) reaching over USD 1 trillion in aggregate capitalisation²⁵.

iBoxx Infrastructure Debt Index, Market Value (2006-2017 YTD, EUR, USD, USD HY, GBP)



Source: Deutsche AM, IHS Markit, March 2017. Past Performance is not a guide to future results.

Based on data available for the iBoxx infrastructure debt indices²⁶ we note that in Europe, the infrastructure corporate bonds market is predominantly investment grade, while in the United States a market for high yield bonds exists, but remains relatively limited in size. Utilities represent over 50% of total capitalisation, but other sectors, including transportation, continue to grow.

Beyond the corporate bonds market, a new market for listed project bonds is emerging and we believe may grow materially in coming years²⁷, alongside the issuance of green bonds associated with infrastructure financing. However, it is currently limited in size, with estimated debt outstanding in Europe totalling EUR 14 billion and relatively illiquid²⁸. Project bonds are publicly traded debt securities issued to fund specific, stand-alone projects, and can provide investors with pure-play investment opportunities that are more comparable with the private infrastructure loan markets.

Corporate infrastructure bonds can be less “pure-play” compared to private debt and listed project bonds, as corporates may also engage in ancillary, non-infrastructure operations. However, listed corporate infrastructure debt retains many of the advantages of infrastructure, while offering the benefit of being a liquid asset class. In our view, as the asset class expands further, investors will increasingly consider specific allocations to listed infrastructure corporate debt strategies. Listed corporate infrastructure debt is exposed to market volatility, but

²³ Thomson Reuters, “Debt Capital Markets Review”, Full Year 2015

²⁴ InfraDeals Trend Report, 2015, March 2016

²⁵ IHS Markit, Capitalisation of iBoxx Infrastructure index as at 30 October 2016

²⁶ Data as at December 2016

²⁷ Past performance is not indicative of future returns. There is no assurance that investment objective will be achieved

²⁸ Bloomberg, 17 October 2016

has historically been less volatile compared with bonds issued by other corporates. It has also historically demonstrated²⁹ stronger credit quality and risk-adjusted returns, particularly for buy-and-hold strategies³⁰.

3 Defining Infrastructure Debt

3.1 Key Features

There is no bright line distinction between infrastructure and non-infrastructure debt. However, Deutsche Asset Management believes that when considering an allocation to infrastructure debt, investors should focus on issuers with business profiles that operate assets with the following key characteristics:

- **Essential Services:** User demand patterns for infrastructure assets tend to be relatively inelastic given the essential nature of these services. They therefore tend to exhibit a lower correlation to the economic cycle compared with other sectors, supporting long-term performance visibility³¹.
- **High Barriers to Entry:** Infrastructure requires high initial capital investment and this acts as a significant impediment to potential competitors entering the market. Assets can enjoy monopolistic or quasi-monopolistic market positioning, as it would be economically unsound, or legally not possible to build a competing facility. Examples of natural monopolies include water infrastructure, as well as gas and electricity grids, hence why such assets are almost always regulated.
- **Diversified End-User Base:** The counterparties to infrastructure assets are generally a widely diversified group of end users which helps to stabilise cash-flows. Often the customer base includes governments and local authorities that tend to be more creditworthy than most private counterparties³².
- **Long-term Cash Flow Predictability:** Infrastructure cash-flows need to be predictable in the long-term. For regulated assets, regulatory frameworks provide long-term revenue visibility to infrastructure investments. Ownership of regulated infrastructure can be transferred to private investors through long-term concession agreements, granting the right to operate a business under a predictable tariff regime, often indexed to inflation. Unregulated assets can be exposed to various degrees to volume and price risk, and it is important that cash-flows are contracted to support long-term predictability³³.
- **Real Assets:** Infrastructure represents a tangible asset – i.e. a combination of land and structures that constitutes real property. Real property will almost always retain a residual value in case of default, supporting recovery rates compared with debt issued by other asset classes³⁴.

3.2 Classification by Sector

- **Listed Infrastructure Debt:** Deutsche Asset Management collaborated with IHS Markit on the development of the Markit iBoxx infrastructure debt indices. The indices were created as a subset of the iBoxx corporate debt indices to track the performance of listed infrastructure corporate bonds, and exclude project bonds and private loans, due to limited data availability³⁵. However, the indices represent a valuable starting point to provide investors with a targeted classification system to determine sector and issuer eligibility.

Bonds are often issued by large corporations with diversified business profiles. The iBoxx infrastructure debt indices include only bonds issued by corporates that engage mainly in infrastructure operations, and have negligible exposure to operating cash-flows from other businesses. It is important to look at the sector of operations, but also at the specific business and financial profile of the issuer, excluding companies that rely materially on volatile and erratic businesses.

²⁹ Past performance is not indicative of future returns. There is no assurance that investment objective will be achieved

³⁰ Based on analytical evidence provided by the iBoxx infrastructure debt indices as at December 2016

³¹ Deutsche Asset Management, Research Report, "Why Invest in Infrastructure?", May 2017

³² S&P Global, "2016 Annual Sovereign Default Study and Rating Transitions", 3 April 2017

³³ Past performance is not indicative of future returns. There is no assurance that investment objective will be achieved

³⁴ Moody's Infrastructure Default and Recovery Rates (1983 – 2015), July 2016. Past performance is not a guide to future results

³⁵ The iBoxx infrastructure indices track listed corporate infrastructure debt, including investment grade bonds in USD, EUR, GBP and high yield bonds in USD

To be eligible, issuers must be predominantly regulated or operate under long-term contractual/concession agreements with limited or no pricing risk, as reflected by high quality, investment-grade ratings. Issuers are automatically eligible if they operate in the following sectors: electricity, gas distribution, pipelines and water, as these sectors are regulated and offer long-term cash-flow visibility.

Eligibility is based on ad-hoc analysis of the issuers' business profiles for other sectors including: integrated oil & gas, multi-utilities, railroads, transportation services, mobile telecommunication, waste & disposal services and specialty REITs³⁶. Businesses materially exposed to market risk, including for example merchant power generation, or oil & gas exploration and production, are not considered infrastructure, due to high cash-flow volatility risk, and higher default rates.

