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The effects on infra debt margins

A study on the components and long-term sustainability of the recent infrastructure debt margin shift[*]

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Abstract

This paper investigates the components of, and further assesses the long-term sustainability of, the recent infrastructure debt margin shift in developed European countries. This is done by collecting debt tranche characteristics data on infrastructure-defined projects in Benelux, France, Germany, the Nordics and the UK, spanning 1st January 2000 to 30th June 2014. By running multivariate, random-effects and difference-in-difference tests on gathered debt tranche data, results have been obtained. The paper shows: i) a change in overall demand for infrastructure debt investments; ii) private institutional investors expanding their market participation; and iii) more expensive pricing of maturity, post-financial crisis compared to pre-financial crisis. The Authors, furthermore, find an increase in the infrastructure debt margin justified. However, the exact margin level of a long-term equilibrium has to be further analysed.

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1. Introduction

Despite originating from the 7th century before Christ, when aqueducts and other infrastructure-like projects were piloted by the Assyrians, the infrastructure sector is an unidentified arena of investments for certain institutional investors. The fact that infrastructure sector investments are relatively unexplored by investors, is moreover peculiar since infrastructure provides a backbone to prospering societies and economies. Referring to the physical and technical structures of a society, the infrastructure sector consists of assets or companies that support the fundamental operation and development of a society, offering essential services to the general public (Dawes et al., 2014).

Assets characterised as infrastructure generally fit into any of the following six main subcategories: utility (e.g. power and energy); transportation (e.g. roads and bridges); telecom, media and technology, henceforth TMT (e.g. towers and satellites); commercial (e.g. ports and airports); social (e.g. schools and hospitals); or other. Although the infrastructure sector is a diverse, broad asset class where different sub-categories can exhibit very different regulatory regimes or type of transactions, there are a few identifiable important common denominators that unite the asset class, which makes it plausible to study as a whole. Firstly, infrastructure sector investments are characterised by a long life span of the underlying asset. Secondly, the necessity of substantial upfront investments makes the asset class capital intense. Lastly, owing to the fact that infrastructure typically is centred around long-term concession contracts in quasi-monopolistic markets with high barriers to entry, the asset class can enjoy comparably high levels of predictability and stability of cash flow streams (Synnott, 2014).

The Organisation for Economic Co-operation and Development (OECD) forecast significant demand for new infrastructure going forward. Driven by population growth there is a strong need for expanding the current global infrastructure stock, while the existing stock will require increased investments in maintenance due to the aging of the stock. The ultimate societal importance of infrastructure can be showcased by the vast amount of investments required; accumulate global infrastructure investments up to year 2030 is forecasted to total roughly $50 trillion, on average representing circa 2.5% of world gross domestic product (henceforth GDP) per annum (Stevens et al., 2006).

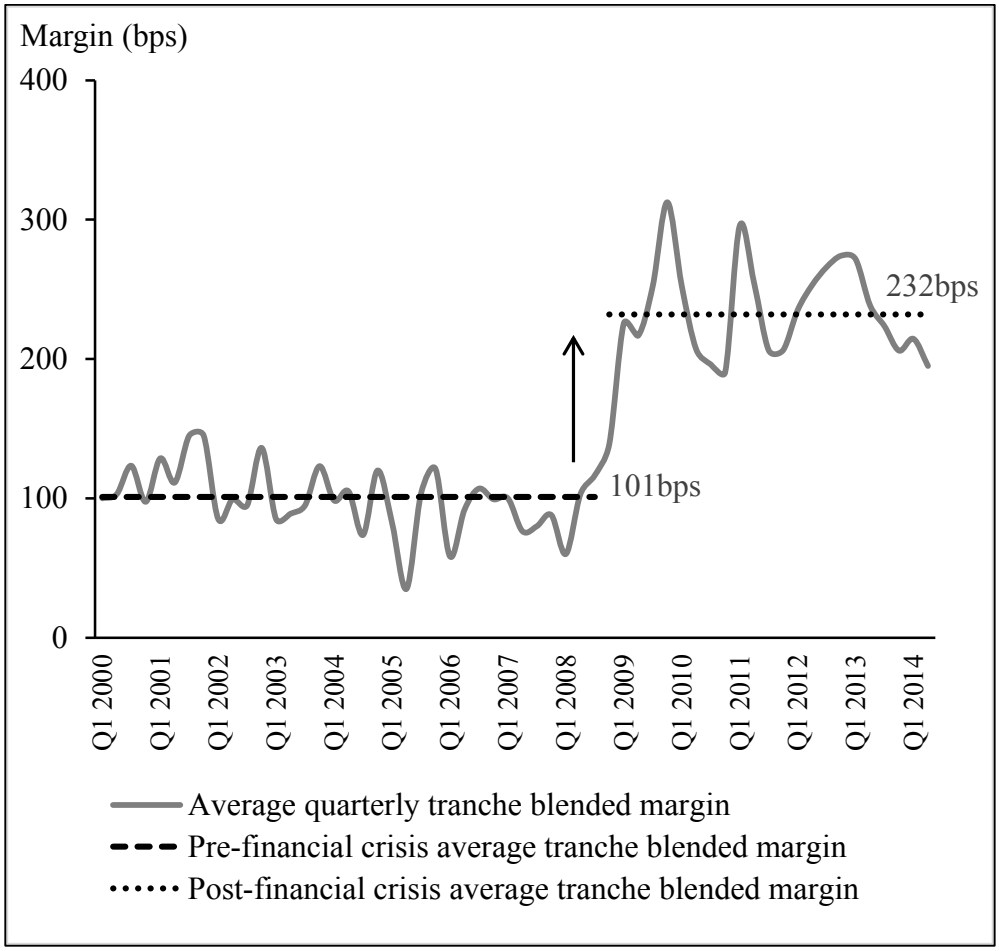
The fundamental importance of infrastructure and hence the facilitation of investments in infrastructure is further supported by several studies, specifically one by The World Bank (1994), indicating a positive correlation between infrastructure stock investments and GDP growth. The study shows that a one percent increase in infrastructure stock per capita yield a one percent increase in GDP, across countries.

While some of the upcoming investment requirements in the infrastructure sector will derive from public or governmental funds, and proportions might be unrealised due to political or other types of obstacles, demand for private infrastructure investments is expected to increase strongly (Synnott, 2014).

Historically, the private infrastructure debt market has typically been controlled by investment banks. In Synnott (2014) Moody's estimate that 80-90% of private infrastructure debt financing was provided by investment banks prior to the financial crisis. However, in response to the 2008 financial crisis, increased financial regulations have been implemented and will be further implemented by 2015 to mitigate and reduce the risk-exposure of banks. The increased regulations are imposed by the Basel Committee on Banking Supervision (henceforth Basel Committee) of the Bank of International Settlements and known as the Basel III Accord. It focuses on the capital and liquidity of banks and imposes higher capital requirements, improved quality of capital as well as new liquidity requirements (Basel Committee on Banking Supervision, 2011). The intentions of the sharpened regulations are to contribute to enhanced long-term financial stability in the banking sector. However, critics have pointed out that the regulations might in fact cause lower credit supply and increasing interest margins (Elliot, 2009). All in all, the new capital stipulations in the Basel III Accord have forced banks to deleverage their balance sheets. Along with the challenge of funding the typical long-term infrastructure assets with short-term deposits, this has made the infrastructure asset class less appealing to the banks, post-financial crisis. All in all, the infrastructure debt margin spread over the London Interbank Offered Rate (henceforth LIBOR) or the Euro Interbank Offered Rate (henceforth EURIBOR) has expanded dramatically post-financial crisis, compared to pre-financial crisis, and have not yet converted back to pre-crisis levels as, for example, credit spreads for European corporate bonds, with a similar weighted average life, have (Synnott, 2014). To put some light on the magnitude of the margin shift, Synnott (2014) finds that developed European infrastructure loans were typically underwritten with a 50-150 basis points

(henceforth bps) margin pre-financial crisis. However, since the Lehman-crash in 2008, loan margins in the developed European countries have widened to 200-300bps. The magnitude of the shift is portrayed further in Figure 1 below, showing historical quarterly average trading of the infrastructure debt margin in developed European countries.

Figure 1: Quarterly development of the infrastructure debt margin in developed European countries



Source: Data set developed by Boork, J, and Synneby, J., 2014, in collaboration with BlackRock.

The ambition of this paper is to research the infrastructure debt margin shift in developed European countries. In more detail, the paper's research questions are:

- *What have been the main components of the shift in the infrastructure debt margin in developed European countries?*
- *How sustainable is the shift in the long term?*

To facilitate the continued, required infrastructure investments driving societal and economic development, it is of great practical importance for investors' ability to make adequate investment decisions, to understand the perceived debt margin shift at an in-depth level. Furthermore, since to the knowledge of the authors of this paper (henceforth the Authors), there are no previous literature or study encompassing the recent infrastructure debt margin shift, its components and sustainability. A paper researching the area would also contribute to the academia surrounding Project Finance debt financing and financial regulatory effects.

In order to investigate the components and sustainability of the perceived infrastructure debt margin shift, the Authors in collaboration with BlackRock Alternative Investors (henceforth BlackRock), construct a data set comprising 232 different infrastructure deals, split over 305 different debt tranches, during the period between 1st of January 2000 and 30th of June 2014. To be able to given nuanced answers to the research questions, the Authors initially study the magnitude of proportional changes in key factors affecting the infrastructure debt margin, pre-, versus post-financial crisis. Furthermore, statistical significance of the actual shift is assessed, and consequently also if there are diverse effects across sub-sectors. Moreover, the Authors test hypotheses relating to debt providers, debt instruments and pricing of maturity (see Section 3.2 Hypotheses for a detailed outline of the tested hypotheses).

The study presents evidence of a significant shift in the infrastructure debt margin occurring post-financial crisis. The shift has been identified to be driven by three main components, namely: i) a change in overall demand for infrastructure debt investments; ii) private institutional investors expanding their market participation; and iii) more expensive pricing of maturity, post-financial crisis compared to pre-financial crisis. The Authors conclude an overall decrease of differentiation of pricing in the infrastructure debt market, mainly driven by the first component. Furthermore, the Authors note a common denominator among the different driving factors of the identified components of the margin shift, namely the introduction of the Basel III Accord. Given that the Basel III Accord not is seen as a temporary occurrence, the Authors find a margin shift to be sustainable. However, it is found to be of greater difficulty to predict at what exact margin level a new equilibrium will be reached.

The continued disposition of the paper is as follows: Chapter 2 describes the underlying previous research and theoretical background within the field and its

adjacent research areas; Chapter 3 provides an outline of the paper's overall research questions and concludes with a discussion of which hypotheses need to be tested in order to give a nuanced answer to the research questions; Chapter 4 defines the data set used and what methodologies have been used in order to test the hypotheses and subsequently answer the research questions; Chapter 5 presents and analyses the results obtained from the conducted tests; and finally Chapter 6 provides concluding remarks on the key findings of the paper, and presents suggestions for potential further research.

2. Previous Research and Theoretical Background

In this section, the Authors aim to outline the theoretical background regarding infrastructure investments as well as the previous research that has been conducted on the subject. Furthermore, an introduction to, and theoretical background of, the Basel III Accord is provided.

2.1 Introducing infrastructure and Project Finance

As stated by Wagenvoort et al. (2010), infrastructure has been understood to include many different things, and a universally accepted definition has remained elusive. One well-known attempt by (Gramlich, 1994) reads:

"*The definition that makes the most sense from an economics standpoint consists of large capital intensive natural monopolies such as highways, other transport facilities, water and sewer lines, and communications."*

Wagenvoort et al. (2010) conclude that the above definition characterises what is commonly referred to as economic infrastructure. A broader definition of infrastructure would also cover social infrastructure, which typically constitutes infrastructure in the health and education sectors. Economic infrastructure accounts for about 75% of total infrastructure investment in the European Union (henceforth the EU), social infrastructure for 25%. Considering the source of financing for infrastructure projects, there are important differences in financing between project sectors. Specifically, investments in the education sector differ significantly from investments in other sectors. In the education sector, public financing corresponds to approximately 85% of total financing. In other infrastructure sectors, private financing is found to be more common. These infrastructure projects are typically financed by Project Finance debt. Esty (2002) defines Project Finance as:

"Project Finance involves a corporate sponsor investing in and owning a single purpose, industrial asset (usually with limited life) through a legally independent entity finance with non-recourse debt."

Esty (2002) claims that the above definition recognises three key decisions associated with the use of Project Finance. First, there is an investment decision

involving an industrial asset. Second, there is an organisational decision to create a legally independent entity that owns the asset, typically resulting in Project Finance representing a form of off-balance sheet financing. The legally independent entity is often referred to as a Special Purpose Entity (henceforth SPE). Third, there is a financing decision involving non-recourse debt. Since the project company is legally independent, the debt can be structured without claim to the equity investors.

Project Finance investments, including infrastructure investments, are usually financed with equity from a concentrated number of sponsoring firms and debt from a concentrated number of banks, typically providing bank debt as opposed to bond financing (Esty, 2004). The debt financing can further be divided into primary or secondary debt investments, the latter being refinancing of existing projects while the former comprise financing of the construction of new assets (Dawes et al., 2014).

Traditionally, investment banks have dominated the infrastructure debt market, with a market share of 80-90% prior to the financial crisis. However, after the financial crisis, the banks have retrenched from the market somewhat, leaving more room for institutional investors to finance the projects (Synnott, 2014).

Infrastructure investments potentially offer some useful characteristics for institutional investors such as pension funds and insurance companies as they can match long-term, annuity-type liabilities. Infrastructure investments generally include long-term, predictable income streams, relatively favourable default and recovery rates of Project Finance (compared to corporate debt), and low correlations to other asset classes (Inderst, 2013).

The vast majority of institutional investor infrastructure funds invest equity stakes. Globally, only 39 debt funds were closed between 1998 and 2012 with a total volume of $18.8 billion, thereby constituting less than 10% of total infrastructure fundraising. However, there has been an increase in the debt side lately, with 8 debt funds closed in 2012 with a volume of $2.7 billion. As of June 2013, 14 more funds were currently being raised, seeking a further $8.3 billion globally, with European debt markets constituting 70% of the focus. Although, the interest in infrastructure debt funds is growing, volumes are still relatively low. There are, however, expectations that institutional investors could not only keep rising their equity investments in infrastructure, but also their debt investments. Further portraying a potential increased focus on infrastructure debt investments, there have been first

examples of direct loans investing by insurance companies and larger pensions funds (Inderst, 2013).

Project bonds are debt instruments issued by Project Finance companies for investment by institutional investors and other financial institutions. These bonds are often tradable on secondary markets but can also be issued as private placements. The European project bond market is relatively small and underdeveloped (Inderst, 2013). However, the Europe 2020 Project Bond Initiative by the EU and the European Investment Bank (henceforth the EIB) intends to increase the project bond activity in Europe. The EU forecasts approximately €1-5 billion initially and €10-20 billion by 2020 (European Commission, 2011 and Rosales and Vassallo, 2012).

European investment in infrastructure has traditionally been largely dependent on bank loans. The impact of the recapitalisation of banks and stricter regulation (e.g. the Basel III Accord) is being widely discussed. European banks have started to limit risk by reducing long-term lending, foreign exposure and lending to risky businesses, and by off-loading assets from their balance sheets. The impact on infrastructure debt financing could be summarised in three points: i) reduced availability of bank finance for long-term projects, i.e. 7-10 years; ii) stricter credit assessments of new ventures; and iii) degrees of sales of loans to institutional investors (Inderst, 2013).

2.2 Characteristics of infrastructure projects

Blanc-Brude (2014) concludes that before the financing decision of a Project Finance investment can be taken, the project SPE has to demonstrate its financial viability with a high degree of probability. Thereby, Project Finance investments tend to exhibit relatively low risk and high probability of repayment. In addition, it is concluded that the yield curve for project debt is driven by two forces: i) the increasing severity of losses towards the end of the loan's life pushes up the yield since the discounted value of expected cash flows is further reduced; while ii) the sequential resolution of uncertainty as maturity approaches pulls it down. These characteristics of Project Finance investments imply low risk investments, allowing for high initial leverage. Esty (2004) finds that the average Project Finance vehicle has a capital gearing ratio of 2.33 times, as opposed to public companies' equivalent of 0.54 times.

Blanc-Brude (2014) confirms that since Project Finance SPEs generally have a high degree of initial leverage, debt contracts often contain several covenants in order

to protect the debt holders. According to Yescombe (2002), examples of such covenants are: i) minimum debt service coverage ratio requirements; ii) non-financial default triggers; iii) step-in options; iv) cash sweeps; v) cash claw-backs; vi) reserve accounts; and vii) prepayment options. These covenants protect the debt holders and make investments in infrastructure projects more financially viable, allowing for lower margins than would be possible for the projects absent debt covenants.

