

**USING PROJECT BONDS
TO FUND SOUTH AFRICA'S
INFRASTRUCTURE
DEVELOPMENT**

by

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ABSTRACT

The growing use of project bonds in funding infrastructure globally deserves attention. Although primarily dominated by the developed markets, emerging markets such as Latin America and Asia have also been successful in using project bonds to finance their infrastructure projects. The project bond market in South Africa remains insignificant, with only a few episodic issuances in the last decade. Given the size of the country's capital markets, institutional investor base and experience with project finance transactions; one would expect the country to have a sizeable project bond market. This paper aims to investigate whether or not South Africa has the capacity to use project bonds to fund its infrastructure development. As government finances take strain, and as bank funding becomes unavailable due to Basel III, South Africa will need to look to the capital markets for the funding of its ambitious infrastructure plan. This paper finds that South Africa should begin to use project bonds and capital markets to fund its infrastructure development. However, more needs to be done on the regulatory and legal side to ensure that the country continues to attract foreign investment for infrastructure development.

Keywords: Project Bonds, Project Finance, Infrastructure, Institutional Investors, Capital markets, Regulation, Spreads

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CHAPTER 1: INTRODUCTION

1.1 Overview

Infrastructure plays an important role in facilitating economic development and it is a critical catalyst for attaining high levels of economic growth. There are two types of infrastructure and, although structurally different, both are equally important drivers of sustainable economic growth. Economic infrastructure includes power, water, transport systems (railways, airports, ports, and roads), telecommunications systems and pipelines. Economic infrastructure promotes investment and allows countries to produce at their natural level, thereby satisfying the needs of both the domestic market and the foreign market through international trade.

Social infrastructure includes schools, hospitals, prisons, housing, leisure and sports facilities. Social infrastructure, on the other hand, provides benefits to individuals, reduces the burden and dependency on government, promotes political stability and increases social cohesion.

The structural difference between the two is in the measurement and quantification of returns from investment. Economic infrastructure provides direct returns to investment, which are easily measured and quantified (e.g. revenues, cash flows, return on equity, return on assets). Returns from social infrastructure are difficult to measure because not only do they accrue to the government (investor) but they also accrue to the private individual(s) and yield low monetary benefits unlike economic infrastructure. These include increased human capital, a more productive labour force, increased innovation

and an entrepreneurial society. Unlike economic infrastructure, these are difficult to quantify. However, they are undoubtedly as equally important as economic infrastructure in any economy.

The role of project bonds in financing infrastructure and private-sector activities has evolved since the birth of the project finance market in the 1980s. Private-sector entities have historically used project finance and project bonds for large-scale projects such as mining, pipelines, and oil fields. However, from the early 1990s, private firms began to finance infrastructure projects such as toll roads, power plants and telecommunication systems using the project finance structure. Recently, we have seen project finance and project bonds also being used to finance social infrastructure projects such as schools, hospitals, university residences and prisons.

Given South Africa's infrastructure needs and limited funding, it is important to investigate project bonds as an alternative source of funding for infrastructure development. While the banking sector has historically provided most of the funding, Basel III will reduce commercial banks' ability to provide long-term financing and, given South Africa's constrained fiscus and balance sheet, the government will need to look at the capital markets for future funding.

1.2 Background of the study

The African Development Bank Group (2012) estimates that Africa's infrastructure upgrading and modernization needs will reach \$360billion up to the year 2040 for projects identified under the Programme for Infrastructure Development in Africa (PIDA). In their study, Foster and Briceño-Garmendia (2010) estimate Africa's current

infrastructure financing needs to be \$93billion per annum. The current investment falls significantly short, with the funding gap estimated at \$38billion per annum. In their study of global infrastructure trends, the McKinsey Global Institute (2013) estimates that \$57trillion in global infrastructure investment will be needed between 2013 – 2030 to keep up with GDP growth, and infrastructure financing as a share of GDP will need to increase from around 3.8% to 5.6% in 2020 worldwide

South Africa has a large infrastructure deficit and domestic finances are insufficient to fund this gap. In the World Bank (2015) Logistics and Performance Index report, South Africa was ranked 38th out of 160 countries globally in terms of infrastructure development. While impressive for a developing country, access to sustainable power and clean water remains limited and many citizens are without housing and education facilities. Transport infrastructure (road, rail, ports) remains underdeveloped, hampering local productivity and international trade.