- **Private Infrastructure Debt:** Compared with listed infrastructure debt, private infrastructure debt is a wider asset class, as it includes a larger universe of issuers by sector, structure and transaction types (including debt tranching e.g. senior and junior). It can involve the financing of large, diversified infrastructure companies, smaller corporates or projects, and can be structured as project finance or corporate deals.

Infrastructure Debt Definition (by Type and Sector)			
Private Infrastructure Debt			
Listed Infrastructure Debt			
Transport	Energy & Utilities	Telecommunications	Social Infrastructure*
<ul style="list-style-type: none"> — Transportation Services <ul style="list-style-type: none"> — Toll roads — Airports — Ports — Railroads & Rolling Stock 	<ul style="list-style-type: none"> — Electricity — Pipelines — Gas Distribution — Water — Waste & disposal Services — Multi-utilities — Integrated Oil & Gas 	<ul style="list-style-type: none"> — Mobile Telecommunications <ul style="list-style-type: none"> — Telecommunication towers — Fiber optics — Specialty REITS operating Mobile Telecommunication 	<ul style="list-style-type: none"> — Stand-Alone Projects & PPPs <ul style="list-style-type: none"> — Schools — Hospitals — Social Housing — Student Accommodation — Judicial Facilities

Notes: *In a limited number of jurisdictions, social infrastructure entities can issue bonds (for example U.K. social housing associations). Source: Deutsche AM, IHS Markit, 7 May 2017

Social infrastructure captures institutional functions such as health and education that cannot rely purely on user charges, and is therefore mainly funded by general obligations issued by governments. In Europe, social infrastructure projects are mainly accessible to investors through the private loan market³⁷, where a framework for public private partnership (PPPs) has emerged as a structured way of raising private sector capital to fund social infrastructure projects. The capital deployment potential for private debt investors in PPPs remains limited in size, is country specific, and is very much determined on a project-by-project basis³⁸. That said, in the future, the PPP market is forecast to continue growing also in other regions, including the United States, and to partly replace public infrastructure investment over time.

- **Municipal Bonds:** Municipal bonds are listed debt securities issued in the United States by a state, municipality or county to finance capital expenditure, including infrastructure projects, such as for example the construction of highways, bridges or schools. Municipal bonds can take the form of general obligations, or can take the form of revenue bonds, securing principal and interest payments through specific revenue streams.

Municipal bonds are excluded from the iBoxx infrastructure debt indices. Although municipal bonds can be used to fund infrastructure projects, investors should consider that these bonds may often reflect more the risk/return profile of the public entities issuing them, rather than the credit quality of the underlying infrastructure asset. As a result, while the credit profile of municipal bonds is on average stronger compared with infrastructure

³⁶ Specialty REITS are Real Estate Investment Trusts (REIT) that can own infrastructure assets, such as for example telecommunication towers

³⁷ Some exceptions exist in Europe, such as for example in the U.K. where registered social housing providers can issue bonds

³⁸ Fitch Ratings, "Private Infrastructure Investment in Developed Economies", December 2014

corporates, spreads are also more in line with government bonds, and their issuance may be affected in the future by government constraints in terms of outstanding debt balances. Moreover, municipal bonds include tax exempt provisions and often carry call provisions, allowing municipalities to redeem them prior to maturity date, making them less suited for buy and hold investment strategies.

3.3 Corporate Debt and Project Finance

Infrastructure debt can take the form of corporate debt (balance sheet lending) or project finance debt (cash-flow lending), and expose investors to different credit and risk/return profiles.

- **Corporate Debt:** On balance sheet corporate finance is the main funding channel for infrastructure debt both in the forms of bank loans, and bonds issued in the capital markets. Corporates issuing bonds are large entities, and often operate in a number of businesses and regions. When corporations issue debt, particularly in capital markets, management typically has discretion to use funds for all the operations of the corporation, while the lender has a claim on all the assets of the borrower in case of default.

Investors should consider that not all operations of a large corporate may be infrastructure related. For example a large integrated utility may operate a regulated electricity distribution network that can be considered infrastructure, but also ancillary businesses including for example electricity trading, that may involve demand and volume risk and that should not be considered infrastructure.

- **Project Finance:** As a result of increased budgetary constraints of the public and corporate sectors, the financing of infrastructure has increasingly taken the form of project finance loans. Project finance is used for the financing of a specific infrastructure project and often involves an asset or project under development. Assets are ring fenced from undertaking non-infrastructure business, and debt used to fund the project is paid back only by the cash-flows generated by the project. In case of default, lenders can only claim on the project assets that are ring fenced in the SPV (Special Purpose Vehicle).

Long-term investors in the United States and Europe have become increasingly comfortable with private placements³⁹. In addition to project finance loans, more recently, project bonds have opened up an alternative debt funding avenue to source financing for infrastructure related projects. Project bonds are publicly traded debt securities backed by a pre-defined group of assets, often constituting a specific project. Projects have a finite life and the majority of these bonds amortise over the lifetime of the specific contract, such as for example a concession agreement.

Following the start of the European Investment Bank project bond pilot phase, project bonds have become increasingly popular in Europe, with most bonds having been issued for toll roads and renewable energy projects⁴⁰. Although the market for project bonds today is still particularly limited in size, it is forecast to grow materially in coming years, attracting investors' attention, as it offers exposure to pure-play opportunities while retaining the advantages of liquidity.

3.4 Seniority, Security and Covenants

Infrastructure debt can benefit from a range of contractual arrangements, designed to manage and allocate transaction risks. These can be divided into three main categories, including seniority, security and covenants. Each transaction can employ a unique combination of these contractual terms, supporting investors in achieving different risk/return combinations.

- **Seniority:** Debt investors rank senior to equity investors. This means that equity investors receive the remaining cash flows from projects, only after deducting operating costs and income used to service debt investors. However, debt can rank across different parts of the capital structure.

The majority of infrastructure financing, including infrastructure bonds, is in the form of senior debt, which ranks in priority to all other financial obligations of the borrower. However, the market offers the opportunity to move

³⁹ InfraNews, "Investors flock to private placements", 9 May 2017

⁴⁰ European Investment Bank, "An outline guide to Project Bond Credit Enhancement and the Project Bond Initiative", 21 December 2012

further down in the debt seniority scale, investing in mezzanine or subordinated debt, and receiving a yield premium in compensation for the increased risk.