Investments in infrastructure projects are often complicated procedures and several years of project preparation can go by before Project Finance debt is originated. Infrastructure investments involve a large initial capital injection in a relatively illiquid asset, making a thorough due diligence necessary in order to limit risk-exposure and establish the financial viability of the project. Furthermore, the projects involve complicated legal procedures and regulatory requirements. As a direct consequence, significant transaction costs are associated with buying and selling infrastructure debt assets (Blanc-Brude, 2014).

Debt relating to Project Finance investments is often held to maturity by lenders and hence trades infrequently. Even secondary market transactions require significant due diligence and documentation. As a result, investments in Project Finance debt are illiquid and investment as well as divestment opportunities occur infrequently. Blanc-Brude (2014) claims that since there are a limited number of projects available to investors at a certain time point, even idiosyncratic risks may have to be priced in as the risks remain un-diversifiable. Due to the unique characteristics of infrastructure debt, corporate debt valuation models cannot be directly applied to the Project Finance debt.

2.3 Impact on debt margins

As concluded by Blanc-Brude (2014), investments in Project Finance are often illiquid by nature. As illiquidity of assets is commonly seen as expensive, the debt margin for infrastructure loans may consist of a liquidity premium to a certain extent. Bokobza et al. (2013) measure what percentage of the corporate loan margin is actually the liquidity premium, i.e. the compensation for the lower liquidity of corporate bank loans compared to corporate bonds. The study divides the margin into three components: i) the default premium; ii) the risk premium; and iii) the liquidity premium. It is found that between 30% and 40% of the corporate loan margin consists of a liquidity premium, and that an additional 10% liquidity premium is applied to

Project Finance loans. Additionally, it is found that there is a difference regarding the magnitude of liquidity premium in Europe versus in North America; in Europe the liquidity premium explains on average 32% of the loan margin, in North America 39%.

According to de Jong and Driessen (2013), expected returns are affected by illiquidity in three different ways: i) compensation for the expected liquidity premium, which includes and exceeds the compensation for transaction costs; ii) compensation for the liquidity risk, which depends on the investor risk aversion and time horizon; and iii) segmentation effects. If the illiquid assets are only held by a certain type of investors, in this case investors with long time horizons, imperfect risk sharing exists for the assets which increases expected returns. The segmentation effects can be argued to be larger for illiquid assets with low correlation with liquid assets.

As mentioned above, certain types of investors may be more present in the infrastructure market than others. This results in a clientele effect for the infrastructure debt investors. Blackburn et al. (2009) use traded options on growth and value funds in order to assess clientele differences in risk preferences. It is concluded that the price of assets, and in turn the inherent pricing of risk characteristics of that asset, is affected by differing investor characteristics. Although risk preferences among investors are important for asset prices, there is limited empirical evidence of the existence of different risk preferences for investors active within different asset markets. Blackburn et al. (2009) identify risk preferences as a potentially important attribute that categorises differences across the two investor clienteles active within the value and growth markets.

On the other hand, de Jong and Driessen (2013) conclude that there is no strong evidence for the presence of liquidity premiums in alternative asset classes. Although there seems to be liquidity risk premiums for hedge funds and private equity, the premiums may contain compensation for other costs as well as risks associated with investing in these asset classes. It is further concluded that as investors with long investment horizons are more likely to be active in these markets, large liquidity premiums are not expected, especially if the asset classes exhibit high correlation with liquid asset markets.

Furthermore, de Jong and Driessen (2013) discuss whether the magnitude of the liquidity premiums differ over time. It is found that, in periods of market stress

such as the financial crisis, the liquidity premiums increase. The findings highlight that the pricing of liquidity may come with temporary fluctuations, increasing in periods of financial instability where access to liquid assets may be higher valued.

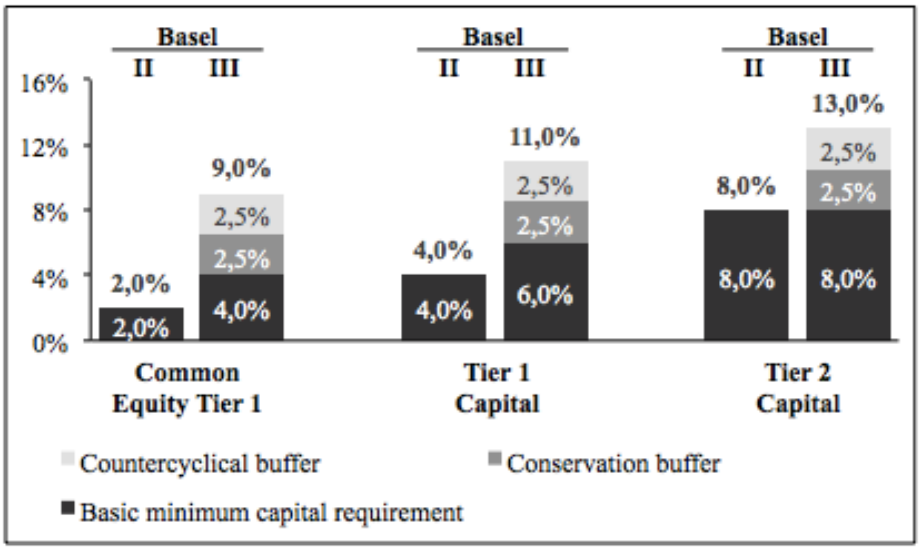
2.4 The Basel III Accord and its effects on Project Finance

In the wake of the financial crisis escalating in the United States of America throughout 2008, regulators have imposed new regulatory stipulations, in order to increase future financial stability. By increased regulatory requirements, regulators want to force enhanced quality and quantity of capital held on banks' balance sheets, in turn increasing the banks' ability to manage operating losses and absorb financial shocks. The Basel Committee, the primary global standard-setter for bank regulation, have presented and initiated the implementation of a new international regulatory framework for banks, the Basel III Accord. The primary focus areas of the Basel III Accord are: i) capital; and ii) liquidity. The Basel III regulations began to be implemented gradually in the beginning of 2013, with full implementation expected in 2019 (Basel Committee on Banking Supervision, 2011).

2.4.1 Minimum capital requirements

The capital requirements have tightened compared to the Basel II Accord, now endorsing banks to hold at least 4.5% Common Equity Tier 1 Capital and 6.0% Tier 1 Capital of risk-weighted assets, at full implementation. Total Capital, comprising both Tier 1 and Tier 2 Capital is set to at least 8.0% of risk-weighted assets. At the top of these minimum ratios, banks are required to hold a 2.5% additional capital conservation buffer. Moreover, an additional buffer is introduced; the countercyclical buffer. National authorities will, after having assessed the credit growth and other indicators that signal build-up of system-wide risk, decide on the magnitude of the buffer which can be anywhere between 0.0% to 2.5%. Hence, at full countercyclical buffer, banks must hold Common Equity Tier 1 Capital, Tier 1 Capital and Total Capital of 9.5%, 11.0% and 13.0% of risk-weighted assets, respectively.

Figure 2: Comparison of capital requirements under the Basel II and Basel III Accords



Source: Kvist, 2010.

In addition to the minimum capital requirements outlined above, a gross leverage ratio requirement is imposed in the Basel III Accord. When in full force in 2019, banks must at all times hold at least 3.0% of Tier 1 Capital to Total Assets (Basel Committee on Banking Supervision, 2011). The magnitude of change at full implementation, compared to the Basel II Accord, is outlined in Figure 2 above.

2.4.2 Minimum liquidity requirements

The Basel III Accord further introduces two different types of required liquidity ratios: i) Liquidity Coverage Ratio (henceforth LCR); and ii) Net Stable Funding Ratio (henceforth NSFR). The LCR focuses on the short-term liquidity, stating that the high quality liquidity buffer of a bank must equal the potential net outflow of cash over a 30-days acute stress scenario. High quality liquid assets comprise cash, central bank reserves, and assets of similar quality. The metric behind the LCR is outlined in Equation 1 below.

$$Equation\ 1: \frac{Stock\ of\ high\ quality\ liquid\ assets}{Net\ cash\ outflow\ over\ a\ 30-day\ period} \geq 100\%$$

The NSFR emphases, on the other hand, longer-term liquidity. In more detail, a bank's access to stable liquidity should always exceed the need of liquidity. The

LCR requirement is binding as of 2015, while the NSFR requirement is expected to be implemented by 2018 even though no exact measurement details yet have been set (Basel Committee on Banking Supervision, 2011). However, in general, banks will be required to keep funding of at least one year in maturity to cover assets with one year maturity or more, to comply with the NSFR requirements (Chan and Worth, 2011). The metric behind the NSFR is outlined in Equation 2 below.

$$Equation\ 2: \frac{Available\ amount\ of\ stable\ funding}{Required\ amount\ of\ stable\ funding} \geq 100\%$$

2.4.3 Criticism and implications for Project Finance

Elliot (2009) argues that increased capital requirement for banks will not be free. All else equal, higher hurdle rates for bank lending, caused by sharpened capital requirements, will likely contribute to i) more difficult loan origination; ii) higher cost of loans; iii) lower interest rates on deposit; and/or iv) reduced market value of banks' common stock. Elliot (2009) further reminds that the exact likelihood and magnitude of the outlined effects must be assessed in more detail. Furthermore, Härle et al. (2010) find, assuming an all-in-all Common Equity Tier 1 Capital including conservation, countercyclical buffers of 9.0% and Tier 1 Capital of 11.0% of risk-weighted assets, a total capital shortfall in the European banking sector in 2019 at approximately €1.1 trillion. Furthermore, capital shortfalls due to the LCR requirements are estimated at €1.3 trillion, and an additional €2.3 trillion due to the NSFR requirements. However, one should bear in mind that an increase in long-term funding (NSFR) would offset larger parts of short-term funding requirements (LCR). Härle et al. (2010) proclaim that a potential mitigating action investigated by the banks would be to make business-model adjustments. These business model adjustments include assessing the product-mix, in light of the Basel III Accord, with a view on which businesses should be retained and which should be not, and how retaining a specific business affect the risk and profitability of the overall portfolio of businesses. Additionally, products may have to be redesigned or priced differently, in order to ensure optimal use of the banks' capital and liquidity. In light of this, Härle et al. (2010) see an increased focus on capital-light products with a continued customer demand but requiring lower amounts of capital.

In terms of how these effects more specifically might affect the typical capital intensive and long-term Project Finance funding, Chan and Worth (2011) argue that there might be non-bank lender entries, exploiting their relative regulatory advantage and meeting an existing demand that banks cannot meet or are not willing to meet. July et al. (2012) point out that banks, in addition, may divest select holdings of Project Finance debt or more increasingly solely focus on their domestic markets. Portugal-based Banco Espírito Santo have indeed already initiated such divestments, off-selling €100 million of assets to the newly started Sequoia infrastructure debt fund. Additionally, the Bank of Ireland sold a €590 million infrastructure debt portfolio to Japan-based Sumitomo Mitsui Banking Corporation at 85% of original value. Moreover, Chan and Worth (2011) suggest that, under the NSFR, it is likely that banks will have to seek long-term funding for its long-term debt, making it more likely banks seek to manoeuvre commitments to very long-term exposures. It is not the case that a project loan with a 25-year tenor will require a 25-year locked-in funding, but to some extent a secured funding will be required. July et al. (2012) emphasise that this is especially true for Project Finance debt since 100% of Project Finance debt due within one year, must be secured by capital with maturity in excess of one year. This is oppose to corporate debt, where only 50% of the debt due within one year must be backed by capital in the same manner. Chan and Worth (2011) indicate that the market currently mirrors these trends; willing lenders of loans above €100 million, grow smaller for loans with a 7-10 year maturity. Project Finance deals are still conducted above these maturities, provided they are well structured and well priced. To mitigate the long-maturity issues, there have also been increased uses of so-called cash sweep mechanisms and margin step-ups after a certain amount of years, providing incentives for the borrower to refinance the loan. July et al. (2012) also estimate an increased pressure on refinancing of Project Finance debt going forward, where potential sources of additional refinancers include the EIB, pension funds, insurers, reinsures, infrastructure debt funds or project bonds.

Chan and Worth (2011) reason that the greatest shift in Project Finance might be the potential function of project bonds. This is owing to the fact that project bonds are relatively well treated under the Basel III Accord. First, the NSFR requires relatively low levels of stable funding for bonds and second, sufficiently rated bonds are recognised as high quality liquid assets and can thus count as short-term liquidity under the LCR requirement.

3. Research Question, Hypotheses and Delimitations

3.1. Research question

Previous studies have covered the main characteristics of infrastructure investments and their effect on performance and valuation. Blanc-Brude (2014) discusses the infrequency of trading in infrastructure investments as well as the significant transaction costs associated with investing in the asset class. In addition, Blanc-Brude (2014) discusses adequate performance measurements for long-term investors in infrastructure. Esty (2002) discusses the overall performance of infrastructure investments and the correlation between the degree of leverage and the riskiness of the investments. Furthermore, Narbel (2013) discusses the impact of Basel III on banks' appetite for renewable energy financing, discussing the capital and liquidity requirements of the regulation and the effect on the amount of capital available for renewable energy financing. However, to the knowledge of the Authors, no previous research has specifically covered the recent debt margin shift for infrastructure investments, which occurred in the lights of the financial crisis.

With the previous research and the theoretical background serving as a foundation, the Authors want to empirically study the infrastructure debt margin shift in developed European countries. The paper's research questions can be formulated as follows:

- *What have been the main components of the shift in the infrastructure debt margin in developed European countries?*
- *Moreover, how sustainable is the shift in the long term?*

3.2 Hypotheses

In order to facilitate the main drivers of the shift in the infrastructure debt margin, the Authors first and foremost aim to study the proportional change in the structural investment environment by assessing magnitude of changes in key factors affecting the infrastructure debt margin. Such factors are, but are not limited to, amount of leverage, proportional percentage of sub-sector involvement, debt tranche maturity, proportional share of private institutional investor involvement, proportional share of deals being Greenfield versus Brownfield and proportional share of debt type (i.e. term loans versus bonds).

To be able to give nuanced answers to the research questions, five key determining hypotheses will be tested and analysed more in-depth. The hypotheses

have been formulated as null-hypotheses, and rejected provided the existence of sufficient statistical significance.

Hypothesis 1: The infrastructure debt margin in developed European countries has not experienced a shift post financial crisis

The purpose of testing this hypothesis is to ensure statistical significance in the perceived infrastructure debt margin shift. Evidence of statistical significance can be used to support the importance of research in the topic, and will be used as a foundation for the continued analysis in the subject. The Authors expect to find a statistically significant effect driving the infrastructure debt margin upwards.

Hypothesis 2: There are no sub-sector differences in the magnitude of the potential infrastructure debt margin shift

The purpose of testing this hypothesis is to discover whether there are significant discrepencies in debt margins between projects within different sub-sectors. In addition, the aim is to analyse whether these differences have changed in magnitude, pre-, versus post-financial crisis. Evidence of a sharp sub-sector composition change between the periods is of importance to highlight given the potential effect on the overall findings of the paper. Furthermore, evidence of differences in margins between sub-sectors support the use of random-effects in the continued regressions. The Authors expect there to exist differences in margins across sub-sectors, most likely caused by different transaction costs and dissimilar stability and predictability of cash flow streams. In addition, in a period of crisis, investor appetite for risk increases the demand for more high-quality and safe projects within the different sub-sectors, possibly decreasing the potential differences in the margins between the sectors.

Hypothesis 3: Private institutional investors do not price infrastructure debt with different margins compared to banks

The purpose of testing this hypothesis is to discover whether private institutional investors price infrastructure debt with different margins compared to the

traditional debt providers, i.e. the banks. As increased regulations have made it more difficult for the banks to finance the typical long-term infrastructure project with short-term facilities, the private institutional investors might have taken a greater proportion of the market space. If it turns out that these private institutional investors have increased their market participation, and in addition, price the infrastructure debt differently, it will have a significant effect on the average infrastructure debt margins. The Authors expect institutional investors to generally target more risky projects where the decrease in bank competition is most apparent. Thereby, the Authors expect a difference in average margins between projects financed by institutional investors and projects finance by banks. Furthermore, the private institutional investors may have differentiated valuation methods, taking into account other risks not fully accounted for by the banks.

Hypothesis 4: Different debt instruments do not experience dissimilar margins

The purpose of testing this hypothesis is to discover whether different debt instruments are priced differently. Given the different characteristics associated with different debt instruments, it is of importance to examine whether the proportional usage of debt instruments has changed, pre-, versus post-financial crisis. Furthermore, as bonds are more favourably treated under the new Basel regulations, in regards to the NSFR and LCR requirements, the Authors expect the usage of project bonds to have increased in proportion, as well as the pricing for bonds to differ compared to term loans.