Teravaninthorn and Raballand (2009) estimate that around 70% of South Africa's rural population live at least two kilometers away from an all-season road. Kumo, Omilola, and Minsat (2015) found that in 2013, only 2% of South Africa's rural households had access to fixed-line internet infrastructure, compared with 9.2% in urban and 16.2% in metropolitan areas. Although government continues to use its own balance sheet to bridge the infrastructure gap, the financing is still not enough.

Given South Africa's infrastructure financing challenge, this study looks at debt capital markets, specifically project bonds, as an alternative source of infrastructure financing in South Africa. While the South African government and state-owned enterprises have

issued several international bonds in the capital markets for the financing of infrastructure projects, they have not explored project bonds as a financing alternative. Long-term institutional investors have the capacity to invest in this asset class and increase investment in infrastructure assets. Croce and Yermo (2013) estimate their assets to be \$80 trillion, with only 1% invested in infrastructure.

Although investment in infrastructure by institutional investors remains low, they have the capacity and appetite to invest in this asset. We have seen many institutional investors locally and abroad set up infrastructure teams for direct investing in infrastructure assets and infrastructure funds for indirect investing. According to Ehlers, Packer, and Remolona (2014), the lack of well-structured projects is one the major reasons for the low investment in infrastructure by institutional investors.

Infrastructure is a major driver of economic growth and it is important that we continuously look for innovative funding methods, thereby unlocking South Africa's growth potential. Many business leaders; corporates; and policy makers argue that South Africa's under-developed infrastructure is one of the reasons for its stagnant economic growth.

Therefore, it is worth investigating if South Africa is ready to tap into the capital markets using project bonds for its infrastructure development. As government's balance sheet gets strained and banking sector funds dry up, they will need to find diverse sources of funding for future projects. If structured correctly, project bonds can be used to attract investment for the country's ambitious infrastructure plan.

1.3 Problem Definition

South Africa is facing an infrastructure deficit and insufficient funding to finance its infrastructure plans. Most of the country's infrastructure projects have been financed using bank loans in conjunction with Export Credit Agency support. However, since the global financial crisis and increased capital requirements for banks, bank financing for infrastructure projects has shrunk. Banks no longer have appetite for long-term financing. Ehlers (2014) found that infrastructure related syndicated project finance loans in emerging markets shrunk from a peak of \$300bn in 2008-2010 to \$230bn in 2011-2013.

This paper will look at project bonds as an alternative to commercial bank loans. Project bonds have been successful in developed countries such as the United States, Australia and Canada where a significant number of infrastructure projects are financed through this instrument. Developing regions such as Latin America have also been successful in raising funding through project bonds and now we are seeing issuances from other developing regions such as Asia.

To test for the viability of project bonds, we will analyse the size and depth of the global debt capital markets to determine whether there is sufficient capital to drive growth in project bonds. We will then analyse investor and issuer objectives and determine whether project bonds are able to satisfy those objectives, which will be important for the establishment of an efficient project bond market that meets the needs of both issuers and investors.

A country's regulatory environment, legal institutions and the protection of property rights are very critical in attracting investment, especially for infrastructure which is physical, immobile, and costs up to several billion dollars. Institutional voids are a major challenge in emerging markets and the protection of property rights can be very weak, resulting in low levels of investment, even from domestic investors. Therefore it is important to analyse the legal and regulatory environment in South Africa to establish whether it is conducive to issuing project bonds and attracting foreign investment.

Lastly, we will look at the determinants of at-issue credit spreads for project bonds. This will provide insight into which factors are important to investors when they price this instrument. While some general factors, such as tenor, size of the bond, and credit rating play a role in the pricing, there are other factors such as host country economic and regulatory variables that are equally important to investors, which we will be paying close attention to.

1.4 Specific objectives

The objective of the study is to investigate whether South Africa is ready to use project bonds to finance its infrastructure development. The aim is to determine whether project bonds are a suitable alternative to commercial bank financing and whether project sponsors should look at accessing the capital markets using project bonds to finance their infrastructure projects. This paper will address the following research objectives:

1. Review the global project bond market.
2. Ascertain whether the South African legal and regulatory environment is conducive to issuing project bonds.