Mezzanine debt sits between senior debt and junior debt. Structurally, mezzanine debt is subordinate in priority of payment to senior debt, but ranks senior to common stock or equity, and is proving to be increasingly popular among infrastructure debt investors due to the risk/return uplift it can provide. Mezzanine capital is typically used to fund growth or acquisitions, enabling a business to grow without diluting equity investors, while simultaneously reducing the cost of capital. Mezzanine debt can be fully repaid at maturity (bullet) and tends to be more expensive than senior debt, due to deeper subordination and weaker enforcement rights against the borrower.

Subordinated debt ranks below senior debt, and in the case of infrastructure generally takes the form of “payment in kind” (PIK) notes. In the case of PIK notes, the borrower pays no cash interest until the principal amount is repaid, thereby allowing additional flexibility for more debt to be taken on without cash-flow implications. PIK debt is the most subordinated type of debt and is generally not repaid until all other debt has been repaid. For this reason it is rated in the high-yield space and not suitable for investment grade infrastructure investors.

- **Security:** Infrastructure debt can be unsecured or secured. Unsecured debt refers to debt that represents a general obligation of the issuer that is not protected, or collateralized by a lien of assets of the borrower, in case of bankruptcy or liquidation, or failure to meet the terms of the repayment. Secured creditors have the benefit of security interest of the assets of the debtor. In the event of the default of the borrower, the unsecured creditors will have a general claim on the assets of the borrower after the specific pledged assets have been assigned to the secured creditors, while secured creditors can enforce security against the assets of the debtor. For this reason, the unsecured creditors will usually realize a smaller proportion of their claims than the secured creditors.
- **Covenants:** Infrastructure debt agreements can include agreements on terms and conditions between the borrower and lenders. These are agreed as a condition of borrowing, with the purpose of supporting the condition of the lender, mitigating the risk of incurring credit losses and acting as an early warning mechanism for lenders. A breach of covenant usually allows creditors to demand immediate repayment of the loan.

Bonds issued in capital markets generally do not place material restrictions on the borrower. Covenants for senior unsecured/secured bonds are relatively standard for investment grade entities rated ‘BBB-’ or above, particularly if notes are issued as part of an MTN (Medium-Term Note Program) and include a “Negative Pledge”, under which the borrower promises to not allow any liens of debt to be placed upon existing obligations.

Private loans and project finance transactions can involve more complex covenant structures and offer the opportunity to lenders to enhance credit protection mechanisms, reducing default probability and enhancing recovery rates in the case of default. Typically covenants restrict certain activities of the borrower to help the lender ensure that credit quality does not unexpectedly deteriorate during the term, or to mitigate specific risks such as construction risk. They also include information covenants, requiring the borrower to provide financial statements and budgets to the lender, to guarantee a timely identification of potential risks.

Covenants require the borrower to respect certain conditions, the violation of which may for example result directly in a default or have other consequences, like a lock-up of dividend distributions to equity investors to reduce leverage. For example, the borrower has to commit to maintain a certain level of leverage (e.g. Debt/EBITDA, Free Cash Flow/Debt), or a minimum interest and debt service cover. Performance indicators such as the debt service coverage ratios (DSCR), are used, to ensure commensurate financial metrics throughout the life of the loans for project finance.

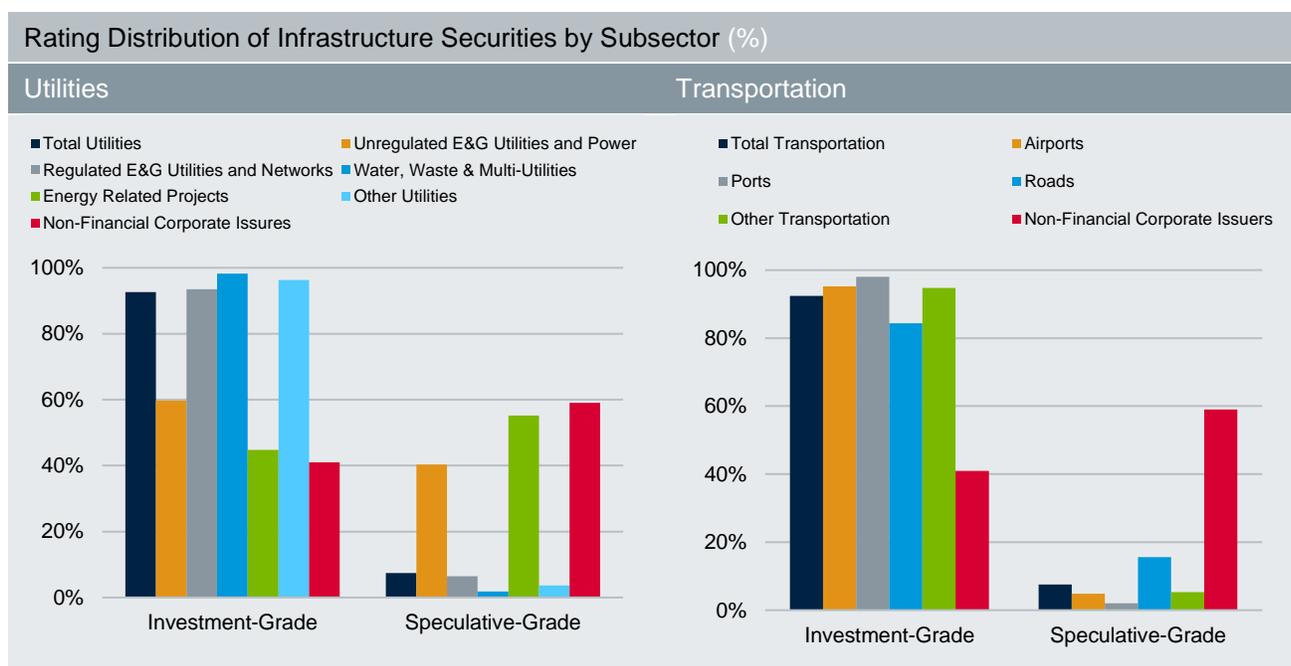
4 The Credit Profile of Infrastructure Debt

The credit profile of infrastructure debt varies by sector and is driven by the individual business and financial profile of the borrower. The majority of outstanding private infrastructure debt, including bank loans is unrated. Private bonds and project bonds are often rated, while listed infrastructure bonds are in practice always rated. Infrastructure debt is generally rated investment-grade, but infrastructure investors focusing on higher risk/return profiles, can access the entire credit spectrum, including high yield debt.