Hypothesis 5: Debt tranche maturity is not more expensively priced post-financial crisis

The purpose of testing this hypothesis is to discover whether the new regulations have made long-term projects more expensive to finance, compared to short-term projects. As the new NSFR requirement stipulates banks to be sufficiently long-term liquid at all times, banks' appetite for long-term illiquid projects might have decreased. Statistically significant results for this hypothesis could imply an increased

illiquidity premium for infrastructure project. Taking the new regulatory requirements into account, the Authors expect maturity to be more expensively priced.

3.3 Delimitations

The Authors have chosen to delimit the research to include infrastructure sector investments in developed European countries (i.e. Belgium, Denmark, Finland, France, Germany, Luxembourg, the Netherlands, Norway, Sweden and the United Kingdom (henceforth the UK) due to a number of reasons. Firstly, the delimitation is motivated by the fact that major institutional investors active in infrastructure debt investments mainly are focusing on these markets, partly driven by the political stability in the region. Secondly, these markets are expected to experience a robust pipeline of infrastructure investments, consisting of both primary and secondary investments. Thirdly, investments are likely to be in major currencies to which investors have ready accesses, hence potential effects due to currency illiquidity or other currency-related issues affecting the results of the study, are limited. Lastly, due to the fact that distinctive markets are regulated by different authorities and regulators, it is of importance that a study isolates markets with similar regulatory characteristics, in order to receive appropriate results (Synnott, 2014).

4. Data and Methodology

4.1 Data

Below, the Authors summarise how the necessary data have been gathered and handled in order to perform required statistical testing of the hypotheses. Moreover, the inherent dependent, independent and control variables are outlined.

4.1.1 Gathering and handling of data

The data set used, see Figure 12 in the Appendix, in the paper is an extension of the data set provided by BlackRock. The original data set provided by BlackRock, (henceforth referred to as the original data set) consists of deal information of infrastructure deals in developed European countries with financial close date between the 1st January 2000 and 30th June 2014. Prior to 1st January 2000, information on infrastructure deals is scares and not considered reliable enough to be included in the data set. The data set consists of both Project Finance investments as well as selected debt investments in pure infrastructure businesses, where the company's balance sheets predominantly consist of infrastructure assets and thereby exhibit very similar characteristics to Project Finance deals.

The original data set was based on deal information from Dealogic, as well as proprietary BlackRock information based on Information Memorandums for specific deals. The original data set included the following data parameters: borrower/project, sub-sector classification, tranche signing date, tranche maturity, tranche size, and tranche blended margin.

The data in the original data set included deals in the UK, Germany, France, Benelux and the Nordics. For infrastructure investments, regulation as well as transaction costs differ across countries. Non-developed countries exhibit a different investment environment for infrastructure investments, making infrastructure debt more costly or risky to provide. The study is therefore concentrated on developed European countries, where the investment environment for infrastructure debt has been relatively stable throughout the analysed time period. In addition, as argued by Annamalai and Jain (2013), average project costs in developing countries are higher than the average project costs in developed countries.

The original data set included deals in the following project sectors: airport, bridge, defence, education, gas distribution, gas pipeline, government buildings,

hospital, other infrastructure projects, police, port, power, prison, rail, sewage, tunnel, urban railway, waste, water or wind farm. Major investors do not consider upstream oil, gas exploration, mining or commercial real estate financings where debt repayment is dependent on market values to be classified as infrastructure. Hence, projects in these sectors are disregarded. Furthermore, the included project sectors have been narrowed down to 6 sub-sector classifications, as specified in Section 4.1.2.3 Control Variables.

The data set has been expanded with additional deals using InfraNews and the Infrastructure Journal and Project Finance Magazine. Deals that fall within the Authors' selection criteria and with complete parameter information have been added. The Authors argue that using and adding deal information from different sources not only expands the underlying data set, but also reduces the selection bias. Furthermore, the data set has been developed by including additional parameters on the included deals. The data set has been developed to include the following data parameters: region, stage, leverage, debt provider and debt type.

Deals where there is lacking information on the main parameters as argued by previous research have been excluded from the data set. In addition, in order to minimise potential errors in the data, and thereby decrease potential attenuation bias, the Authors have cross-checked the deal information across the three data sources.

Deals consisting of several debt tranches with differing parameters regarding debt provider, tranche maturity or debt type have been divided into several data points, one for each debt tranche. This way, different factors affecting are not mixed. Leverage has been calculated on the total project values (i.e. total project debt and equity) and consequently applied to all underlying debt tranches for the concerned project. The ultimate data set consists of 305 tranches relating to 232 deals.

As the data provided by the different data sources to a large extent consists of self-reported data, the data sources may consist of more deals where certain types of investors have been involved. For example, financial institutions such as banks can be seen to be more likely to self-report as they want to achieve high results in league tables. Certain investors, such as private institutions, may care less about league table results, and are consequently less likely to self-report certain deal information. In addition, as the data sources staff are to large extent based in the UK, the data provided by the data sources is more likely to include deal information for deals

within the UK market. In Figure 5, the relationship between deals and region is shown in more detail.

4.1.2 Definition of variables

In this section, the Authors describe and categorise all variables included in the data set. The variables are categorised according to dependent, independent and control variables.

4.1.2.1 Dependent variable

Below, the dependent variable used in the statistical testing of the hypotheses is outlined.

Tranche blended margin: Details of the debt margin for the different deals is provided by the different data sources. Often, the margin differs across the life of the debt. The margin is therefore calculated as the weighted average margin throughout the entire life of the tranche, thereby taking into account potential step-ups or decreases that may occur. Equation 3 below illustrates the calculation of the margins used in the statistical tests.

$$Equation\ 3: Tranche\ blended\ margin = \frac{\sum_{k=0}^{n} Margin_k}{n}$$

An alternative approach to the calculation of the tranche blended margin would be to introduce another weight, giving margins in earlier years a larger effect on the overall margin. This would take into account the time value of money as well as the level of uncertainty regarding renegotiation of future margins. However, this approach is seen to be too speculative, and the used approach is considered a close enough approximation.

4.1.2.2 Independent variables

Below, the independent variables used in the statistical testing of the hypotheses are outlined.

Date dummy: A dummy variable has been created to separate deals with financial close prior the financial crisis and deals with financial close after the financial crisis. As a cut-off date for the post-financial crisis period, the date of the bankruptcy of Lehman Brothers has been used, i.e. 15th September 2008. This is

commonly used by academics, such as Cella et al. (2013). In addition, dummy variables for each individual year have been calculated in order to test for changes in margin between the years.

Debt provider: Dummy variables have been created in order to account for the different types of debt providers active in the infrastructure debt market. Three different types of debt providers are used, namely banks, bank syndicates and private institutional investors. The split of banks and bank syndicates follows Annamalai and Jain's (2013) argumentation that there is a relationship between the degree of investor interest and the existence of loan syndication.

Debt type: Dummy variables have been created in order to account for the different types of debt used for the infrastructure projects. The debt is divided into two debt type classifications, namely term loans and bonds.

Maturity: A dummy variable has been created in order to account for the different tenors of the individual infrastructure projects. As argued by Eckhardt (2012), it will be difficult to issue loans with maturity exceeding 7 years, in the future. Therefore, a cut-off of 7 years has been used to distinguish loans with long tenor from loans with short tenor. Furthermore, in order to increase the statistical significance of separate statistical tests where the debt maturity is used as a control variable, logged values of the debt maturity have been calculated.

4.1.2.3 Control variables

Below, the control variables used in the statistical testing of the hypotheses are outlined.

Leverage: As argued by Esty (2002), there is a significant relationship between asset risk and the leverage used in infrastructure projects. The leverage for each individual deal has therefore been calculated using information from the data sources. For deals consisting of several tranches, the leverage for the entire project has been calculated and thereafter been used as leverage for the individual tranches.

Sector: Industry classification has been narrowed down to 6 difference sub-sectors, generally used by major infrastructure investors. The basis for the sub-sector classification is that projects within the specific sub-sectors exhibit similar cash flow profiles, competition, regulation and risk profiles. According to Blanc-Brude and Ismail (2013), sub-sector dummies can be used as sufficient proxies for the contractual characteristics of the projects, as certain sector projects are always

procured using the same revenue models. The sub-sector classifications used in the paper are outlined in Figure 3 below.

Figure 3: Infrastructure sub-sector classifications

Social infrastructure	Utilities	Transportation	TMT	Commercial	Other
Defence	Electricity	Bridge	Towers	Airport	Other
Education	Gas	Car park	Mobile	Port	
Government	Petrochemical	Rail	Satellite		
Health	Photovoltaic Solar	Road			
Housing	Sewage	Transit			
Leisure	Treatment	Tunnel			
Police	Upstream				
Prison	Water				
Waste	Wind				

Region: As argued by Annamalai and Jain (2013), there are large differences in regulation and other factors affecting the investment environment between different countries. Therefore, the infrastructure deals have been sorted into different regions to account for these differences. The regions included in the data set are the UK, Germany, France, Benelux (Belgium, Netherlands, Luxemburg) and the Nordics (Sweden, Norway, Finland, Denmark). The individual countries are sorted into broader regions as the investment environment is considered relatively similar within the specific regions.

Investment stage: Furthermore, the stage of the concerned project is taken into account, i.e. whether the project is defined as a new project, i.e. Greenfield, or an existing project, i.e. Brownfield. According to Inderst (2010), Greenfield and Brownfield projects exhibit different risk-return profiles, where Greenfield projects are seen as more risky and yield higher returns than Brownfield projects.

Size: The size of each individual tranche is included as a control variable. Logged values for the size of each tranche have been used, in line Inderst (2010), who mentions size as an important factor for testing for debt characteristics for infrastructure deals.

4.2 Methodology

In order to test the hypotheses and engage in an educated analysis surrounding the research questions, several different plausible methodologies come to mind. One approach would be to conduct a qualitative research interviewing industry experts and

investment professionals active in the sector, in order to obtain a view of what factors have affected their investment decisions and pricing strategies in the distinctive periods. Another approach would be to conduct a case study on a selected infrastructure project or on a range of projects that have experienced debt issuances both pre-, and post-financial crisis and subsequently compare the specific characteristics and magnitude of the discrepancies between the situations. A third approach, and the one chosen by the Authors, would be to assemble an as comprehensive data set as possible, containing data points on every underlying debt tranche per infrastructure deal, in order to quantitatively assess and analyse the change while ensuring statistical significance. The model the Authors have constructed and proceeded with in the testing of each hypothesis is set out in the below section.

4.2.1 Model specification

Before statistically testing the set out hypotheses the Authors found it important to achieve an overview of the development and picture the effects with descriptive statistics. By doing so, a preliminary view of the situation could be obtained at a very initial stage and furthermore, a broader portrait of the sector disposition and underlying data set could be showcased. The numeric variables, i.e. tranche size, maturity, leverage and tranche blended margin, were plotted by pre-, and post-financial crisis period on mean, standard deviation, minimum value and maximum value, respectively. All numeric variables include 305 observations each, as outlined above in Section 4.1.1 Gathering and handling of data. The remaining variables, i.e. the categorical variables, as described in Section 4.1.2 Definition of variables, were subsequently plotted by total, pre-, and post-financial crisis time periods, on number of observations, with adherent percentage share of the sample and average tranche blended margin indicated. After an initial overview had been obtained, the hypotheses were statistically tested by running regressions, as described below. Since the hypotheses are formulated as null-hypotheses rejecting these, provided the existence of sufficient statistical significance, supports the Authors' expectations.

4.2.1.1 Choice of statistical method per hypothesis

Hypothesis 1: The infrastructure debt margin in developed European countries has not experienced a shift post financial crisis

To assess if Hypothesis 1 could be rejected or not, the Authors find it most applicable to initially run a multiple regression of the effects of the created date dummy variable on the tranche blended margin. When running this particular regression, all additional variables are held constant as control variables in order to increase the clarification of the relative impact of the independent date dummy variable.

Furthermore, since changes in compositions across certain categorical variables, i.e. regions and sub-sectors, could have large effects on the yielded results, due to diverse pricing driven by different risk-return profiles, the Authors want to test the effects of the date variable on the tranche blended margin while such changes are taken into account. In order to validate such the effects of the date dummy variable on the tranche blended margin, the Authors have also conducted a random-effects regression, with a newly created dummy as group variable, i.e. a region plus sub-sector dummy. Since there are 5 regions and 6 sub-sectors, 30 different groups would have been created. However, since the data set lacks deals in certain combinations of regions and sub-sectors, 25 groups were created. Before deciding on using the random-effects regression test, the Authors conducted, in accordance with Greene (2012), fixed-effects regressions and subsequently a Hausman specification test in order to ultimately decide on which of the models is most appropriate to use. In the Hausman specification test, the null-hypothesis is that the preferred model is the random-effects model and that the unique errors are uncorrelated with the regressors. If the difference between the models is not systematic with at least 5% significance, the null-hypothesis typically cannot be rejected and hence the random-effects model is preferred. Running the Hausman-test on the random-, and fixed-effects model results on the data set, the null-hypothesis could only be rejected with 50% significance. Consequently, the Authors proceeded with the random-effects model.

The random-effects model was run with tranche blended margin as dependent variable, the date dummy as independent variable, region plus sub-sector as group and consequently, debt provider, debt type, investment stage, maturity, size and leverage as control variables.

Hypothesis 2: There are no sub-sector differences in the magnitude of the potential infrastructure debt margin shift

To assess if Hypothesis 2 could be rejected or not, the Authors find it most interesting and compelling to compute coefficients of variation for the pre-, and post-financial crisis time periods, respectively. By comparing the pre-financial crisis coefficient of variation to the post-financial crisis coefficient of variation, an understanding of the change in variability across sub-sectors between the periods can be obtained. The coefficient of variation is calculated in accordance to Equation 4 below:

$$Equation\ 4: Coefficient\ of\ Variation = \frac{\sigma}{\mu}$$

The standard deviation (σ) is calculated on sub-sector level and the mean (μ) is calculated on a deal-level, in order to portray the appropriate distribution between sub-sectors. The coefficient of variation measure is a more useful measure than the normal standard deviation, given the coefficient of variation is a normalised measure of dispersion and puts the standard deviation in the context of the mean. Comparing variability of data series with widely different means, it is therefore more accurate to proceed with the coefficient of variation measure. When computing the coefficients of variation, the TMT sub-sector was disregarded in both time periods for comparability reasons, since the data set lacks data on TMT-deals in the pre-financial crisis time period.

Difference-in-difference tests could have been an alternative method in order to reject or not reject the second hypothesis. However, the Authors argue that while a difference-in-difference test answers the question if a single sub-sector has changed more or less compared to the average of the others, it gives less insight into how the overall variability across sub-sectors has changed. Given that there is an established difference across sub-sectors pre-financial crisis, assessing if the overall variability across sub-sectors has changed post-financial crisis determines both if single sub-sectors have changed with different magnitude, while also portraying the change in the overall variability across sub-sectors.

Hypothesis 3: Private institutional investors do not price infrastructure debt with different margins compared to banks

Testing if Hypothesis 3 could be rejected or not, the Authors have proceeded with a similar random-effects model as specified under Hypothesis 1 above, with the

differing factor being that the debt provider variable private institutional investors instead constituted an independent variable, and that the date dummy variable instead was considered a control variable. Additionally, the other debt provider variables, bank and bank syndicate, were excluded from the test, since the aim of the test was to obtain results of the private institutional investors variable's effect on the dependent tranche blended margin variable, in relation to the other two types of debt providers.

Hypothesis 4: Different debt instruments do not experience dissimilar margins

Testing if Hypothesis 4 could be rejected or not, the Authors have proceeded with a similar random-effects model as specified under Hypothesis 1 above, with the differing factor being that the debt type variable bond instead constituted an independent variable, and that the date dummy variable instead was considered a control variable. Additionally, the other debt type variable, term loan, was excluded from the test, since the aim of the test was to obtain results of the bond variable's effect on the dependent tranche blended margin variable, in relation to the other debt type variable.

Hypothesis 5: Debt tranche maturity is not more expensively priced post-financial crisis

Assessing if Hypothesis 5 could be rejected or not, the Authors perform a difference-in-difference test. The Authors argue that the difference-in-difference is the most appropriate model to use in this instance given the clear existence of a treatment group (long-tenor tranches) and a control group (short-tenor tranches) as well as two different time periods.

By statistically validating if the pricing of maturity has increased post-financial crisis compared to pre-financial crisis, an understanding of a potential illiquidity premium increase can be obtained. When conducting the difference-in-difference test, the region plus sub-sector dummy is used as a group in order to take into account the differences between these categorical variables. Furthermore, an interaction between the date dummy variable and the 7-year tranche maturity variable described in Section 4.1.2.2 Independent variables was created. Since long-tenor tranches, i.e. tranches with a maturity of 7 years or above, was given the dummy

value 1, a result with a positive coefficient of the interaction on the tranche blended margin would indicate that margins for long-tenor tranches have had a comparably larger effect on the tranche blended margin post-financial crisis, than pre-financial crisis.