3. Examine the factors that determine the at-issue spreads for project bonds.

1.5 Justification for the study

There are two main reasons why this study is being undertaken. Firstly, infrastructure development continues to be a challenge in South Africa. While there are many on-going initiatives aimed at expediting infrastructure development, funding continues to be scarce. Given South Africa's economic challenges and the regulatory changes in the banking sector, funding will be even more constrained in the medium-to-long-term. Although there is much academic literature on how South Africa and the rest of the world can attract funding, the research is primarily focused on reshaping the macroeconomic environment (monetary and fiscal policy); domestic and foreign policy coordination; and foreign direct investment. There is not enough research that looks at using alternative funding sources, specifically project bonds and capital markets to finance the country's infrastructure deficit.

Secondly, there has not been any research on the use of project bonds in South Africa, which have been successful in many emerging markets. The growth of the global project bond market and their success in other developing countries warrants a study on how they can be used in South Africa, given its ambitious infrastructure plan. At present, there is one study that was conducted by the African Development Bank in 2012 that looks at the use of this instrument in Africa and concludes that South Africa is one of the few countries on the continent that is ready to use this instrument, given the capacity of its institutions and the depth of its capital markets.

Research shows that infrastructure leads to economic growth. In their study, Estache, Speciale and Veredas (2005) found that economic infrastructure (roads, power and telecommunications) contributes significantly to long-run growth in Africa.

Calderón (2009) finds that the growth pay-off of reaching Mauritius's infrastructure development is a 1.1% increase in per annum GDP in North Africa and 2.3% in Sub-Saharan Africa, with most of the contribution coming from more, rather than better, infrastructure. Across Africa, infrastructure contributed 99 basis points to per capita economic growth, versus 68 points for other structural policies. Most of the contribution came from increases in stock (89 basis points), versus quality improvements (10 basis points).

Our study becomes useful because it addresses the question of how South Africa can fund its infrastructure deficit and once we begin to effectively answer that question, we begin to find solutions for economic growth and development.

1.6 Limitations

Firstly, academic literature on project bonds is very limited. While various studies on infrastructure mention project bonds, there are no academic studies that focus on project bonds. We therefore had to rely on industry reports and data for much of the information contained in this paper.

Secondly, data on the performance of project bonds is unavailable. We therefore used the Dow Jones Brookfield Global Infrastructure Broad Market Corporate Bond Index (DCR) as a proxy for the performance of project bonds which we test for in section four

of this paper. However, it is important to note that, this index was launched on the 16th July 2015. All information presented prior to the index launch date is back-tested. The back-test calculations are based on the same methodology that was in effect when the index was officially launched.

Lastly, when collecting data for project bonds issued between 2009 and September 2015 in order to evaluate the determinants of at-issue spreads, we started off with 424 project bonds. However, many project bonds are issued through private placements, therefore much of the information is not disclosed. We therefore removed those bonds from our sample. Secondly, majority of project bonds issued in Latin America (Brazil, Mexico, and Peru) and Malaysia are local currency bonds and are not rated by the any of the ratings agencies. Those were also removed from our sample. Lastly, we only selected bonds denominated in United States dollars from our sample.

1.7 Outline of the paper

This paper is divided into seven sections. In section two we review the relevant literature; section three looks at the research methodology; section four will be an analysis of the global project bond market and issuer and investor objectives; section five looks at the legal and regulatory environment; section six tests for the determinants of at-issue spreads; and section seven concludes and makes recommendations for future studies.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

In this chapter we will define project finance and project bonds; we will review literature on how project finance has been used to finance infrastructure projects; we will look at literature on why project bonds are now a relevant and preferred debt instrument in project finance; we will assess issuer and investor objectives; we will review existing legal and institutional framework and whether it supports project bond financing in South Africa. The chapter concludes by looking at the determinants of project bond credit spreads.

2.2 Definitions

In this section we will look various definitions of project finance and project bonds. It is important to understand what project finance is in order to obtain a better understanding of project bonds and how they fit into the project finance structure. A project bond is a debt instrument that can only be issued via a project finance structure. You cannot issue a project bond without having a project finance structure in place.

Most infrastructure projects are funded using the project finance structure. The off-balance sheet nature of this structure makes it an attractive financing mechanism for governments and state-owned enterprises. These organisations have a large pipeline of infrastructure projects, which they fund mostly with debt; therefore the project finance structure allows them to take on large amounts of debt, which is not included in their balance sheets.