4.1 Rating Distribution and Volatility

- **Rating Profile:** Infrastructure assets are highly leveraged, due to the capital-intensive nature of their business, but are supported by relatively low business risk and long-term financial performance predictability. Therefore infrastructure debt has relatively low default rates and higher recovery rates compared with equally rated non-financial corporate debt.

Infrastructure bonds are mainly issued by larger companies, and ratings are predominantly investment-grade ('BBB' and above), while non-financial corporates are rated predominantly sub-investment grade ('BB' and below)⁴¹. The utility sector accounts for the majority of the bonds rated investment grade, and for about 75% of total rated infrastructure issuance by volume, while transportation accounts for about 25%. Sub-investment grade bonds have a greater exposure to market risk, and are issued mainly in the energy and unregulated utilities sectors, particularly in the United States⁴².



Sources: Moody's, Infrastructure Default and Recovery Rates 1983-2015, July 2016. Investment grade ratings range from 'AAA' to 'BBB-', speculative grade ranges from 'BB+' and below. For illustrative purposes only. Past performance is not a guide to future results.

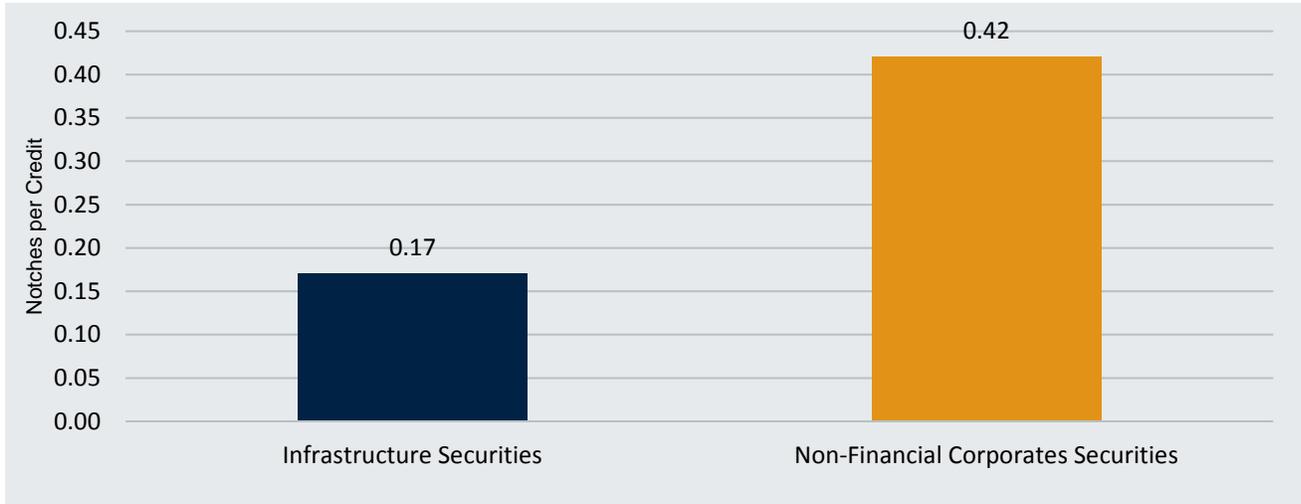
- **Rating Volatility:** Infrastructure ratings are less volatile compared to other sectors, meaning that infrastructure debt is more stable in periods of economic downturn and bearish credit cycles. Credit stability is underpinned by the predictability of operating performance, often protected by regulation. Moreover, infrastructure corporates tend to benefit from swift capital markets access, reducing refinancing risk, particularly if not materially exposed to commodity cycles. For this reason, infrastructure securities enjoy a volatility of 0.17 notches per credit compared with a volatility of 0.42 notches per credit for non-financial corporate bonds⁴³.

⁴¹ Moody's, Infrastructure Default and Recovery Rates 1983-2015, July 2016

⁴² Moody's, Infrastructure Default and Recovery Rates 1983-2015, July 2016

⁴³ Moody's, Infrastructure Default and Recovery Rates 1983-2015, July 2016

Average One Year Rating Volatility by Asset Class (Notches per Credit, 1983-2015)

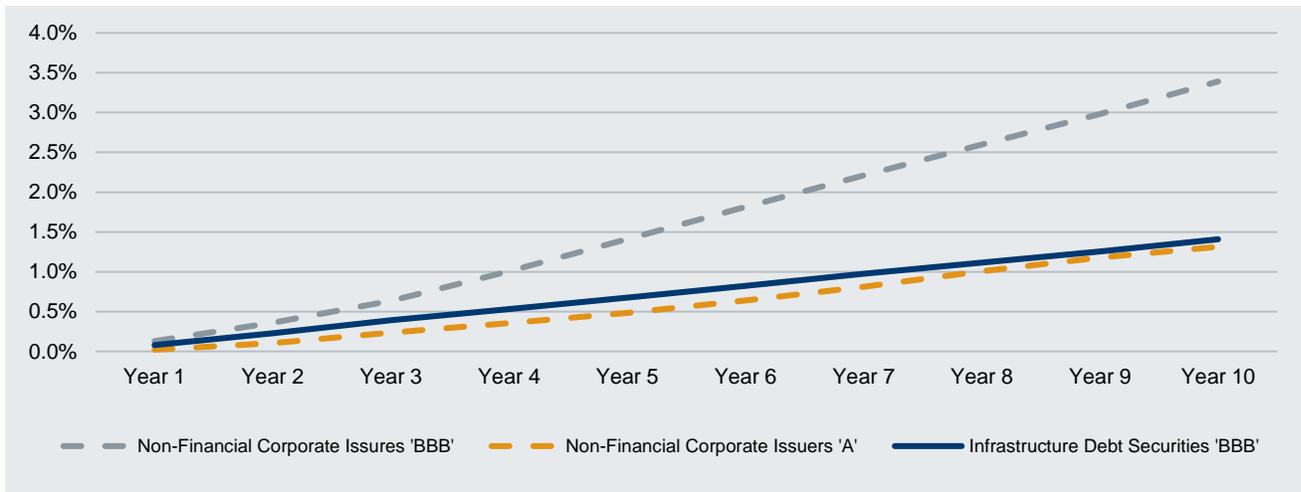


Sources: Moody's, Infrastructure Default and Recovery Rates 1983-2015, July 2016. For illustrative purposes only. Past performance is not a guide to future results.