4.2.1.2 Statistical significance

The statistical significance of the results is determined by assessing the estimated probability of obtaining the observed sample results when the hypotheses are actually true, i.e. the calculated probability or the p-value. The pre-determined levels of statistical significance are set by the Authors at, $P < 0.01$, $P < 0.05$ and $P < 0.10$, respectively, where $P < 0.01$ is seen as statistically highly significant and $P < 0.05$ is seen as statically significant and $P < 0.10$ is seen as reasonably statistically significant. The level of reasonable statistical significance is set with respect to the rather limited number of observations included in the data set, and hence the lower threshold for rejecting the hypotheses is set to a 10% significance level.

4.2.1.3 Economical significance

Moreover, to be able to fully assess the importance of the independent variable on the dependent variable, i.e. tranche blended margin, the economical significance is also considered. The economical significance is determined by assessing the sign and size of the association, i.e. coefficient, and if that potential causality follows theoretical expectations. When considering the size of the coefficient it is related to the pre-financial crisis mean tranche blended margins, presented in Figure 4 and Figure 5 below.

4.2.2 Robustness checks

Robustness checks are important to conduct in order to ensure the validity of the results. Areas where the Authors have made executive decisions in the design of the data relate primarily to the date dummy variable and the tranche maturity dummy variable.

Firstly, the cut-off date for the date dummy variable was set to the date of the Lehman Brothers crash. This date has been chosen in accordance to previous research, but it could be argued that an alternative date should be used. Nevertheless, it is important to test whether a change of cut-off date affect the yielded results. The Authors have therefore changed the cut-off date backwards and forward in time

quarterly, up to four quarters, and run the same regressions on each of these eight new cut-off dates. The Authors can report that such changes do not particularly affect the yielded results and hence the results are considered fully robust on this instance.

The second robustness check has been conducted on the tranche maturity dummy variable. Namely, by changing the set cut-off year from 7 years to other values to distinguish from short-, and long tenors. The cut-off at 7 years has been chosen in accordance with prevailing academia, however it is, also here, of importance to test should a change in cut-off value affect the results. When lowering the cut-off year by 1 year the results are in line with previous obtained results, both in terms of statistical and economic significance. Furthermore, when increasing the cut-off year by 1 year, economically significant results are obtained, however, with low statistical significance. Hence, the Authors can conclude that the results are considered significant but with somewhat limited robustness in regards to the maturity variable.

5. Results and Analysis

In the following section, the Authors outline the yielded results on a per hypothesis basis and subsequently analyse the results given the previous research and theoretical background presented in Chapter 2 Previous Research and Theoretical Background. The presented results are to be seen as this paper's main findings and contribution to the academic field.

5.1 Results

In order to properly and profoundly portray the generated results, an introductory section providing descriptive statistics of the data set is provided before outlying the results on a per hypothesis basis. Potential causing factors or relationships are briefly pointed out in this section, but analysed more in-depth in Section 5.2 Analysis.

5.1.1 Descriptive statistics

To begin with, it is important to underline the fact that the prevailing data set consists of 305 debt tranches, nearly equally split between the different time periods, i.e. pre-, versus post-financial crisis. The pre-financial crisis period is built upon 151 debt tranches, equalling 49.5% of total debt tranches. Subsequently, the post-financial crisis period is built upon 154 debt tranches, equalling 50.5% of total debt tranches. An equal distribution of pre-, versus post-financial crisis debt tranches is an important factor for increasing the statistical significance of the results. This is owing to the fact that both time periods consist of an equal number of tranches, thereby making both time periods uniformly exposed to potential outliers and therefore increasing the robustness of the overall results.

Figure 4 below portrays descriptive statistics of the numerical variables included in the data set. An initial study of these variables provides an initial and immediate overview of the changes in the investment environment of the infrastructure debt market in developed European countries.

Figure 4: Descriptive statistics of numerical variables

	Total data set			
	Mean	Std. Dev.	Min	Max
Tranche blended margin	167bps	93bps	15bps	789bps
Tranche maturity	20,6 yrs	9,1 yrs	1,6 yrs	44,0 yrs
Tranche size	€305,5m	€516,3m	€1,1m	€4 850,0m
Project leverage	82,6%	12,1%	32,8%	99,2%
	Pre-financial crisis			
	Mean	Std. Dev.	Min	Max
Tranche blended margin	101bps	37bps	15bps	350bps
Tranche maturity	22,0 yrs	8,9 yrs	1,6 yrs	44,0 yrs
Tranche size	€307,0m	€594,9m	€1,1m	€4 850,0m
Project leverage	83,2%	11,1%	42,3%	99,2%
	Post-financial crisis			
	Mean	Std. Dev.	Min	Max
Tranche blended margin	232bps	85bps	42bps	789bps
Tranche maturity	19,3 yrs	9,0 yrs	2,5 yrs	38,0 yrs
Tranche size	€304,0m	€427,4m	€5,0m	€2 572,0m
Project leverage	82,0%	12,9%	32,8%	98,5%

Note: Cut-off date for pre-, and post-financial crisis is set to 15th September 2008.

As indicated in Figure 4 above, the average tranche blended margin for the infrastructure projects has increased significantly after the financial crisis, now on average trading at 232bps above appropriate benchmark, i.e. LIBOR or EURIBOR, compared to an average of 101bps pre-financial crisis. In addition, the standard deviation of the tranche blended margin has increased post-financial crisis, which may indicate a less uniform overall pricing. However, this may also be caused by shifts in categorical variable composition between the periods. As for the tranche maturity, projects prior to the financial crisis exhibited longer debt tenors than projects post the financial crisis. This decrease in average tranche maturity is possibly due to the new regulatory requirements for the banking community as outlined in Section 2.4 The Basel III Accord and its effects on Project Finance. No significant difference in average tranche size is indicated by the descriptive statistics. However, a significant decrease in the standard deviation of the debt tranche sizes is apparent. Furthermore, the project leverage for the deals included in the data set seems

unaffected by the financial crisis, with average values of approximately 82-83% in both time periods.

Moreover, Figure 5 below portrays descriptive statistics for the different categorical variables included in the data set, showing the change in proportions between the pre-, and post-financial crisis time periods. It is important to distinguish the changes in proportions between the time periods in order to develop a clear picture of the change in investment landscape and to evaluate the impact of the included categorical variables. As different categories are priced differently, driven by diverse risk-return profiles, a change in proportion between the time periods may affect the overall average tranche blended margin.

Figure 5: Descriptive statistics of categorical variables

	Total data set			**Pre-financial crisis**			**Post-financial crisis**		
	Observat-ions	Share of period sample	Average tranche blended margin	Observat-ions	Share of period sample	Average tranche blended margin	Observat-ions	Share of period sample	Average tranche blended margin
Greenfield	240	79%	158bps	129	85%	98bps	111	72%	227bps
Brownfield	65	21%	201bps	22	15%	115bps	43	28%	245bps
UK	186	61%	167bps	103	68%	107bps	83	54%	241bps
France	52	17%	159bps	18	12%	73bps	34	22%	205bps
BeNeLux	36	12%	172bps	15	10%	89bps	21	14%	231bps
Germany	20	7%	189bps	9	6%	115bps	11	7%	250bps
Nordics	11	4%	152bps	6	4%	94bps	5	3%	221bps
Social infrastructure	123	40%	147bps	73	48%	96bps	50	32%	221bps
Transportation	89	29%	172bps	46	30%	110bps	43	28%	239bps
Utilities	59	19%	164bps	24	16%	95bps	35	23%	211bps
Commercial	18	6%	209bps	5	3%	118bps	13	8%	243bps
TMT	8	3%	326bps	0	0%	n.a.	8	5%	326bps
Other	8	3%	194bps	3	2%	113bps	5	3%	243bps
Bank syndicate	185	61%	168bps	93	62%	104bps	92	60%	232bps
Bank	99	32%	146bps	55	36%	95bps	44	29%	210bps
Private institution	21	7%	262bps	3	2%	125bps	18	12%	285bps
Term loan	277	91%	161bps	145	96%	101bps	132	86%	227bps
Bond	28	9%	224bps	6	4%	96bps	22	14%	259bps

Note: Cut-off date for pre-, and post-financial crisis is set to 15th of September 2008.

Firstly, an increase in the average tranche blended margin is noted across all categorical variables, further validating the shift in the infrastructure debt margin across investment stage, sub-sectors, geographies, debt providers and debt types.

Secondly, a proportional change between the distribution of Greenfield and Brownfield projects is noted, with the share of Greenfield projects decreasing post-financial crisis. The increased pressure on refinancing of Project Finance debt, i.e. an increase of Brownfield projects, is supported by the projections of July et al. (2012)

and Chan and Worth (2011). Additionally, this could partly be explained by a shift in the risk-awareness of the infrastructure debt investors, since Brownfield projects by nature could be argued to constitute safer investments, owing the projects' financial viability has already been proven. However, with this argumentation it seems odd that Brownfield projects experience a higher average tranche blended margin in both time periods, potentially caused by data skewedness since the amount of Brownfield projects is limited compared to the amount of Greenfield projects.

Thirdly, a more uniform distribution of projects across regions post-financial crisis is noted. This could possibly be caused by an increase in the availability of deal information for projects outside the UK in the later time period. Additionally, it could be explained by changes in government spending within the different regions, with comparably less government spending on infrastructure in the UK post-financial crisis, while as stated in Abadie (2011), France has maintained their investments in infrastructure assets post-financial crisis. As with geographical regions, a more uniform distribution of projects across sub-sectors is noted post-financial crisis. This is possibly due to a shift in government spending behaviour since the change is greatest in the social infrastructure sub-sector where governments by nature are more active, as concluded by Wagenvoort et al. (2010). The increasingly uniform infrastructure investment universe could as well be explained by investors' increasing risk-awareness, ultimately influencing a more diverse investment behaviour in order to lower idiosyncratic risks by diversification. Moreover, it is important to outline that the data set does not include any deals in the TMT sub-sector pre-financial crisis. Post-financial crisis the data set contains three separate TMT-deals, split over 8 debt tranches, where the most central are the Project Finance deal of Global System for Mobile Communication in France in 2011 and the refinancing of UK-based communications infrastructure company Arqiva in 2013. Since margins in the TMT sub-sector are comparably high, the lack of TMT-deals pre-financial crisis affects the initial, overall picture of the increasing average tranche blended margin. Furthermore, this underlines the importance of more sophisticated statistical tests and further strengthens the Authors' decision to conduct statistical tests on a fixed region and sub-sector basis, using random-effects regressions.

Fourthly, private institutional investors have expanded their participation in the infrastructure debt market post-financial crisis, currently having a market share of 12% of the issued debt tranches according to the data set. Additionally, debt tranches

provided by private institutional investors exhibit higher average margins than debt tranches provided by banks or syndicates of banks, potentially driven by different pricing-models, based on diverse appetite for risk and required rate of returns.

Lastly, there has been a slight change in debt type composition in the infrastructure debt market, with more debt provided in the form of bonds post-financial crisis. At an initial look, bonds appear more expensive than term loans with average overall margins of 224bps versus 161bps, which seems counterintuitive considering the fact that bonds typically are used to finance less risky infrastructure deals. This is possibly due to outliers in the data set, as the amount of debt tranches provided in the form of bonds is limited. In addition, it may be caused by a larger propensity by banks to finance the infrastructure deals with profitable but high risk-return profiles with bonds, driven by current regulatory accords where bonds are more favourably regulated, from a liquidity stand-point under the new LCR and NSFR requirements. This would largely be in accordance with the Chan and Worth (2011) projections, projecting a wider use of project bonds in Project Finance financing.

5.1.2 Hypothesis 1

Hypothesis 1 was formulated as: "*The infrastructure debt margin in developed European countries has not experienced a shift post financial crisis".* With this hypothesis, the Authors aim to test whether the financial crisis has had a statistical significant impact on the average infrastructure debt margin.

Figure 6: Multivariate regression of Date on Tranche blended margin

Multivariate regression

Variables	*Tranche blended margin (bps)*		
Dependent variables	Coefficient	Significance (P>|t|)	Standard error
Date	125,99***	(0,000)	[7,425]
Control variables	Coefficient	Significance (P>|t|)	Standard error
Regions			
UK	23,26	(0,246)	[20,02]
BeNeLux	10,01	(0,644)	[21,619]
Germany	37,14	(0,117)	[23,644]
France	-17,40	(0,401)	[20,712]
Nordics	*Omitted*	*Omitted*	*Omitted*
Sub-sectors			
Socialinfrastructure	-101,15***	(0,000)	[25,283]
Transportation	-77,81***	(0,001)	[24,248]
Utilities	-101,75***	(0,000)	[24,498]
Commercial	-92,46***	(0,001)	[26,490]
Other	-77,83**	(0,016)	[32,026]
TMT	*Omitted*	*Omitted*	*Omitted*
Debt provider			
Bank	-71,14***	(0,000)	[19,939]
Bank syndicate	-58,54***	(0,003)	[19,879]
Private institution	*Omitted*	*Omitted*	*Omitted*
Debt type			
Term loan	32,53*	(0,063)	[17,452]
Bond	*Omitted*	*Omitted*	*Omitted*
Other tranche characteristics			
Investment stage	-12,15	(0,289)	[11,431]
Tranche maturity (logged)	7,88	(0,620)	[15,878]
Tranche size (logged)	-4,43	(0,527)	[6,998]
Leverage	17,51	(0,569)	[30,679]
Constant	202,88***	(0,000)	[43,805]
N	305		
R^2	58,87%		

Note: The significance levels are represented by 10% (*), 5% (**) and 1% (***).

As indicated by Figure 6 above, a multivariate regression provides initial support that the date variable has a large effect on the tranche blended margin, with a

coefficient of 126.0bps. Additionally, the date variable is statistically significant at a 1% significance level.

Figure 7: Random-effects GLS regression of Date on Tranche blended margin

Random-effects GLS regression

Variables	*Tranche blended margin (bps)*		
Dependent variables	Coefficient	Significance (P>|t|)	Standard error
Date	125,81***	(0,000)	[7,52]
Control variables	Coefficient	Significance (P>|t|)	Standard error
Debt provider			
Bank	-66,57***	(0,001)	[19,579]
Bank syndicate	-52,98***	(0,007)	[19,595]
Private institution	*Omitted*	*Omitted*	*Omitted*
Debt type			
Term loan	24,98	(0,150)	[17,353]
Bond	*Omitted*	*Omitted*	*Omitted*
Other tranche characteristics			
Investment stage	-8,06	(0,472)	[11,207]
Tranche maturity (logged)	12,83	(0,410)	[15,586]
Tranche size (logged)	-3,27	(0,643)	[7,058]
Leverage	4,57	(0,881)	[30,427]
Constant	129,50***	(0,000)	[35,772]
Groups	25		
R^2	52,69%		

Note: The significance levels are represented by 10% (*), 5% (**) and 1% (***).

Furthermore, as indicated in Figure 7 above, a random-effects regression provides additional support that the date variable has a large effect on the tranche blended margin, with a value of 125.8bps. As with the multivariate regression, the random-effects test shows a statistical significance at a 1% significance level of the date variable on the tranche blended margin. Therefore, the Authors can conclude that there has occurred a significant shift in the infrastructure debt margin, and thus Hypothesis 1 can be rejected.

5.1.3 Hypothesis 2

Hypothesis 2 was formulated as: "*There are no sub-sector differences in the magnitude of the potential infrastructure debt margin shift".* With this hypothesis, the Authors aim to test whether there are significant differences in debt margins between projects within different sub-sectors. In addition, the Authors aim to test whether these differences have changed in magnitude, pre-, versus post-financial crisis.

Firstly, as outlined in Figure 5, without controlling for other variables affecting the tranche blended margin, the different sub-sectors do exhibit different average margins. Controlling for other contributing factors, Figure 6 above, shows that projects within the TMT sub-sector exhibit significantly higher debt margins than debt tranches in other sub-sectors. All the sub-sectors' coefficients are significant at a 1% significance level, except the coefficient for the Other sub-sector, which is significant at a 5% significance level.

Secondly, in order to test the second part of the hypothesis, i.e. whether there is a difference in the magnitude of the shift between the sub-sectors, the Authors have calculated the coefficient of variation between the sub-sectors (excluding the TMT sub-sector due to data limitations mentioned in Section 5.1.1 Descriptive statistics), on a pre-, and post-financial crisis basis, respectively.