2.2.1 Project finance

Finnerty (1996) defines project financing as the raising of funds on a limited-recourse or non-recourse basis to finance an economically separable capital investment project in which the funders look primarily to the cash flows from the project as the source of funds to service their loans and provide a return on their equity invested in the project. Project financing is used mainly to finance infrastructure such as pipelines, refineries, power generation facilities and toll roads.

Comer (1996) describes project finance as financing that is repaid solely by the cash flows from a specific asset and secured solely by that asset and its contracts. Lenders do not have recourse to the owners of the project for repayment of the debt. It entails allocation of risks to entities best equipped to handle that specific risk.

Esty and Christov (2002) describe project finance as a structure whereby a corporate sponsor invests in and owns a single purpose, industrial asset (usually with a limited life) through a legally-independent entity financed with non-recourse debt.

Esty (2004) states that the project finance structure involves the creation of a legally independent project company financed with equity from one or sponsoring firms and non-recourse debt for the purpose of investing in a capital asset.

The Basel Committee on Banking Supervision (2006) defines project finance as a funding method in which the lenders look primarily to the revenues/cash flows generated by a single project, both as the source of repayment and as security for the exposure. Project Finance transactions play an important role in financing development

throughout the world. This type of financing is usually for large, complex and expensive installations that might include, for example, power plants, chemical processing plants, mines, transportation infrastructure, environment, and telecommunications infrastructure.

According to Switala (2009), project financing can be described as a specialized funding structure that relies on the future cash flows of a project as the primary source of repayment. The project's assets, rights and interests are held as collateral or security. It is often referred to as non-recourse or limited recourse finance whereby the lenders have no or limited recourse to the sponsors or shareholders of the project company for the repayment of the loan. Because it is an off-balance financing structure, the project finance structure allows the public sector to tackle its infrastructure backlog in partnership with the private sector with limited requirements from its own resources.

Sawant (2010) describes project finance as the financing of a single-purpose infrastructure asset with a limited life through the creation of an independent legal vehicle, (usually a special purpose vehicle), characterized by non-recourse debt or limited recourse debt, high debt levels, and detailed long-term contracts; where the composition of such assets is not altered during the course of the SPVs life.

Gardner and Wright (2012) state that, as a financing technique, project finance is described as the raising of finance on a limited recourse basis, for the purposes of developing a large capital-intensive infrastructure project. The borrower is a single special purpose vehicle (SPV) and repayment of the financing by the borrower (SPV)

will be dependent on the internally generated cash flows of the project. Project financing allows the shareholders to book the debt off-balance sheet.

Yescombe (2014) defines project finance as a method of raising long-term debt financing for major projects through 'financial engineering,' based on lending against the cash flow generated by the project alone. It depends on a detailed evaluation of a project's construction, operating and revenue risks, and their allocation between investors, lenders, and other parties through contractual and other arrangements.

2.2.2 Project Bonds

The European PPP Expertise Centre (2012) define project bonds as debt instruments issued by PPP project companies and typically bought by institutional investors (e.g. insurance companies, pension funds). In some instances they are tradable on secondary markets.

Boudrias and Kotkin (2012) state that project bond markets include non-recourse project-based bond issuances, generally with longer tenors and investment grade ratings (however not a requirement) where a typical issuance would be from a project operating company with a long term off-take contract with the debt amortizing fully by the term of the contract.

Conduit and Lee (2013) define project bonds as bonds issued to capital market investors, which finances (the whole or part of) a project financing. The bond can be used for initial project financing, either co-financing with commercial bank debt or to refinance existing bank debt, often post construction.

Mezui and Hundal (2013) define project bonds as debt instruments with the following characteristics: they are issued to raise capital for specific standalone projects; coupons and principal repayments are serviced from the cash flows generated by the specific project; and they assume, and their performance is subject to certain project specific risk.

In their definition of project bonds, Croce and Gatti (2014) state that project bonds can be referred to as bonds that are issued by a Special Purpose Vehicle (SPV) and sold either to banks or, more frequently, to other bond investors. The project bond can be a straight bond, whose creditworthiness depends on the cash flow performance of the SPV, or a secured bond assisted by credit enhancement mechanisms.

McClean (2015) states that a project bond is a bond used to finance (or re-finance) one or a portfolio of infrastructure assets. The project bond may be listed on a stock exchange or may be issued through a private placement. Project bonds offer tenors of up to 40 years where the maturity can match the life of the concession or off-take contract.