4.2 Default, Recovery Rates and Risks Factors

- **Default Rates:** Infrastructure debt has consistently generated default rates lower than equally rated non-financial corporate bonds. The ten year cumulative default rate for 'BBB' rated infrastructure debt is ca. 1.4%, compared with 3.4% for equally rated corporate issues. For this reason 'BBB' rated infrastructure securities tend to have a default profile which is closer to 'A' rated non-financial corporates⁴⁴.

Average Cumulative Default Rates by Asset Class (% , 1983-2015)



Sources: Moody's, Infrastructure Default and Recovery Rates 1983-2015, July 2016. For illustrative purposes only. Past performance is not a guide to future results.

- **Recovery Rates:** Infrastructure debt has demonstrated on average higher recovery rates compared with non-financial corporates, for both senior secured and unsecured debt. Senior secured infrastructure debt demonstrated a recovery rate of 74%, compared with 54% for equivalent non-financial corporates debt⁴⁵. Recovery rates for project finance loans are even higher, at about 80%, despite the fact that project finance loans tend to be more highly geared and have a longer tenor compared with listed infrastructure debt. Moreover,

⁴⁴ Moody's, Infrastructure Default and Recovery Rates 1983-2015, July 2016

⁴⁵ Moody's, Infrastructure Default and Recovery Rates 1983-2015, July 2016

although ultimate recovery rates for project finance average 80%, the most likely ultimate recovery rate according to Moody's default study was 100% in almost 67% of observations⁴⁶.

Type	Senior Secured	Senior Unsecured
Corporate Infrastructure & Project Finance Debt	74%	56%
Non-Financial Corporate Debt	54%	38%

Sources: Moody's, Infrastructure Default and Recovery Rates 1983-2015, July 2016. For illustrative purposes only. Past performance is not a guide to future results.

Looking at specific sectors, for senior secured debt, regulated utilities show the strongest recovery rates at 81%, while transportation has a recovery rate of 74% and energy related projects have the weakest recovery rate at 66%, which is still above recovery rates for non-financial corporates at 54%⁴⁷. Recovery rates for senior unsecured infrastructure debt are also consistently higher compared with senior unsecured non-financial corporates⁴⁸.

- **General Risks of Investing in Infrastructure:** Infrastructure can expose investors to a number of general risks. These can be divided into those common to the entire asset class and those that are asset specific. Risks common to the asset class are mainly political and regulatory, while asset-specific risks can include, for example, construction risk, operational risk and financing risk.

Political and regulatory risk: Infrastructure assets are essential to the effective functioning of society and the modern economy, hence governments prefer to maintain some control and regulate them. The level of exposure to political developments as well as the features of the regulatory framework can vary significantly from one country or sector to another and can have an impact on investment performance. Investing in infrastructure requires a detailed understanding of regulation, developed through experience and often active long-term relationship with regulators. Strategic asset allocation can help mitigate political and regulatory risk through geographical and sector diversification.

Construction risk: Construction risk involves greenfield projects and includes cost overruns or construction delays, due to factors such as design errors or changes in the project specifications during execution. These risks can be particularly high for complex assets such as bridges or energy plants and may involve technology risk when new untested technologies are used. Cost overruns or delays can lead to a postponement in the project operational phase, delayed revenues and reduced returns.

Operational risk: Operational risks materialise when an infrastructure asset is in full operation and include performance risk or maintenance risk. Performance risk can include falling short of volume or price objectives or increased costs of doing business. Maintenance risk includes unplanned maintenance costs that can reduce operating cash flow levels. Exposure to operational risk varies by asset type. Regulated assets like electricity grids are typically more protected against certain risks through regulatory formulas or cost pass through to the customer, while unregulated assets are usually more exposed.

Financial risk: Depending on the level of leverage and the debt structure, infrastructure assets can be exposed to interest rate volatility or refinancing risk. If not hedged, interest costs may increase, reducing operating cash flow levels. Lenders may require a higher cost of debt in the case of construction delays for a greenfield project, while assets held in foreign countries may expose investors to exchange rate risks.

⁴⁶ Moody's, Default and Recovery Rates for Project Finance Bank Loans 1983-2014; Annual Default Study: Corporate Default and Recovery Rates, 1920-2015

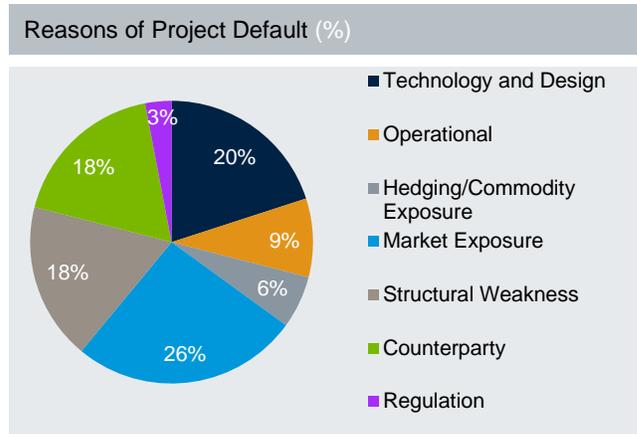
⁴⁷ Moody's, Infrastructure Default and Recovery Rates 1983-2015, July 2016

⁴⁸ Moody's, Infrastructure Default and Recovery Rates 1983-2015, July 2016

- **Why Do Infrastructure Projects Default:** Most project finance deals include high leverage, but loans are structured to be resilient to a variety of potential risks, and to minimise post default loss. However projects can fail. In 2014 Standard & Poor's published research analysing the reasons why project finance transactions default⁴⁹.

The main risk for project default is market exposure. While some projects are supported by fixed-price contracts, many are exposed to market volatility, including volume risk or price risk. Regulation does not represent a material reason for projects' default, and is rather supportive for credit quality.

Technology and counterparty risk are also main reasons for project default. Technology and design problems are more likely in the project construction phase, highlighting that using a proven technology and an experienced construction firm are important conditions to minimise project default. Counterparty risk is an additional reason for project's default, as large projects often rely on irreplaceable counterparties. For example a sewage plant might struggle to find a new concession provider, if the local government water utility terminates its contract. Structural transaction weaknesses can represent an additional reason for project default. Often projects may not be completely bankruptcy remote and may be subject to transmission of financial stress from the parent, leading to a default.