Figure 8: Coefficient of Variation between sub-sectors

Coefficient of Variation between sub-sectors

	Average tranche blended margin (bps)	
Sub-sector	Pre-financial crisis	Post-financial crisis
Social infrastructure	96bps	221bps
Transportation	110bps	239bps
Utilities	95bps	211bps
Commercial	118bps	243bps
Other	113bps	243bps
Standard deviation between sub-sectors	10bps	15bps
Total data set (excluding TMT)		
Average tranche blended margin (bps)	101bps	227bps
Coefficient of Variation (%)	**10,3%**	**6,4%**

Note: The Coefficient of Variation is calculated as the 'Standard deviation between sub-sectors' divided by 'Average tranche blended margin'.

As can be concluded from Figure 8 above, the coefficient of variation for the sub-sectors has decreased notably post-financial crisis, implying more uniform pricing across sub-sectors. A possible explanation to this could be that pre-financial crisis, risky projects were perceived attractive enough to receive funding in a higher extent. Post-financial crisis, the risk-awareness among investors can be argued to have increased. As a result, the demand for risky projects, across all different sub-sectors, has decreased and in general less-risky projects are attractive enough for investors to receive funding. Consequently, the difference in average risk-levels across sub-sectors has decreased post-financial crisis. Alternatively, as the investment environment might be in a state of shock, debt margins in all sectors are priced higher and more uniformly, without complete underlying rationality, in line with de Jong and Driessen (2013) that discuss the increase of liquidity premiums in times of financial distress.

To conclude, the Authors find that there has been a shift in the debt margin across all different sub-sectors. Furthermore, the difference in pricing between sub-sectors is lower post-financial crisis, compared to pre-financial crisis, imposing a shift of different magnitude across sub-sectors. Hence, the Authors can reject the second hypothesis.

5.1.4 Hypothesis 3

Hypothesis 3 was formulated as: "*Private institutional investors do not price infrastructure debt with different margins compared to banks".* With this hypothesis, the Authors aim to test whether private institutional investors price infrastructure debt higher compared to traditional debt providers, i.e. banks. Firstly, at an initial look at the descriptive statistics in Figure 5, projects financed by institutional investors do exhibit higher margins on average than projects financed by banks, across both time periods. To further statistical assess the hypotheses a random-effects regression has been conducted, outlined in Figure 9 below.

Figure 9: Random-effects GLS regression of Private institution on Tranche blended margin

Random-effects GLS regression

Variables	*Tranche blended margin (bps)*		
Dependent variables	Coefficient	Significance (P>|t|)	Standard error
Private institution	58,10***	(0,002)	[18,927]
Control variables	Coefficient	Significance (P>|t|)	Standard error
Debt type			
Term loan	27,87	(0,105)	[17,213]
Bond	*Omitted*	*Omitted*	*Omitted*
Other tranche characteristics			
Date	125,49***	(0,000)	[7,507]
Investment stage	-6,00	(0,591)	[11,179]
Tranche maturity (logged)	11,87	(0,444)	[15,51]
Tranche size (logged)	-0,44	(0,947)	[6,67]
Leverage	-0,49	(0,987)	[30,18]
Constant	68,61*	(0,060)	[36,536]
N	305		
Groups	25		
R^2	52,07%		

Note: The significance levels are represented by 10% (*), 5% (**) and 1% (***).

As portrayed in Figure 9 above, the coefficient for private institutional investors is statistically significant at a 1% significance level, with a positive impact

of 58.1bps. A possible explanation for this is that private institutional investors fund projects that are riskier along other potential dimensions not observed by the Authors.

Therefore, the Authors can conclude that projects financed by private institutional investors exhibit significantly higher margins than projects financed by banks. Consequently, Hypothesis 3 can be rejected.

5.1.5 Hypothesis 4

Hypothesis 4 was formulated as: "*Different debt instruments do not experience dissimilar margins"*. With this hypothesis, the Authors aim to test whether different debt instruments experience dissimilar margins, i.e. whether tranches financed with bonds are priced with different margins compared to tranches financed with traditional term loans. Firstly, at an initial look at the descriptive statistics in Figure 5, tranches financed by bonds seem to be priced higher than tranches financed by term loans. To further assess this relationship, a random-effects regression has been conducted, with the results portrayed in Figure 10 below.

Figure 10: Random-effects GLS regression of Bond on Tranche blended margin

Random-effects GLS regression

Variables	*Tranche blended margin (bps)*		
Dependent variables	Coefficient	Significance (P>|t|)	Standard error
Bond	-24,98	(0,150)	[17,353]
Control variables	Coefficient	Significance (P>|t|)	Standard error
Debt provider			
Bank	-66,57***	(0,001)	[19,579]
Bank syndicate	-52,98***	(0,007)	[19,595]
Private institution	*Omitted*	*Omitted*	*Omitted*
Other tranche characteristics			
Date	125,81***	(0,000)	[7,520]
Investment stage	-8,06	(0,472)	[11,207]
Tranche maturity (logged)	12,83	(0,410)	[15,586]
Tranche size (logged)	-3,27	(0,643)	[7,058]
Leverage	4,57	(0,881)	[30,427]
Constant	154,47***	(0,000)	[38,174]
N	305		
Groups	25		
R^2	52,69%		

Note: The significance levels are represented by 10% (*), 5% (**) and 1% (***).

Looking at the random-effects regression in Figure 10 above, the coefficient for bonds is only statistically significant at a 15% significance level, with an impact of -25.0bps. Although the random-effects regression shows economically significant results for bonds, the test does not provide statistically significant results at the by the Authors required minimum 10% level.

Therefore, the Authors cannot conclude with statistical significance that different debt instruments experience dissimilar margins. However, the statistical test does show a difference between the debt instruments, with tranches funded by bonds experiencing lower debt margins than tranches funded by term loans. Considering the limited amount of data points, the results can still be considered informative, and not in accordance to the initial results as portrayed in the descriptive statistics in Figure 5. Interestingly, such inferences are further supported by Chan and Worth (2011) that point out that the fact that bonds are more generously treated under the new Basel III

Accord, imply either lower margins for project bonds or an increased use of project bonds. To conclude, the Authors cannot reject Hypothesis 4, but acknowledge the economical significance of the results and the academic support of the direction of the results.

5.1.6 Hypothesis 5

Hypothesis 5 was formulated as: "*Debt tranche maturity is not more expensively priced post-financial crisis"*. With this hypothesis, the Authors aim to test whether the new regulatory requirements, imposed by the Basel III Accord, have resulted in debt tranche maturity being more expensively priced post-financial crisis, i.e. an increase in a form of illiquidity premium. In order to test this hypothesis, a difference-in-difference test has been conducted using the date variable and 7-year maturity variable, as defined in Section 4.1.2.2 Independent variables.

Figure 11: Difference-in-Difference test of Tranche maturity and Date on Tranche blended margin

Difference-in-Difference test

Variables	*Tranche blended margin (bps)*		
Dependent variables	Coefficient	Significance (P>|t|)	Standard error
Interaction			
Tranche maturity (7 years) * Date	37,41*	(0,094)	[22,358]
Control variables	Coefficient	Significance (P>|t|)	Standard error
Debt provider			
Bank	-60,36***	(0,002)	[19,306]
Bank syndicate	-45,47**	(0,019)	[19,364]
Private institution	*Omitted*	*Omitted*	*Omitted*
Debt type			
Term loan	29,05*	(0,089)	[17,073]
Bond	*Omitted*	*Omitted*	*Omitted*
Other tranche characteristics			
Date	92,98***	(0,000)	[21,003]
Investment stage	-11,12	(0,300)	[10,734]
Tranche maturity (7 years)	11,43	(0,515)	[17,533]
Tranche size (logged)	-1,80	(0,797)	[6,997]
Leverage	5,22	(0,861)	[29,816]
Constant	124,59***	(0,000)	[34,804]
N	305		
Groups	25		
R^2	53,06%		

Note: The significance levels are represented by 10% (*), 5% (**) and 1% (***). The cut-off year for the Tranche maturity dummy is set to 7 years. The Interaction is established by multiplying the 'Tranche maturity (7 years)' variable with the Date variable.

Looking at the difference-in-difference test in Figure 11 above, the coefficient for the date and 7-year maturity interaction is significant at a 10% significance level, with an economical impact of 37.4bps. Further, bearing in mind the limited data sample, the results are considered reasonably significant. In addition, the coefficient is economically significant. Therefore, the Authors can conclude that debt tranche maturity is priced more expensively after the financial crisis, possibly as a result of the new regulatory requirements. Another explanatory factor could be that the time

period defined as post-financial crisis is a time period of financial uncertainty, in which, as argued by de Jong and Driessen (2013), liquidity is more highly valued. To conclude, the Authors can reject Hypothesis 5.

5.2 Analysis

In this section, the Authors analyse the received results presented above, in connection to the previous research within the area, as presented in Chapter 2 Previous Research and Theoretical Background. The underlying objective of the analysis is to give nuanced and educated answers to the paper's two overall research questions: 1) "*What have been the main components of the shift in the infrastructure debt margin in developed European countries?";* and 2) "*How sustainable is the shift in the long term?"*. For the sake of clarity, these two research questions are analysed and answered on a separate basis, in Section 5.2.1 Research question 1 and Section 5.2.2 Research question 2, respectively.

5.2.1 Research question 1

The results in Section 5.1 Results, confirm that there has been a substantial shift in the infrastructure debt margin. Analysing the results further, the Authors can distinguish three main components having contributed to the shift on a statistical and economically significant level, namely: i) change in overall demand for infrastructure debt investments; ii) private institutional investors expanding their market participation; and iii) more expensive pricing of maturity. Furthermore, one other key component of the shift has been identified, namely the expansion of bond financing. This relationship is supported in the previous research by Chan and Worth (2011), however the findings presented in this paper do not support the relationship and change to be statistically significant at a sufficient level, and therefore the impact of this component on the infrastructure debt margin is not elaborated on further.

Firstly, regarding the change in overall demand for infrastructure debt investments, the Authors have specifically noted a change in the investment environment for infrastructure debt, post-financial crisis. As described by Synnott (2014), the investment banks have traditionally had a large market share in this market. However, after the financial crisis, these traditional investors have started to retrench somewhat from the market, reducing their share of the market. A retrenchment of such fashion was projected by Härle et al. (2010) and Chan and Worth (2011), who suggest an increased focus by the banks on capital-light products.

This conclusion is further supported by the Authors' findings, and is presented in Figure 5. A potential driver of this change in demand of the traditional investors could firstly be an increased risk-awareness in the light of the financial crisis and sovereign debt crisis in Europe. In a period of crisis, it is common that investors restrain their risk-exposure in order to limit potential credit-losses and remain within the desired risk-return profile of the stakeholders. An increased risk-awareness is further supported in the findings of this paper. Namely, as portrayed in Figure 5 where the Authors note more differentiated investment behaviour across sub-sectors and regions, with investors decreasing their risk-exposure to specific characteristics associated with certain sub-sectors or regions. In other words, more differentiated investment behaviour is, by the Authors, seen as a way to decrease idiosyncratic risk-taking. However, as Blanc-Brude (2014) proposes, idiosyncratic risks cannot be completely diversified due to the inherent nature of the infrastructure investment sector, where there are only a limited number of projects available to be funded at a given point in time. The Authors nevertheless, suggest that investors heavily exposed to specific sectors or regions, still are able to initially reduce their idiosyncratic risk-exposure pertaining to specific industries or geographies. Moreover, Figure 8 shows a more uniform pricing between sub-sectors, as the coefficient of variation has decreased from 10.3% to 6.4%, post-financial crisis. Due to the magnitude of the decrease, the Authors see this as a means of evidence of increased risk-awareness, as more safe investments are funded across sectors.

A potential additional driver of the change in demand among investors could be the increased regulatory requirements, as presented in Section 2.4 The Basel III Accord and its effects on Project Finance. As outlined by the Basel Committee on Banking Supervision (2011), the Basel III Accord proposes, when fully implemented, both increased capital requirements and introduces new short-, and long-term liquidity requirements. As further supported by Elliot (2009), these increased regulations will likely cause higher costs of loans or more difficult loan origination. Not only is the actual margin shift that Elliot (2009) projects supported by the findings in this paper, also more challenging loan origination processes further affect the potential demand negatively.

Secondly, regarding the private institutional investors expanding their market participation, the Authors have found a significant increase in the proportional deals that are funded by institutional investors, as portrayed in Figure 5. This is in line with

Chan and Worth (2011), who argue that there is potential for non-bank lender entries due to their regulatory advantages in relation to banks. Furthermore, it is supported by the findings of Inderst (2013), who concludes an increasing interest in infrastructure debt funds with growing volumes, although still at a relatively low level.

Moreover, the different pricing between banks and private institutional investors has been determined statistically and economically significant with institutional investors pricing the infrastructure debt with higher margins, as outlined in Figure 9. The higher pricing of infrastructure debt by private institutions could be owing to several different drivers. One of these drivers possibly being an underlying clientele effect, where private institutions target investments with higher risk-profiles in order to meet demand of the investors in the respective funds. Distinguishing different investor clienteles according to their inherent risk-awareness is a finding in line with previous research, where for example, Blackburn et al. (2009) draw similar conclusions. A clientele targeting projects of higher inherent risk, naturally also require compensation for that exposure by higher returns, in this case by higher debt margins. Furthermore, Blackburn et al. (2009) conclude that the price of an asset, and in turn the inherent pricing of risk characteristics of that asset, is affected by differing investor characteristics. Such characteristics could be, geographical exposure, currency exposure, and development risk, among others. This results in the different investors taking different factors into account when pricing the infrastructure debt investments. Hence, the Authors feel confident in stating that an increased participation of a new clientele, private institutional investors, that price infrastructure debt differently, has constituted a contributing factor for the infrastructure debt margins shifting upwards post-financial crisis.

Thirdly, regarding the more expensive pricing of maturity as this paper's findings suggest in Figure 11, the Authors view the new regulatory requirements as presented in Section 2.4 The Basel III Accord and its effects on Project Finance, as the main driver of change. This is supported by the conclusions drawn by Chan and Worth (2011), who suggest that under the newly stipulated NSFR requirement, it is likely that banks will manoeuver their commitments to long-term exposures. Conjointly, July et al (2012) emphasise that this connection is especially true in the Project Finance debt market, since 100% of that kind of debt with a maturity exceeding 1 year, must be secured by funding with maturities in excess of 1 year, according to the NSFR requirement. This compares to corporate debt where only 50%

needs to be secured. The Authors find that this will result in both the demand for, and pricing of, long-term infrastructure investments changing. More specifically, the results presented in Figure 5, show that the banks' market share has decreased post-financial crisis for the infrastructure debt investments in general. Further supporting the relationship outlined by Chan and Worth (2011) and July et al. (2012), Figure 4 shows that the average maturity for the infrastructure debt tranches actually has decreased, from an average of 22.0 years pre-financial crisis to 19.3 years post-financial crisis. This supports the statement that the demand for long-term projects among investors has decreased. As for the change in pricing of maturity, the Authors presume that as a result of the new regulatory requirements, the investors and especially the banks, see maturity as a bigger concern post-financial crisis. In turn, the pricing of maturity should have increased, resulting in higher debt margins for long-term tranches. This presumption is further supported by the obtained results, portrayed in Figure 11, where statistically significant results for the change in pricing of long-term maturities are found, representing a form of increased illiquidity premium. The inherent illiquid nature of infrastructure debt investments has largely been covered in previous academia, where Blanc-Brude (2014) concludes that Project Finance debt margins often include an illiquidity premium.

In Section 5.2.2 Research question 2 below, the Authors further elaborate on to what extent these three underlying components are sustainable in the longer term.

5.2.2 Research question 2

In order to evaluate the sustainability of the magnitude of shift in the infrastructure debt margin, the driving factors behind each of the three components, elaborated upon in Section 5.2.1 Research question 1, are analysed from a sustainability perspective. Firstly, the Authors note a common denominator affecting all three identified major components of the shift in infrastructure debt margins, namely the increased regulatory requirements as stipulated in the Basel III Accord. This is particularly interesting considering the fact that this is not a temporary occurrence. Unless the Basel III Accord is modified or new, less strict regulatory requirements are stipulated, an effect of the Basel III Accord on the infrastructure debt margin could be argued to sustain. However, the magnitude of the effect can be debated. Moreover, it could be argued that the banks participating in the infrastructure debt market might find ways to circumvent stipulated regulations. Their abilities to do so are, however, not

elaborated upon further in this paper given the speculative nature of the potential occurrence. Furthermore, considering the results, it is plausible that an increasing participation of private institutional investors will continue to drive up margins and sustain the shift. However, the Authors argue that such a development is not certain in the long-term, given that a vast increasing demand among investors ultimately will constitute a downward pressure on the margins.