Source: Standard & Poor's, October 2014. Past performance is not a guide to future results.

4.3 Infrastructure Debt and Solvency II

- **Capital Charges Reduced:** The strong credit profile of infrastructure debt has been recently acknowledged by the European insurance regulator. In September 2015, the European Commission published legislation amending the Solvency II treatment, and recognising infrastructure as a distinctive asset category.

Qualifying infrastructure debt now benefits from a risk calibration lower than generic corporate debt, resulting in a lower capital charge for insurance companies investing in infrastructure debt. For example, the spread risk capital requirement for 'BBB' rated corporate bonds with a duration of 10 years is 20%. In comparison, a qualifying infrastructure instrument of the same rating and duration would attract a 15% spread risk capital requirement. The reduction in capital charges was supported by the evidence that infrastructure debt exhibits better recovery rates than non-financial corporate debt, and is less sensitive to broader economic factors. Insurance companies investing in bonds or loans also have to demonstrate that they are able to hold the investment to maturity⁵⁰.

- **Qualifying Infrastructure:** On June 8, 2017, the European Commission proposed to extend beyond project finance the reduction in the amount of capital that insurance companies need to hold also when they invest in infrastructure corporates, with the aim of further supporting investment in infrastructure⁵¹. According to Solvency II regulation, qualifying infrastructure will now include infrastructure corporates and project entities. Qualifying infrastructure corporate debt will qualify, provided a substantial part of their revenues is earned from infrastructure. An infrastructure project entity includes entities that are not permitted to perform any other function than owning, financing, developing or operating infrastructure assets (SPVs), and where the primary source of payments to debt providers is the income generated by the asset being financed⁵². The core criteria framing infrastructure debt are: the predictability of cash-flows, stability under stress conditions, and a contractual framework that has the objective to reduce default rates and enhance recovery rates in case of default⁵³.

⁴⁹ Standard & Poor's: "Lessons Learned From 20 Years of Rating Global Project Finance Debt", October 2014

⁵⁰ Source: EU Commission, draft amendment to Commission Delegated Regulation (EU) 2015/35, C(2015) 6588/2 from 30 Sep 2015, page 13, no. 17

⁵¹ Investment and Pension Europe, "Commission calls for Solvency II rule change to boost infra spending", 8 June 2017

⁵² Source: EU Commission, draft amendment to Commission Delegated Regulation (EU) 2015/35, C(2015) 6588/2 from 30 Sep 2015, page 15, no. 1

⁵³ Source: New Article 164 of Commission Delegated Regulation (EU) 2015/35 see EU Commission, draft amendment to Commission Delegated Regulation (EU) 2015/35, C(2015) 6588/2 from 30 Sep 2015, page 16, no. 4

5 Infrastructure Debt Performance Overview

Performance characteristics of infrastructure debt can prove attractive to long-term investors, including pension funds and life assurance companies. As part of a multi-asset portfolio, potential performance benefits include diversification, and strong risk-adjusted returns, supported by comparatively lower total return volatility⁵⁴. Within a fixed-income portfolio, infrastructure debt represents a valuable source of duration - supporting investors' long-term buy and hold strategies - and can offer a risk-adjusted spread premium over equally rated corporate debt.

- **Benchmarking Performance:** The risk/return profile of infrastructure debt can depend on a number of factors, including the borrower's geographical and sector exposure or credit quality. With over 70 sub-indices, the iBoxx infrastructure debt index family measures the performance of listed, corporate senior infrastructure bonds in EUR, GBP and USD investment grade markets, as well as the USD high yield market. Indices are available for different maturities, rating and sectors, including telecommunications, transportation, utilities and regulated utilities.

For private infrastructure debt performance data availability is limited. However, the iBoxx infrastructure debt indices represent a valid tool to explore the benefits of the asset class, investigating performance attributes that are valid for listed and private debt and test different investment strategies, as part of a multi-asset, fixed income or infrastructure portfolio. The iBoxx indices can also provide an indication of the differences of private infrastructure debt relative to liquid investment strategies, for example estimating the illiquidity premium.

5.1 Performance in a Multi-Asset Class Portfolio

- **Risk/Adjusted Returns:** Infrastructure debt has the potential to provide superior risk-adjusted total returns compared to other asset classes⁵⁵. In particular, the strong risk-adjusted performance of infrastructure debt is supported by comparatively lower total return volatility driven by the asset class's long-term predictability. This leads to high Sharpe ratios across all three main investment grade markets (USD, GBP and EUR) covered by the iBoxx infrastructure debt indices compared with other asset classes.

A high Sharpe ratio is attractive because it equates to a high return per unit of risk. For example, over a nine year period to June 2017, infrastructure debt, denominated in USD, delivered a Sharpe ratio of 1.1, higher than the 0.9 delivered by U.S. corporate debt and the 0.6 delivered by U.S. equities. Over the same period, infrastructure debt, denominated in EUR, delivered a Sharpe ratio of 1.2 supported by comparatively low volatility, while GBP denominated infrastructure debt reached a Sharpe ratio of 0.9.

⁵⁴ Past performance is not indicative of future returns. There is no assurance that investment objective will be achieved

⁵⁵ Past performance is not indicative of future returns. There is no assurance that investment objective will be achieved

Multi-Asset Class Performance Comparison (Total Return, 9 year results for the quarter to June 2017)

	Infrastructure Bonds USD	Corporate Bonds USD	US TIPS USD	Global Bonds USD	US Equities USD	Global Infrastructure Equities USD	Global Equities USD
USD							
Annualized Total Return	6.9%	5.7%	3.2%	2.7%	9.7%	8.2%	5.7%
Annualized Standard Deviation	6.3%	6.2%	5.4%	6.1%	16.6%	15.9%	18.2%
Sharpe Ratio	1.1	0.9	0.6	0.5	0.6	0.6	0.4
	Infrastructure Bonds EUR	Corporate Bonds EUR	Sovereign Inflation-Linked EUR	Global Bonds EUR	European Equities EUR	Global Infrastructure Equities EUR	Global Equities EUR
EUR							
Annualized Total Return	6.3%	5.0%	3.9%	4.2%	6.5%	12.1%	9.6%
Annualized Standard Deviation	3.8%	4.4%	5.9%	3.1%	17.2%	13.3%	15.3%
Sharpe Ratio	1.2	0.8	0.4	0.8	0.4	0.8	0.6
	Infrastructure Bonds GBP	Corporate Bonds GBP	UK Gilts GBP	Global Bonds GBP	UK Equities GBP	Global Infrastructure Equities GBP	Global Equities GBP
GBP							
Annualized Total Return	8.9%	7.3%	8.2%	7.7%	6.9%	13.5%	11.4%
Annualized Standard Deviation	6.2%	8.3%	8.9%	12.9%	14.8%	12.6%	14.3%
Sharpe Ratio	0.9	0.5	0.6	0.4	0.3	0.8	0.6