As argued by Bobokza et al. (2013), the European Project Finance loan margin consists to 32% of an illiquidity premium. Conjointly, de Jong and Driessen (2013) discuss the variability of the illiquidity premium over time, concluding that liquidity premiums are higher during times of financial distress. With this in mind, a proportion of the found illiquidity premium as established by the higher pricing of long-term projects post-financial crisis, can be argued to be temporary, driven by the past and current uncertainties in the global economy. Keeping the findings of Bobokza et al. (2013) in mind, it could be argued that a larger proportion of the average post-financial crisis loan margin than a third constitutes a liquidity premium. Some increase in the proportion of the loan margin pertaining to the liquidity premium is considered justified, given the new regulatory requirements. However, a certain percentage of the shift can be argued to pertain to the market having been, and might still be, under distress.

In order to further assess the sustainability of the shift in the infrastructure debt margin, the results presented in Figure 13, in the Appendix, can be evaluated. The results show a clear downward trend of the yearly effects on the infrastructure debt margin between 2011 and 2014, where the yearly effect on the margin is decreasing from 149.5bps in 2011 to 110.7bps in 2014. The obtained results of the conducted regression is, moreover, statistically significant at a 1% level. Therefore, the Authors can conclude that the trend of the shift in the infrastructure debt margin is decreasing in recent years, although remains at a considerably high level. These results are in line with the paper's conclusions that a certain proportion of the perceived shift in infrastructure debt margins is related to the market having been and might currently be in degrees of financial distress, and therefore not considered to be fully sustainable in the long-term. Additionally, the fact that the margins still are at a considerably higher level in 2014, compared to pre-financial crisis, is in line with the paper's conclusions that a proportion of the shift in average margins is driven by the

new regulatory requirements, an effect that is determined by the Authors as sustainable to a certain extent.

To summarise, the findings of the paper demonstrate a change in the investment environment for infrastructure debt, with a clear shift in the level of margins. Going forward, it is more problematic to ascertain at what magnitude the perceived shift is sustainable. In line with the findings of Elliot (2009), the Authors remind that a more exact approximation of the effects needs to be assessed in more detail. The Authors acknowledge that the Basel III Accord is to be regarded as permanent, and to be fully implemented by 2019, directly affecting the demand for, and the pricing of, the infrastructure debt. However, the Authors also note an on-going downward trend in the average infrastructure debt margin, determined with full statistical significance. With this new investment environment, with new regulations along with a different proportion of investor clienteles, it is uncertain at what level of infrastructure debt margin a new, sustainable demand and supply equilibrium will be reached in the future. Nevertheless, given the results presented in the paper, the Authors can establish that the future equilibrium will be at a higher margin level post-financial crisis, compared to pre-financial crisis.

6. Conclusions and Further Research

6.1 Conclusions

The aim of this study was to examine the main components driving the infrastructure debt margin shift, post-financial crisis, in developed European countries. Furthermore, the aim was to evaluate how sustainable the perceived shift could be considered to be. The research area on infrastructure debt is a comparably undeveloped research field within finance, with the infrastructure debt margin shift post-financial crisis being a topic with very limited previous research. Hence, the angle taken by the Authors constitutes an innovative approach and adds further knowledge of the infrastructure debt investment market. Furthermore, the findings of the study bridges the gaps between the infrastructure debt field and other research fields within finance, namely clientele effects and illiquidity premiums.

The obtained results conclude that a significant shift in the infrastructure debt margin has occurred post-financial crisis. The shift has been identified to be driven by three main components, namely: i) a change in overall demand for infrastructure debt investments; ii) private institutional investors expanding their market participation; and iii) more expensive pricing of maturity, post-financial crisis compared to pre-financial crisis. The Authors can conclude an overall decrease of differentiation of pricing in the infrastructure debt market, mainly driven by the first component. As the overall demand for infrastructure debt investments has changed post-financial crisis, the spectrum of level of risk among projects being funded has narrowed, resulting in more uniform pricing across sub-sectors. In other words, an increased lack of pricing differentiation.

Furthermore, the Authors note a common denominator among the different driving factors of the identified components of the margin shift, namely the introduction of the Basel III Accord. The new regulatory framework, with the introduced LCR and NSFR requirements, is seen to adversely affect Project Finance debt financings, specifically. The new requirements make it increasingly difficult and costly for banks to fund long-term projects, driving up margins and reducing overall demand for infrastructure deals. Hence, to assess and give a nuanced answer to whether the observed shift is sustainable, the occurrence of the Basel III Accord needs to be taken into consideration. Given that the Basel III Accord not is seen as a temporary occurrence, the Authors believe a certain degree of margin shift to be

sustainable. However, it is of greater difficulty to predict at what exact margin level a new equilibrium will be reached. In an initial attempt to assess at what margin level a new market equilibrium could be reached, the Authors have analysed the yearly trend of the margin levels in recent years, and noted a significant decrease between 2011 and 2014. This further pictures the inherent difficulty in predicting the exact, new sustainable level of the infrastructure debt margin. The decreasing trend might be explained by a proportion of the margin shift being caused by the market being under degrees of financial distress.

To summarise, the Authors find an increase in the infrastructure debt margin justified. However, the exact margin level of a long-term equilibrium has to be further analysed.

6.2 Further research

The academia covering infrastructure debt investments is found to be relatively underdeveloped. Although this paper contributes with significant results in the field, there are still many more aspects to analyse. Furthermore, as a result of limited data availability, there would be potential for improved robustness of the obtained results if the data on infrastructure debt investments were more ready accessed. For example, given the limited robustness of the test performed with the long-term maturity variable, a study comprising a larger set of infrastructure deals could further validate the robustness of the increased illiquidity premium, found in this paper.

Further research could also be conducted upon previous periods of financial distress, in order to more precisely portray the proportions of the effects of the Basel III Accord, in relation to the market being under financial distress.

Moreover, a more detailed study on inherent debt tranche covenants would contribute to prevailing academia, since a more profound understanding of the deal-specific risks could be obtained, and hence a further bridge between infrastructure debt and clientele effects could be established, as well as an increased understanding of the change in investors' risk-awareness.

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Appendix

Figure 12: Data set overview

Borrower/Project	Stage	Region	Tranche signing date	Sub-sector classification	Tranche maturity (years)	Tranche size (EURm)	Leverage (%)	Tranche blended margin (bps)	Debt provider	Debt type
NewSchools Leyton Ltd	Green	UK	2000-03-01	Social infrastructure	23,00	22,9	94%		Bank	Term loan
A-Train AB	Brown	Nordics	2000-04-28	Transportation	14,00	163,2	62%		Bank syndicate	Term loan
Total School Solution Ltd	Green	UK	2000-05-05	Social infrastructure	24,67	19,5	91%		Bank	Term loan
Health Management (UCLH) plc	Green	UK	2000-07-12	Social infrastructure	30,00	405,7	90%		Bank	Term loan
Modus Services plc	Green	UK	2000-09-06	Social infrastructure	25,00	510,2	71%		Bank	Term loan
Modus Services plc	Green	UK	2000-09-06	Social infrastructure	27,00	348,6	71%		Bank	Term loan
Arrow Light Rail	Green	UK	2000-09-19	Transportation	25,00	309,5	87%		Bank syndicate	Term loan
Arrow Light Rail	Green	UK	2000-09-19	Transportation	25,00	6,7	87%		Bank syndicate	Term loan
Arrow Light Rail	Green	UK	2000-09-19	Transportation	4,00	5,0	87%		Bank syndicate	Term loan
Warnowquerung GmbH & Co KG	Green	Germany	2000-09-26	Transportation	23,00	73,5	80%		Bank syndicate	Term loan
Warnowquerung GmbH & Co KG	Green	Germany	2000-09-26	Transportation	25,00	36,8	80%		Bank syndicate	Term loan
White Horse Education Partnership	Green	UK	2000-10-27	Social infrastructure	27,00	54,2	81%		Bank syndicate	Term loan
Ayr Environmental Services Ltd	Green	UK	2000-11-01	Utilities	27,00	132,1	84%		Bank	Term loan
Blackshaw Healthcare Services Ltd	Green	UK	2000-11-17	Social infrastructure	30,00	80,6	81%		Bank syndicate	Term loan
Hull Maternity Development Ltd	Green	UK	2000-12-07	Social infrastructure	27,00	48,6	99%		Bank	Term loan
Tidefast Ltd	Brown	UK	2001-01-24	Commercial	5,00	341,5	92%		Bank syndicate	Term loan
Bywest Ltd	Green	UK	2001-01-31	Social infrastructure	33,00	78,9	83%		Bank syndicate	Term loan
Miven Ltd	Green	UK	2001-03-03	Social infrastructure	24,00	8,3	53%		Bank	Term loan
Kirklees Grouped Schools	Green	UK	2001-03-30	Social infrastructure	32,00	43,6	61%		Bank	Term loan
NewSchools (Cornwall) Ltd	Green	UK	2001-03-30	Social infrastructure	23,00	61,7	64%		Bank	Term loan
Support Services (Gravesend) Ltd	Green	UK	2001-04-12	Social infrastructure	25,00	73,0	90%		Bank syndicate	Term loan
Catalyst Healthcare (Hexham) plc	Green	UK	2001-04-14	Social infrastructure	30,00	52,0	90%		Bank	Term loan
3ED (Glasgow) Ltd	Green	UK	2001-04-17	Social infrastructure	26,75	447,8	85%		Bank syndicate	Term loan
Midland Expressway Ltd	Brown	UK	2001-05-24	Transportation	16,75	1059,9	82%		Bank syndicate	Term loan
Midland Expressway Ltd	Brown	UK	2001-05-24	Transportation	3,33	13,3	82%		Bank	Bond
NewSchools (Swanscombe)	Green	UK	2001-05-24	Social infrastructure	25,50	21,2	94%		Bank	Term loan
Machrie Ltd	Green	UK	2001-06-04	Social infrastructure	29,00	42,3	53%		Bank	Term loan
Catchment (Tay) Ltd	Green	UK	2001-06-26	Utilities	28,00	105,4	74%		Bank	Bond
NATS (En Route) plc	Green	UK	2001-07-26	Other	20,00	2351,2	93%		Bank syndicate	Term loan
Yorkshire Link Holdings Ltd	Green	UK	2002-02-04	Transportation	23,00	132,3	91%		Private	Bond
Yorkshire Link Holdings Ltd	Green	UK	2002-02-04	Transportation	23,00	127,7	91%		Bank syndicate	Term loan
Brighton School Services	Green	UK	2002-03-08	Social infrastructure	24,00	29,1	93%		Bank	Term loan
CH Bolton Ltd	Green	UK	2002-04-12	Social infrastructure	22,50	19,5	92%		Bank	Term loan
Albion Healthcare (Oxford) Ltd	Green	UK	2002-04-19	Social infrastructure	28,50	53,6	89%		Bank	Term loan
Cheshire SPV Ltd	Green	UK	2002-05-07	Social infrastructure	29,00	52,7	93%		Bank	Term loan
Infraspeed BV	Green	Benelux	2002-05-14	Transportation	27,42	1005,0	89%		Bank syndicate	Term loan
St Thomas More School Partnership	Green	UK	2002-05-28	Social infrastructure	25,00	25,3	97%		Bank	Term loan
Linteum (Uttlesford) Ltd	Green	UK	2002-05-30	Social infrastructure	28,00	11,4	82%		Bank	Term loan
Robertson Healthcare (Findlay House) Ltd	Green	UK	2002-06-06	Social infrastructure	27,50	6,5	94%		Bank	Term loan
Defence Management (Watchfield) Ltd	Green	UK	2002-06-20	Social infrastructure	22,50	172,1	61%		Bank syndicate	Term loan
TH Schools Ltd Partnership	Green	UK	2002-06-30	Social infrastructure	24,50	76,7	95%		Bank	Term loan
Plot B Partnership	Green	UK	2002-09-18	Social infrastructure	25,00	26,7	99%		Bank	Term loan
Plot B Partnership	Green	UK	2002-09-18	Social infrastructure	1,58	26,7	99%		Bank	Term loan
Cobco (450) Ltd	Green	UK	2002-10-22	Social infrastructure	27,00	19,0	75%		Bank	Term loan
Modern Court EA Ltd	Green	UK	2002-10-31	Social infrastructure	25,67	45,1	89%		Bank	Term loan
Services Support (Manchester) Ltd	Green	UK	2002-12-04	Social infrastructure	25,83	133,3	90%		Bank syndicate	Term loan
Services Support (Manchester) Ltd	Green	UK	2002-12-04	Social infrastructure	2,25	8,3	90%		Bank syndicate	Term loan
Services Support (Manchester) Ltd	Green	UK	2002-12-04	Social infrastructure	25,83	7,6	90%		Bank syndicate	Term loan
Tube Lines (Holdings) Ltd	Green	UK	2002-12-31	Transportation	18,00	964,0	82%		Bank syndicate	Term loan
Tube Lines (Holdings) Ltd	Green	UK	2002-12-31	Transportation	18,00	459,1	82%		Bank syndicate	Term loan
Tube Lines (Holdings) Ltd	Green	UK	2002-12-31	Transportation	25,00	459,1	82%		Bank syndicate	Term loan
Tube Lines (Holdings) Ltd	Green	UK	2002-12-31	Transportation	18,00	229,5	82%		Bank syndicate	Term loan
Tube Lines (Holdings) Ltd	Green	UK	2002-12-31	Transportation	25,00	229,5	82%		Bank syndicate	Term loan
Tube Lines (Holdings) Ltd	Green	UK	2002-12-31	Transportation	18,00	153,0	82%		Bank syndicate	Term loan
Tube Lines (Holdings) Ltd	Green	UK	2002-12-31	Transportation	25,00	153,0	82%		Bank syndicate	Term loan
Tube Lines (Holdings) Ltd	Green	UK	2002-12-31	Transportation	25,00	15,3	82%		Bank syndicate	Term loan
Connect A30/A35 Ltd	Brown	UK	2003-02-28	Transportation	10,00	177,0	83%		Bank syndicate	Term loan
Metronet	Green	UK	2003-04-04	Transportation	27,00	2343,3	88%		Bank syndicate	Term loan
Metronet	Green	UK	2003-04-04	Transportation	29,00	1025,2	88%		Bank syndicate	Bond
Metronet	Green	UK	2003-04-04	Transportation	29,00	483,3	88%		Bank syndicate	Bond
26.9KM E39 Klett-Bardshaug Road	Green	Nordics	2003-04-07	Transportation	23,50	184,0	91%		Bank syndicate	Term loan
Poort van den Bosch BV	Green	Benelux	2003-04-17	Transportation	3,00	86,5	64%		Bank syndicate	Term loan
Poort van den Bosch BV	Green	Benelux	2003-04-17	Transportation	17,00	53,0	64%		Bank syndicate	Term loan
Birmingham Schools Partnership Ltd	Green	UK	2003-04-24	Social infrastructure	27,00	68,1	90%		Bank syndicate	Term loan
Orkdalsvegen AS	Green	Nordics	2003-06-25	Transportation	25,00	120,0	86%		Bank syndicate	Term loan
Easter Ross Primary Care Resource Centre PFI	Green	UK	2003-07-31	Social infrastructure	23,00	11,0	86%		Bank	Term loan
Albion Healthcare (Doncaster) Ltd	Green	UK	2003-08-11	Social infrastructure	24,50	27,0	90%		Bank	Term loan
NATS (En Route) plc	Brown	UK	2003-10-09	Commercial	5,00	422,7	87%		Bank syndicate	Term loan
Paradigm Secure Communications Ltd	Green	UK	2003-10-24	Social infrastructure	14,00	1265,3	70%		Bank syndicate	Term loan
Paradigm Secure Communications Ltd	Green	UK	2003-10-24	Social infrastructure	13,50	119,3	70%		Bank syndicate	Term loan
8.1MW Oupia Wind Farm	Green	France	2003-10-28	Utilities	15,00	7,4	89%		Bank	Term loan
Sheppey Route Ltd	Green	UK	2004-02-19	Transportation	28,50	140,5	94%		Bank	Term loan
Bycentral Ltd	Green	UK	2004-03-05	Social infrastructure	30,00	124,8	70%		Bank syndicate	Term loan
Hospital Co (Oxford John Radcliffe) Ltd	Green	UK	2004-03-31	Social infrastructure	28,50	187,0	80%		Bank syndicate	Term loan
Hospital Co (Oxford John Radcliffe) Ltd	Green	UK	2004-03-31	Social infrastructure	30,42	28,4	80%		Bank syndicate	Term loan
17.5KM E39 Lyngdal-Flekkefjord Road	Green	Nordics	2004-04-29	Transportation	27,00	158,7	95%		Bank syndicate	Term loan
Delfluent BV	Green	Benelux	2004-05-26	Utilities	28,00	166,4	80%		Bank syndicate	Term loan
Delfluent BV	Green	Benelux	2004-05-26	Utilities	28,00	125,0	80%		Bank	Term loan
A-Train AB	Brown	Nordics	2004-06-01	Transportation	5,00	126,6	74%		Bank syndicate	Term loan
RapidEye AG	Green	Germany	2004-06-21	Other	7,42	75,0	54%		Bank syndicate	Term loan
Alfarveg Way	Green	Nordics	2004-07-28	Transportation	26,00	125,0	76%		Bank syndicate	Term loan
128MW Havelland Wind Farms	Green	Germany	2004-12-15	Utilities	15,00	139,3	89%		Bank syndicate	Term loan
Brussels International Airport Co SA/NV - BIAC	Brown	Benelux	2005-02-14	Commercial	5,00	458,8	87%		Bank syndicate	Term loan
Brussels International Airport Co SA/NV - BIAC	Brown	Benelux	2005-02-14	Commercial	7,00	458,8	87%		Bank syndicate	Term loan
Ally & Cham de Cham Wind Farms	Green	France	2005-04-30	Utilities	15,00	67,8	83%		Bank	Term loan
Transform Schools (Bassetlaw) Ltd	Green	UK	2005-07-12	Social infrastructure	27,00	184,6	89%		Bank syndicate	Term loan