Source: IHS Markit, Bloomberg, Deutsche AM, January 2017. Infrastructure Bonds: iBoxx Infrastructure Debt; Corporate Bonds: iBoxx Corporate Debt; US TIPS: iBoxx TIPS Inflation-Linked; Global Bonds: Barclays Global Aggregate; US Equities: S&P 500; Global Infrastructure Equities: DJ Brookfield Global Infrastructure; Global Equities: MSCI World; Sovereign Inflation Linked EUR: iBoxx Sovereigns Inflation-Linked Euro-Inflation; European Equities: S&P 350; UK Gilts: iBoxx Gilt Inflation-linked; UK Equities: FTSE 100; Annualised Sharpe Ratio is based on quarterly data and is calculated as the average of the arithmetic return less the risk-free rate divided by the annualized standard deviation. The benchmark risk-free rate used is the 3-month US Treasury for USD, 3-month German Bund for EUR and 3-month UK Gilt. Past performance is not an indicator of future results.

- **Diversification Benefits:** Correlation coefficients demonstrate that investment-grade infrastructure debt can provide diversification benefits as part of a multi-asset class portfolio. In particular correlation with sector equity investment, as measured by the Dow Jones Brookfield Global Infrastructure Index is moderate-to-low, underpinning our view that listed infrastructure equities and debt are complementary within an investor's portfolio. Over a nine year period to June 2017, diversification benefits are particularly evident for EUR denominated investment-grade infrastructure, where the correlation coefficient against sector equities is 24.1%.

Multi-Asset Class Correlation Analysis (Total Return, 9 year results for the quarter to June 2017)

	Corporate Bonds USD	US TIPS USD	Global Bonds USD	US Equities USD	Global Infrastructure Equities USD	Global Equities USD
USD						
Infrastructure Bonds USD	80.0%	72.6%	62.6%	14.9%	49.8%	22.8%
	Corporate Bonds EUR	Sovereign inflation Linked EUR	Global Bonds EUR	European Equities EUR	Global Infrastructure Equities EUR	Global Equities EUR
EUR						
Infrastructure Bonds EUR	70.5%	75.1%	66.5%	21.3%	24.1%	15.1%
	Corporate Bonds GBP	UK Gilts GBP	Global Bonds GBP	US Equities GBP	Global Infrastructure Equities GBP	Global Equities GBP
GBP						
Infrastructure Bonds GBP	45.4%	66.9%	22.9%	16.4%	34.5%	13.3%

Source: IHS Markit, Bloomberg, Deutsche AM, January 2017. Correlations based on quarterly returns to June 2016. Past performance is not a guide to future results.

Compared with listed infrastructure debt, private infrastructure debt has the potential to increase diversification benefits even further, particularly due to the unlisted nature of the asset class⁵⁶.

5.2 Infrastructure Debt in a Fixed Income Portfolio

In this section, we analyse the historical performance of investment-grade infrastructure debt within a fixed income portfolio, by looking at average benchmark spreads⁵⁷ achieved in 2016, relative to non-financial corporates, also on a risk-adjusted basis.

For the comparison, we chose a duration reflective of infrastructure debt in respective markets at ‘A’, as indicated by the respective iBoxx infrastructure debt index: EUR (6 years)⁵⁸, GBP (11-11 years)⁵⁹ and USD (9-10 years)⁶⁰. The analysis focuses on the average ‘A’ rating category, as infrastructure debt is mostly rated in the ‘AA’ to ‘BBB’ range.

- **Risk-Adjusted Benchmark Spread Analysis:** We compare indices with mostly similar duration and the same rating. Risk-adjusted benchmark spreads are estimated by subtracting the annual expected loss (basis points) obtained by multiplying the average annual cumulated default probability with senior secured loss given default at the appropriate duration and rating level⁶¹.

The analysis demonstrates that, ‘ceteris paribus’, over the period January 2016-December 2016, listed ‘A’, investment-grade infrastructure debt offered a benchmark spread premium compared with non-financial corporate debt, and that this spread has the potential to be wider on a risk-adjusted basis. For example, for 2016, looking at the USD market, ‘A’-rated infrastructure debt offered a benchmark spread of 156 basis points. This represents an 18 basis point spread premium over the benchmark spread for ‘A’-rated non-financial corporates debt at 138 basis points. On a risk-adjusted basis, the estimated benchmark-spread premium offered by ‘A’-rated infrastructure debt over ‘A’-rated non-financial corporates debt widens to 23 basis points.

Risk-Adjusted Benchmark Spread Analysis (Average, Estimate, January 2016 – December 2016)



Source: IHS Markit, Bloomberg, Deutsche AM, Moody’s, January 2017. Infrastructure: iBoxx Infrastructure Debt Indices; Non-Financial Corporates: iBoxx Non-Financial Corporates. Past performance is not a guide to future results.

⁵⁶ Past performance is not indicative of future returns. There is no assurance that investment objective will be achieved
⁵⁷ The benchmark spread is defined as a premium above the yield of a risk-free bond, necessary to compensate for additional risk associated with holding the bond. It is calculated as the difference between the yield of the bond and the free-risk benchmark bond, Markit, “Markit iBoxx Spread Analytics, July 2010
⁵⁸ Based on iBoxx Infrastructure Debt Index, EUR, as at 07 April 2017
⁵⁹ Based on iBoxx Infrastructure Debt Index, GBP, as at 07 April 2017
⁶⁰ Based on iBoxx Infrastructure Debt Index, USD, as at 07 April 2017
⁶¹ Moody’s, Infrastructure Default and Recovery Rates 1983-2015, July 2016. There is no assurance that investment objectives can be achieved

Risk-Adjusted Benchmark Spread Analysis (Average, Estimate, January 2016 – December 2016)

	Average Rating	Duration (Years)	Benchmark Spread (bps.)	Average Annual Cumulated Default Probability (Estimate)	Loss Given Default (Sen. Secured, %)	Expected Loss (bps.)	Risk-Adjusted Benchmark Spread (bps.)
EUR							
Infrastructure, 'A', EUR	'A'	6	108	0.04%	26%	1	107
Non-Financial Corporates, 'A', EUR	'A'	6	106	0.11%	46%	5	101
USD							
Infrastructure, 'A', USD	'A'	9-10	156	0.04%	26%	1	155
Non-Financial Corporates, 'A', USD	'A'	9-10	138	0.13%	46%	6	132
GBP							
Infrastructure, 'A', GBP	'A'	10-11	151	0.04%	26%	1	150
Non-Financial Corporates, 'A', GBP	'A'	10-11	142	0.13%	46%	6	136

Source: IHS Markit, Bloomberg, Moody's, Deutsche AM, January 2017. Infrastructure: iBoxx Infrastructure Debt Indices; Non-Financial Corporates: iBoxx Non-Financial Corporates. Index duration may not always exactly match, and available indices within the 'A' rating category were chosen to minimise duration variance. Past performance is not a guide to future results.

5.3 Benchmarking Private Infrastructure Debt

- **Wider Potential for Alpha:** For investors with long-term buy and hold strategies, private infrastructure debt offers greater potential for alpha and diversification benefits compared with listed infrastructure debt. However, private debt investment strategies are complex and require bespoke origination experience from an asset manager to negotiate transaction structure, duration, and covenants.

Pursuing alpha requires a detailed understanding of the asset credit profile, to be able to potentially avoid downgrades and defaults, and diversify an investment portfolio to benefit from credit cycles⁶².

Although private infrastructure debt is less liquid than listed infrastructure debt, we note that an active and growing secondary market is continuing to develop across the United States and Europe, supporting the liquidity profile of the asset class.

- **Spread Premium:** Private debt can offer an illiquidity premium over listed infrastructure debt, particularly at origination. Factors described above, including differences in credit profile, transaction structure (e.g. security or covenant packages), and the relative illiquidity of private infrastructure debt, translate into a spread premium over listed infrastructure debt, that for 2016 we estimate to be up to 50 basis points in Europe and up to 80 basis points in the United States for investment grade infrastructure debt⁶³.

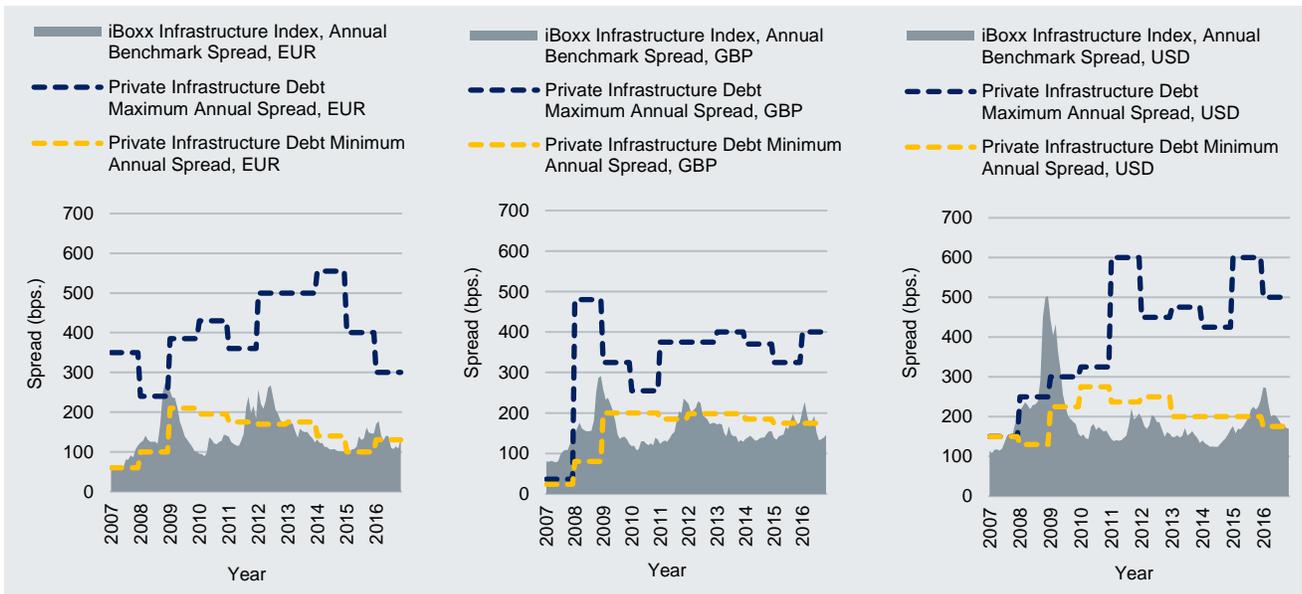
Although, for the reasons described above, it is difficult to quantify exactly the benefit offered by private infrastructure debt, the iBoxx infrastructure debt indices represent a valid tool to benchmark the return premium offered by private infrastructure debt.

The chart below is based on a comparison of the iBoxx infrastructure debt indices (investment-grade) with Deutsche Asset Management's proprietary transaction database recording transactions in the market across both investment grade and high-yield private debt markets. It gives a broad indication of the maximum-and minimum benchmark-spread premium achievable for private infrastructure debt across the USD, EUR and GBP markets.

⁶² Moody's, Infrastructure Default and Recovery Rates 1983-2015, July 2016. There is no assurance that investment objectives can be achieved

⁶³ Estimate based on Deutsche Asset Management proprietary transaction database of market transactions. Past performance is not a guide to future results. There is no assurance that investment objectives can be achieved

Private Infrastructure Debt Loan Premium Range (Estimate, 2007-2016, bps.)



Source: IHS Markit, iBoxx Infrastructure Debt Indices. Private debt spreads based on Deutsche AM proprietary transaction database of market transactions, January 2017. Past performance is not a guide to future results. Private infrastructure debt annual spread maximum and minimum include transactions across both investment grade and high yield rating categories.

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