Borrower/Project	Stage	Region	Tranche signing date	Sub-sector classification	Tranche maturity (years)	Tranche size (EURm)	Leverage (%)	Tranche blended margin (bps)	Debt provider	Debt type
Coast To Coast Water Ltd - C2C	Green	UK	2005-07-22	Utilities	25,00	73,3	85%		Bank syndicate	Term loan
Woolwich Arsenal Rail Enterprises - WARE	Green	UK	2005-09-29	Transportation	30,00	318,8	92%		Bank syndicate	Term loan
800MW Trianel CCGT	Green	Germany	2005-11-14	Utilities	20,00	368,2	80%		Bank	Term loan
Helicopter Flight Training Services GmbH - HFTS	Green	Germany	2005-11-24	Social infrastructure	14,00	174,9	70%		Bank	Term loan
Hospital Co (Queen Alexandra) Ltd	Green	UK	2005-12-15	Social infrastructure	35,00	395,6	92%		Private	Term loan
Optimep 4 SAS	Green	France	2006-02-23	Social infrastructure	31,00	271,2	64%		Bank syndicate	Term loan
Caen Hospital Centre	Green	France	2006-03-16	Social infrastructure	30,00	84,6	85%		Bank syndicate	Term loan
Abertis Acquisition of SANEF	Brown	France	2006-03-17	Transportation	4,00	2583,4	42%		Bank syndicate	Term loan
Eiffage SA	Brown	France	2006-04-27	Transportation	7,00	4850,0	70%		Bank syndicate	Term loan
120MW Q7 Offshore Wind Farm	Green	Benelux	2006-10-25	Utilities	11,00	219,0	57%		Bank syndicate	Term loan
Aquiris Brussels Wastewater PPP	Green	Benelux	2006-11-15	Utilities	18,00	100,0	93%		Bank	Term loan
Aquiris Brussels Wastewater PPP	Green	Benelux	2006-11-15	Utilities	19,00	167,0	93%		Bank	Term loan
Tres Vent GIF Wind Farms	Green	France	2006-12-05	Utilities	20,00	60,6	82%		Bank syndicate	Term loan
A65 Toll Road Langon to Pau	Green	France	2007-01-26	Transportation	13,00	940,9	81%		Bank syndicate	Term loan
Pierre Oudot Hospital, Bourgoin Jallieu PPP	Green	France	2007-04-16	Social infrastructure	20,00	124,3	93%		Bank syndicate	Term loan
23.8MW Suderland Wind Farm	Green	Germany	2007-06-14	Utilities	17,00	23,2	83%		Bank	Term loan
23.8MW Suderland Wind Farm	Green	Germany	2007-06-14	Utilities	20,00	1,1	83%		Bank	Term loan
EDF EN Wind Farm Portfolio	Green	France	2007-09-28	Utilities	19,42	231,1	89%		Bank syndicate	Term loan
Tank Farm Acquisition Debt Facilities	Brown	Germany	2007-10-01	Utilities	5,17	50,6	72%		Bank	Term loan
Sloe Centrale 870MW CCGT	Green	Benelux	2008-02-21	Utilities	18,00	510,0	86%		Bank syndicate	Term loan
Centre Hospitalier Intercommunal d'Annemasse-Bonneville PPP	Green	France	2008-03-20	Social infrastructure	35,00	136,2	91%		Bank syndicate	Term loan
Centre Hospitalier Intercommunal d'Annemasse-Bonneville PPP	Green	France	2008-03-20	Social infrastructure	33,50	25,7	91%		Bank syndicate	Term loan
Gate LNG receiving terminal	Green	Benelux	2008-07-18	Utilities	21,50	341,5	94%		Bank syndicate	Term loan
Gate LNG receiving terminal	Green	Benelux	2008-07-18	Utilities	21,50	35,3	94%		Bank syndicate	Term loan
Rijnmond 1 IPP Refinancing	Brown	Benelux	2008-07-21	Utilities	11,00	448,0	85%		Bank syndicate	Term loan
Dalriada Water Ltd	Green	UK	2006-05-30	Utilities	23,50	160,4	90%		Bank syndicate	Term loan
Stirling Gateway Ltd	Green	UK	2006-06-30	Social infrastructure	31,00	116,2	95%		Bank syndicate	Term loan
IIC by Education (Peterborough School) Ltd	Green	UK	2006-07-31	Social infrastructure	30,00	70,0	84%		Bank	Term loan
Moto Investments Ltd	Green	UK	2006-07-31	Transportation	5,00	683,1	78%		Bank syndicate	Term loan
BY Education (Lewisham) Ltd	Green	UK	2006-08-11	Social infrastructure	30,00	76,2	85%		Bank syndicate	Term loan
Clover Bidco Ltd	Brown	UK	2006-12-14	Commercial	7,00	714,0	66%		Bank syndicate	Term loan
Macquarie Motorways Group Ltd	Brown	UK	2006-12-29	Transportation	9,00	1491,0	86%		Bank syndicate	Term loan
Leeds LIFT Co	Green	UK	2007-01-18	Social infrastructure	26,50	43,2	95%		Private	Bond
Pyramid Schools (Plymouth) Ltd	Green	UK	2007-02-27	Social infrastructure	24,50	83,4	91%		Bank	Term loan
Glen Water	Green	UK	2007-03-06	Utilities	24,00	199,4	93%		Bank syndicate	Term loan
Clackmannanshire Education Partnership	Green	UK	2007-03-14	Social infrastructure	31,50	104,0	94%		Bank	Term loan
Honoris	Green	France	2007-04-16	Social infrastructure	35,00	124,0	90%		Bank syndicate	Term loan
Honoris	Green	France	2007-04-16	Social infrastructure	20,00	15,0	90%		Bank syndicate	Term loan
Solihull BSF Schools Ltd	Green	UK	2007-05-01	Social infrastructure	27,00	89,6	91%		Bank	Term loan
Lincolnshire Mental Health Services NHS Trust	Green	UK	2007-05-03	Social infrastructure	30,00	45,2	90%		Bank	Term loan
Bolton and Rochdale LIFT Co	Green	UK	2007-05-11	Social infrastructure	25,00	30,5	68%		Bank	Term loan
UPP Loughborough Student Accommodation Ltd	Green	UK	2007-06-06	Social infrastructure	30,00	68,0	74%		Bank	Term loan
Leicestershire Mental Health Services NHS Trust	Green	UK	2007-06-18	Social infrastructure	30,00	19,1	90%		Bank	Term loan
Axiom Education (Perth & Kinross) Ltd	Green	UK	2007-06-30	Social infrastructure	32,00	232,1	93%		Bank syndicate	Term loan
Verdun Participation 2 - VP2	Brown	France	2007-07-13	Transportation	44,00	573,0	83%		Bank syndicate	Term loan
A'Lienor	Green	France	2007-07-26	Transportation	8,00	980,0	82%		Bank syndicate	Term loan
South East Essex NHS LIFT Company (LIFTCO)	Green	UK	2007-08-09	Social infrastructure	25,00	13,5	57%		Bank	Term loan
InspirED Consortium (East Dunbartsonshire) plc	Green	UK	2007-08-10	Social infrastructure	29,00	165,3	92%		Bank syndicate	Term loan
HDM Schools Solutions Ltd	Green	UK	2007-08-17	Social infrastructure	30,00	117,8	90%		Bank	Term loan
Derbyshire Mental Health Services NHS Trust	Green	UK	2007-10-09	Social infrastructure	30,00	58,8	90%		Bank	Term loan
IIC Northampton Ltd	Green	UK	2007-10-31	Social infrastructure	29,00	55,9	87%		Bank	Term loan
Falkirk Schools Gateway Ltd	Green	UK	2007-11-13	Social infrastructure	31,00	205,2	92%		Bank	Term loan
Catalyst Education (Lancashire) Phase II Ltd	Brown	UK	2007-12-14	Social infrastructure	27,00	78,9	90%		Bank	Term loan
Amey Lighting (Norfolk) Ltd	Green	UK	2008-01-31	Other	25,00	42,3	83%		Bank syndicate	Term loan
E4DB&G ProjectCo Ltd	Green	UK	2008-02-29	Social infrastructure	30,00	145,1	91%		Bank syndicate	Term loan
Arcour	Green	France	2008-03-14	Transportation	10,00	425,0	93%		Bank syndicate	Term loan
Arcour	Green	France	2008-03-14	Transportation	37,00	200,0	93%		Bank	Term loan
TT2 Ltd	Green	UK	2008-04-30	Transportation	30,00	264,8	85%		Bank syndicate	Term loan
AirTanker Finance Ltd	Green	UK	2008-06-30	Social infrastructure	27,00	2803,7	90%		Bank syndicate	Term loan
Partners 4 LIFT (FundCo 2) Ltd	Green	UK	2008-08-01	Social infrastructure	25,00	15,6	93%		Bank syndicate	Term loan
Willow Bidco Ltd	Brown	UK	2008-08-28	Transportation	3,00	1031,5	61%		Bank syndicate	Term loan
Willow Bidco Ltd	Brown	UK	2008-08-28	Transportation	5,00	1014,8	61%		Bank syndicate	Term loan
Willow Bidco Ltd	Brown	UK	2008-08-28	Transportation	7,00	409,7	61%		Bank syndicate	Term loan
Willow Bidco Ltd	Brown	UK	2008-08-28	Transportation	5,00	317,1	61%		Bank syndicate	Term loan
Kent PFI Co 1	Green	UK	2008-10-24	Social infrastructure	28,00	105,4	93%		Bank syndicate	Term loan
Locorail NV	Green	Benelux	2008-11-05	Transportation	38,00	821,0	96%		Bank syndicate	Term loan
Highway Management (Scotland) Ltd	Green	UK	2009-01-15	Transportation	32,00	326,1	86%		Bank syndicate	Term loan
Foundation for Life	Brown	UK	2009-02-04	Social infrastructure	25,00	13,4	91%		Bank	Term loan
Leeds PFI SPV 2 Ltd	Brown	UK	2009-02-23	Social infrastructure	14,50	38,3	85%		Bank	Term loan
Via Solutions Sudwest GmbH & Co KG	Green	Germany	2009-03-30	Transportation	28,50	450,0	74%		Bank syndicate	Term loan
Consort Healthcare (Fife) Ltd	Green	UK	2009-04-30	Social infrastructure	29,00	223,9	92%		Bank syndicate	Term loan
Connect Plus - M25 Widening Project	Green	UK	2009-05-19	Transportation	27,00	1269,0	86%		Bank syndicate	Term loan
QED Luton (Challney) Ltd	Green	UK	2009-06-03	Social infrastructure	26,25	33,7	90%		Bank	Term loan
Newham Learning Partnership (ProjectCo) Ltd	Green	UK	2009-06-19	Social infrastructure	25,00	58,8	90%		Bank	Term loan
Collaborative Services Support NE Ltd	Green	UK	2009-06-26	Social infrastructure	26,00	35,3	86%		Bank syndicate	Term loan
Barnsley Partnership 4 Learning	Green	UK	2009-07-07	Social infrastructure	28,00	115,8	76%		Bank syndicate	Term loan
Barnsley Partnership 4 Learning	Green	UK	2009-07-07	Social infrastructure	25,00	45,7	76%		Bank syndicate	Term loan
Barnsley Partnership 4 Learning	Green	UK	2009-07-07	Social infrastructure	25,00	44,9	76%		Bank	Term loan
Connect CNDR	Green	UK	2009-07-15	Transportation	28,00	86,1	87%		Bank syndicate	Term loan
Equitix Education (Derbyshire) Ltd	Green	UK	2009-07-23	Social infrastructure	25,00	42,9	93%		Bank	Term loan
East Lancashire Building Partnership	Green	UK	2009-08-06	Social infrastructure	24,50	27,1	88%		Bank	Term loan
Catalyst Education (Birmingham) Phase 1 Ltd	Green	UK	2009-08-21	Social infrastructure	24,00	62,4	90%		Bank syndicate	Term loan
BRAHM LIFTCO	Brown	UK	2009-10-02	Social infrastructure	24,50	13,1	86%		Bank	Term loan
Ivy Bidco Ltd	Brown	UK	2009-10-21	Commercial	5,00	1194,3	71%		Bank syndicate	Term loan
WLHC Project Co Ltd	Green	UK	2010-01-29	Social infrastructure	25,00	40,1	91%		Bank	Term loan
Hospital Co (Southmead) Ltd	Green	UK	2010-02-25	Social infrastructure	30,00	582,4	86%		Bank syndicate	Term loan
Esteem	Green	UK	2010-03-04	Social infrastructure	25,00	42,0	90%		Bank syndicate	Term loan
Community 1st Oldham	Green	UK	2010-04-23	Social infrastructure	25,00	13,5	90%		Bank	Term loan
Amey Birmingham Highways Ltd	Green	UK	2010-05-06	Transportation	25,00	296,6	79%		Bank syndicate	Term loan
Tay Valley Lighting (Nottingham) Ltd	Green	UK	2010-05-25	Other	24,00	52,0	90%		Bank syndicate	Term loan
Swedish Hospital Partners AB	Green	Nordics	2010-06-29	Social infrastructure	28,50	986,0	89%		Bank syndicate	Term loan
BWP Project Services Ltd	Green	UK	2010-06-30	Social infrastructure	27,50	134,7	86%		Bank syndicate	Term loan
Lewisham Schools for the Future LEP Ltd	Green	UK	2010-08-17	Social infrastructure	26,00	41,3	92%		Bank	Term loan

Borrower/Project	Stage	Region	Tranche signing date	Sub-sector classification	Tranche maturity (years)	Tranche size (EURm)	Leverage (%)	Tranche blended margin (bps)	Debt provider	Debt type
BAM PPP Somerset BSF Ltd	Green	UK	2010-09-23	Social infrastructure	26,00	72,9	89%		Bank syndicate	Term loan
Transformation Partnership for Learning	Green	UK	2010-10-29	Social infrastructure	26,50	32,2	86%		Bank	Term loan
Highfield PFI	Green	UK	2010-11-19	Social infrastructure	26,00	31,6	90%		Bank	Term loan
Building Better Health - Lambeth Southwark & Lewisham Ltd	Green	UK	2010-12-01	Social infrastructure	25,00	21,7	91%		Bank	Term loan
Camden BSF SPV Ltd	Green	UK	2010-12-21	Social infrastructure	25,00	64,8	92%		Bank	Term loan
Atlandes	Green	France	2011-01-18	Transportation	19,00	937,5	82%		Bank syndicate	Term loan
Sea Tank 510	Green	Benelux	2011-04-01	Commercial	9,00	165,0	80%		Bank syndicate	Term loan
A-Modell A8 Ulm- Augsburg GmbH& CoKG	Green	Germany	2011-05-31	Transportation	19,00	298,0	80%		Bank syndicate	Term loan
R4 Ghent Road (Belgium)	Green	Benelux	2012-02-07	Transportation	9,00	85,0	89%		Bank syndicate	Term loan
Vattenfall Finnish Electricity Distribution Asset	Brown	Nordics	2012-02-12	Utilities	5,00	1250,0	69%		Bank syndicate	Term loan
The Tribunal de Grande Istance (TGI) - Paris - PPP	Brown	France	2012-02-15	Social infrastructure	30,00	552,4	89%		Bank syndicate	Term loan
Leicester BSF - Schools 6 & 7	Green	UK	2012-04-18	Social infrastructure	25,00	57,1	90%		Bank	Term loan
Lambeth's Myatt's Field Social Housing PFI	Green	UK	2012-05-04	Social infrastructure	24,00	93,5	90%		Bank syndicate	Term loan
Edinburgh Airport Acquisition	Green	UK	2012-05-31	Commercial	5,00	500,8	50%		Bank syndicate	Term loan
Aviation Museum	Green	Benelux	2012-06-13	Other	25,00	81,0	90%		Bank syndicate	Term loan
Nimes-Montpellier HSR PPP	Green	France	2012-06-28	Transportation	5,25	828,0	91%		Bank syndicate	Term loan
Nimes-Montpellier HSR PPP	Green	France	2012-06-28	Transportation	23,00	225,0	91%		Bank syndicate	Term loan
Intercity Express Programme	Brown	UK	2012-07-25	Transportation	29,00	2572,0	88%		Bank syndicate	Term loan
Intercity Express Programme	Brown	UK	2012-07-25	Transportation	29,00	192,3	88%		Bank	Term loan
Pisto Oil Storage Company - France	Brown	France	2012-07-30	Other	7,00	442,6	92%		Bank syndicate	Term loan
Sheffield Highway PFI	Green	UK	2012-07-31	Transportation	23,50	271,3	78%		Bank syndicate	Term loan
Hounslow Highways PFI	Green	UK	2012-08-30	Transportation	24,50	111,0	69%		Bank syndicate	Term loan
Isle of Wight Roads Maintenance Scheme	Green	UK	2012-09-26	Transportation	24,50	118,3	60%		Bank syndicate	Term loan
Avon and Somerset Police HQ	Green	UK	2012-10-01	Social infrastructure	26,00	95,2	93%		Bank	Term loan
Peel Ports	Brown	UK	2012-11-20	Commercial	5,00	522,9	93%		Bank syndicate	Term loan
Peel Ports	Brown	UK	2012-11-20	Commercial	3,00	433,3	93%		Bank syndicate	Term loan
Peel Ports	Brown	UK	2012-11-20	Commercial	10,00	273,9	93%		Private	Bond
Peel Ports	Brown	UK	2012-11-20	Commercial	7,00	249,0	93%		Bank syndicate	Term loan
Rijnmond 1 IPP Refinancing	Brown	Benelux	2008-07-21	Utilities	11,00	21,0	85%		Bank syndicate	Term loan
Prado Sud Tunnel Marseille	Green	France	2008-10-03	Transportation	10,00	153,2	86%		Bank syndicate	Term loan
Nice Airport Car Rental Parking PPP	Green	France	2008-11-08	Commercial	25,00	32,9	79%		Bank	Term loan
T-Power CCGT	Brown	Benelux	2008-12-18	Utilities	20,00	396,0	95%		Bank syndicate	Term loan
12MW SFE Plainchamp Wind Farm	Green	France	2009-01-29	Utilities	15,00	11,9	72%		Bank syndicate	Term loan
Gate LNG expansion	Brown	Benelux	2009-03-17	Utilities	20,00	72,8	85%		Bank syndicate	Term loan
A5 Malsch-Offenburg PPP	Green	Germany	2009-03-30	Transportation	28,50	210,8	80%		Bank syndicate	Term loan
Berlin Brandenburg International Airport	Green	Germany	2009-06-30	Commercial	10,00	469,7	85%		Bank syndicate	Term loan
Berlin Brandenburg International Airport	Green	Germany	2009-06-30	Commercial	10,00	929,3	85%		Bank syndicate	Term loan
Brabo 1 Antwerp Tram	Green	Benelux	2009-08-05	Transportation	10,00	160,0	89%		Bank syndicate	Term loan
M51 Kliplev-Sonderborg Highway PPP	Green	Nordics	2010-02-17	Transportation	2,50	131,8	86%		Bank syndicate	Term loan
GSM-R Rail Communications PPP	Green	France	2010-02-18	TMT	14,00	107,7	82%		Bank syndicate	Term loan
GSM-R Rail Communications PPP	Green	France	2010-02-18	TMT	5,50	408,4	82%		Bank syndicate	Term loan
Exeltium Power Purchase Financing	Green	France	2010-04-12	Utilities	9,50	1596,4	92%		Bank syndicate	Term loan
Flemish Schools PPP	Green	Benelux	2010-06-10	Social infrastructure	30,00	1491,8	93%		Bank	Term loan
Villers-Saint-Sepulcre waste center PPP	Green	France	2010-06-11	Social infrastructure	20,00	129,7	76%		Bank	Term loan
Symove Waste Center	Green	France	2010-06-11	Utilities	20,00	129,7	98%		Bank	Term loan
Flemish Bus Depots PPP - Bruges, Overijse, Zomergem	Green	Benelux	2010-06-30	Transportation	24,00	31,4	84%		Bank	Term loan
5.2MW Solaire Esparron 2 PV plant	Green	France	2010-07-02	Utilities	18,00	15,3	89%		Bank	Term loan
5.2MW Solaire Esparron 2 PV plant	Green	France	2010-07-02	Utilities	18,00	6,0	89%		Private	Term loan
Schiphol Airport Justice Complex PPP	Green	Benelux	2010-07-08	Social infrastructure	25,75	63,9	86%		Bank syndicate	Term loan
6MW Saint-Hilaire PV plant	Green	France	2010-09-02	Utilities	18,00	12,1	85%		Bank	Term loan
6MW Saint-Hilaire PV plant	Green	France	2010-09-02	Utilities	18,00	5,0	85%		Private	Term loan
A12 Utrecht Lunetten-Veenendaal Road Expansion PPP	Green	Benelux	2010-09-23	Transportation	22,00	80,0	66%		Bank syndicate	Term loan
Bremervörde Prison PPP	Green	Germany	2010-10-18	Social infrastructure	25,00	60,0	91%		Bank syndicate	Term loan
A15 Maasvlakte-Vaanplein Road PPP	Green	Benelux	2010-12-15	Transportation	24,00	140,0	52%		Bank syndicate	Term loan
A15 Maasvlakte-Vaanplein Road PPP	Green	Benelux	2010-12-15	Transportation	24,00	143,0	52%		Bank syndicate	Term loan
LGV Tours-Bordeaux	Green	France	2011-06-16	Transportation	27,00	625,1	81%		Bank syndicate	Term loan
LGV Tours-Bordeaux	Green	France	2011-06-16	Transportation	27,00	1071,1	81%		Bank syndicate	Term loan
LGV Bretagne-Pays de la Loire PPP	Green	France	2011-07-28	Transportation	8,00	800,0	33%		Bank syndicate	Term loan
LGV Bretagne-Pays de la Loire PPP	Green	France	2011-07-28	Transportation	19,00	230,0	33%		Bank syndicate	Term loan
Peel Ports	Brown	UK	2012-11-20	Commercial	25,00	82,2	93%		Private	Bond
Peel Ports	Brown	UK	2012-11-20	Commercial	7,00	27,4	93%		Private	Bond
Peel Ports	Brown	UK	2012-11-20	Commercial	15,00	19,9	93%		Private	Bond
N33 Road PPP	Green	Benelux	2012-11-21	Transportation	20,00	124,9	91%		Bank syndicate	Term loan
Pylônes Services (FPS) (85% Stake)	Brown	France	2012-11-26	TMT	7,00	69,7	47%		Bank syndicate	Term loan
Supreme Court of the Hague	Green	Benelux	2013-01-23	Social infrastructure	34,42	37,9	76%		Bank syndicate	Term loan
Affinity Water	Brown	UK	2013-01-29	Utilities	23,00	292,4	48%		Bank syndicate	Bond
Affinity Water	Brown	UK	2013-01-29	Utilities	32,00	175,4	48%		Bank syndicate	Bond
Affinity Water	Brown	UK	2013-01-29	Utilities	9,75	93,6	48%		Bank syndicate	Bond
288MW Butendiek offshore wind financing	Green	Germany	2013-02-07	Utilities	14,00	405,5	75%		Bank syndicate	Term loan
288MW Butendiek offshore wind financing	Green	Germany	2013-02-07	Utilities	3,00	41,1	75%		Bank syndicate	Term loan
288MW Butendiek offshore wind financing	Green	Germany	2013-02-07	Utilities	14,00	81,5	75%		Bank syndicate	Term loan
A1/A6 Watergraafsmeer	Green	Benelux	2013-02-26	Transportation	27,00	454,4	90%		Bank syndicate	Term loan
A1/A6 Schiphol-Amsterdam-Almere Road PPP Phase I	Green	Benelux	2013-02-27	Transportation	27,50	200,7	82%		Bank syndicate	Term loan
Arqiva	Brown	UK	2013-02-28	TMT	3,00	924,9	81%		Bank syndicate	Term loan
Arqiva	Brown	UK	2013-02-28	TMT	5,00	908,7	81%		Bank syndicate	Term loan
Arqiva	Brown	UK	2013-02-28	TMT	7,00	693,7	81%		Private	Bond
Arqiva	Brown	UK	2013-02-28	TMT	19,00	462,5	81%		Private	Bond
Arqiva	Brown	UK	2013-02-28	TMT	7,00	404,6	81%		Private	Bond
Bicester Community Hospital	Green	UK	2013-03-01	Social infrastructure	25,00	5,3	90%		Bank	Term loan
Alder Hey Children's Hospital PFI	Green	UK	2013-03-20	Social infrastructure	30,00	78,3	51%		Private	Term loan
Alder Hey Children's Hospital PFI	Green	UK	2013-03-20	Social infrastructure	30,00	64,3	51%		Bank	Term loan
The Queen Elizabeth II Hospital	Green	UK	2013-03-28	Social infrastructure	25,00	31,9	90%		Bank	Term loan
Brookfield	Brown	UK	2013-04-16	Utilities	10,00	258,6	66%		Private	Bond
Brookfield	Brown	UK	2013-04-16	Utilities	15,00	187,4	66%		Private	Bond
Brookfield	Brown	UK	2013-04-16	Utilities	12,00	134,7	66%		Private	Bond
Brookfield	Brown	UK	2013-04-16	Utilities	20,00	117,2	66%		Private	Bond
Hertfordshire University	Green	UK	2013-05-30	Social infrastructure	21,42	167,5	76%		Private	Bond
Inverness College Redevelopment PPP	Green	UK	2013-05-30	Social infrastructure	25,00	49,0	91%		Bank	Term loan
OpenGrid Europe	Brown	Germany	2013-06-03	Utilities	3,00	1100,0	89%		Bank syndicate	Term loan
OpenGrid Europe	Brown	Germany	2013-06-03	Utilities	5,00	1100,0	89%		Bank syndicate	Term loan
Sheringham Shoal OFTO	Green	UK	2013-06-28	Utilities	19,00	224,0	88%		Bank syndicate	Term loan
Thameslink Rolling Stock	Green	UK	2013-06-28	Transportation	22,00	1891,9	90%		Bank syndicate	Term loan
Seguin Island City of Music PPP (Cite Musicale)	Green	France	2013-07-15	Social infrastructure	5,00	127,0	50%		Bank syndicate	Term loan

Borrower/Project	Stage	Region	Tranche signing date	Sub-sector classification	Tranche maturity (years)	Tranche size (EURm)	Leverage (%)	Tranche blended margin (bps)	Debt provider	Debt type
London Fire Station	Green	UK	2013-08-01	Other	25,00	54,1	82%		Bank	Term loan
Total Gas Network (TIGF)	Brown	France	2013-08-01	Utilities	3,00	200,0	83%		Bank syndicate	Term loan
Total Gas Network (TIGF)	Brown	France	2013-08-01	Utilities	3,00	200,0	83%		Bank syndicate	Term loan
Birmingham Dental Hospital	Green	UK	2013-08-16	Social infrastructure	25,00	50,4	86%		Bank	Term loan
London Array OFTO	Brown	UK	2013-09-10	Utilities	19,00	249,4	93%		Bank syndicate	Term loan
London Array OFTO	Brown	UK	2013-09-10	Utilities	19,00	247,2	93%		Bank	Term loan
Pendleton Social Housing	Green	UK	2013-09-17	Social infrastructure	29,00	98,3	87%		Private	Bond
Zaanstad Prison	Green	Benelux	2013-09-27	Social infrastructure	28,00	72,0	89%		Private	Bond
Zaanstad Prison	Green	Benelux	2013-09-27	Social infrastructure	8,00	12,3	89%		Bank	Term loan
9.36MW Gardanne Solar Plant Financing	Green	France	2013-10-09	Utilities	17,00	10,0	81%		Bank syndicate	Term loan
Aisne and Meuse Dams	Green	France	2013-10-24	Other	26,00	270,0	90%		Bank syndicate	Term loan
James Gillespie High School (Edinburgh)	Green	UK	2013-12-13	Social infrastructure	26,00	39,3	92%		Bank	Term loan
Brunswick Neighbourhood Regeneration	Green	UK	2013-12-19	Social infrastructure	23,00	88,1	65%		Bank	Bond
GDF Suez Wind Portfolio	Green	UK	2013-12-30	Utilities	14,33	109,7	97%		Bank syndicate	Term loan
3.8MW Porette De Nerone PV Plant Refinancing 2014	Brown	France	2014-01-06	Utilities	16,00	10,9	89%		Bank	Term loan
6MW Parc Eolien du Miroir Wind Farm	Green	France	2014-01-06	Utilities	14,00	6,5	87%		Bank	Term loan
Beauvais Bypass PPP	Brown	France	2014-01-13	Transportation	3,00	62,6	92%		Bank syndicate	Term loan
Fortum Finland	Brown	Nordics	2014-01-14	Utilities	5,00	2000,0	62%		Bank syndicate	Term loan
Wolverhampton Schools	Green	UK	2014-01-20	Social infrastructure	25,00	56,9	92%		Bank	Term loan
M8 Scotland	Green	UK	2014-02-14	Transportation	31,00	213,0	90%		Bank	Term loan
M8 Scotland	Green	UK	2014-02-14	Transportation	20,00	213,0	90%		Private	Bond
A11	Green	Benelux	2014-03-21	Transportation	31,25	865,4	88%		Bank syndicate	Bond
A11	Green	Benelux	2014-03-21	Transportation	33,50	115,6	88%		Bank	Term loan
North Tyneside Housing	Green	UK	2014-03-26	Social infrastructure	27,00	91,4	87%		Bank	Bond
Mersey Gateway	Green	UK	2014-03-31	Transportation	24,50	310,7	92%		Bank syndicate	Bond
Mersey Gateway	Green	UK	2014-03-31	Transportation	18,00	232,1	92%		Bank syndicate	Term loan
Mersey Gateway	Green	UK	2014-03-31	Transportation	3,17	123,9	92%		Bank	Term loan
IEP II	Green	UK	2014-04-16	Transportation	29,50	1189,9	89%		Bank	Term loan
Fortel-Bonnieres Wind Farms	Green	France	2014-04-22	Utilities	15,00	65,0	82%		Bank	Term loan
12MW Brassemonte Solar Plant	Green	France	2014-04-30	Utilities	18,75	20,6	80%		Bank syndicate	Term loan
Vinci Park	Brown	France	2014-05-27	Transportation	3,00	460,0	80%		Bank syndicate	Term loan
Vinci Park	Brown	France	2014-05-27	Transportation	5,00	460,0	80%		Bank syndicate	Term loan
Fortum Norway	Brown	Nordics	2014-06-30	Utilities	5,00	87,8	62%		Bank syndicate	Term loan

Note: Tranche blended margin intentionally undisclosed due proprietary information.
Source: Data set developed by Boork, J, and Synneby, J., 2014, in collaboration with BlackRock.

Figure 13: Random-effects GLS regression of Yearly effects on Tranche blended margin

Random-effects GLS regression

Variables	*Tranche blended margin (bps)*		
Dependent variables	Coefficient	Significance (P>|t|)	Standard error
Year 2009	135,75***	(0,000)	[13,478]
Year 2010	107,95***	(0,000)	[12,471]
Year 2011	149,50***	(0,000)	[25,93]
Year 2012	142,93***	(0,000)	[14,248]
Year 2013	136,11***	(0,000)	[12,227]
Year 2014	110,66***	(0,000)	[15,798]
Control variables	Coefficient	Significance (P>|t|)	Standard error
Debt provider			
Bank	-64,90***	(0,001)	[19,919]
Bank syndicate	-52,87***	(0,008)	[19,778]
Private institution	*Omitted*	*Omitted*	*Omitted*
Debt type			
Term loan	23,96	(0,176)	[17,709]
Bond	*Omitted*	*Omitted*	*Omitted*
Other tranche characteristics			
Investment stage	-8,12	(0,475)	[11,371]
Tranche maturity (logged)	11,44	(0,461)	[15,523]
Tranche size (logged)	-2,12	(0,762)	[6,997]
Leverage	28,75	(0,356)	[31,149]
Constant	110,17***	(0,002)	[36,167]
N	305		
Groups	25		
R^2	55,86%		

Note: The significance levels are represented by 10% (*), 5% (**) and 1% (***).