Oji (2015) states that infrastructure project bonds serve as an additional source for raising funds from local and international capital markets. Interest payments and repayment of the principal are secured by the cash flows from specific projects. Infrastructure bonds can also be issued by private sector firms without any government intervention.

The OECD (2015) defines project bonds as standardized securities that are issued solely to finance individual stand-alone infrastructure projects. They can be issued in public markets, or placed privately and provide a potential solution to finance brownfield projects with long-term debt. Project bonds are more risky because the risk of loss to credit holders is higher for any one specific project versus a diversified portfolio of projects.

2.3 Project finance and infrastructure projects

Esty and Christov (2002) argue that project finance is not a new phenomenon. One of the oldest recorded applications of project financing dates as far back as 1299, when the English Crown enlisted a Florentine merchant bank to aid in the development of the Devon silver mines. Early trading expeditions in the seventeenth and eighteenth centuries were also financed on a project basis. Investors provided financing to the Dutch East India Company and British East India Company for voyages to Asia after which they were repaid according to their share of the cargo once sold.

In the 1970s project finance began to evolve into its modern form, partly in response to several large natural discoveries and partly in response to soaring energy prices and the resulting demand for alternative energy sources. In the early 1970s British Petroleum raised \$945million on a project basis to develop the “Forties Field” in the North Sea. Esty et al. (2014) found that in the early 1990s municipalities began to marry project finance with public-sector activities, which gave rise to public-private partnerships (PPPs or P3) that were used to expand the pool of funds in the face of limited government budgets. Through PPPs, governments were able to shift construction and

operating risk to the private sector in attempt to improve efficiency, while governments typically assumed market risk

In the year 2000, the project finance market peaked, reaching \$378.7bn in deals closed. Chan-fishel (2003) shows that between 1998 and 2003 infrastructure projects attracted the most funding from global project financing, with telecoms representing anywhere between a quarter and half of infrastructure financing between 1998 – 2001.

We see from Esty et al. (2014) that over the last few years, total project-financed investment recovered to \$415.0 billion in 2013 from a depressed level of \$249.3 billion in 2009. The four-year project finance CAGR from 2009 to 2013 for all regions was 10%.

2.4 Global project bond market

According to Boudrias & Kotkin (2012), the project bond market was born in the early 1990s when project sponsors began accessing the bond market to finance projects. Since then, capital markets have been used to access finance for various projects on a non-recourse basis. These include oil and gas projects; power generation assets and infrastructure projects, both in developed and emerging markets.

While project bonds have in the past been used to finance infrastructure projects in developed countries, Dailami and Hauswald (2003) find that access to the international bond markets by infrastructure projects in emerging economies is relatively new, borne of the economic reforms, market liberalization and financial innovations. Although many developing countries around the world use project bonds for infrastructure

financing, the South African project bond market is characterized by episodic issuances than a normal flow of transactions.

Esty et al. (2014) found that project bond issuance has largely been concentrated in the United States, the United Kingdom, and Canada, which together accounted for half the total market in the last five years, as at July 2014. Nonetheless, between 2009 and 2013 project bonds have been used to finance projects in an increasing number of developing countries. One noticeable change over the last ten years is that project bonds have become more common in developing countries such as Brazil, Malaysia, and Peru.

Although they still represent a small fraction of debt financing for infrastructure projects, projects bonds continue to increase their market share in the financing of infrastructure projects. Between 2007 and 2012, projects bonds issued by SPVs ranged between USD 8.5bn and USD 27bn. In 2013 we saw a record amount of USD 49.3bn in project bond financing, representing 19% of total debt provided to project finance.

Research by Esty et al. (2014) shows that from a sector perspective, 85% of all project bond issuances between 2009 and 2013 went to finance infrastructure, oil and gas, and power. Infrastructure attracted 35% of all bond financing, followed by oil and gas, with 28%, and power, with 23%. The four-year CAGR for total project bond financing between 2009 and 2013 was 56%. All sectors had massive four-year CAGR; the sector with the highest growth was social infrastructure, where bond issues tripled.

2.5 Project bond investor objectives

Institutional investors are usually considered long-term investors due to the long-term nature of their liabilities. They hold more illiquid and long-term assets that include infrastructure projects or long-term bonds and other forms of alternative investments than other investors. Although institutional investors have several objectives, which determine which asset classes to invest in, there are three important objectives that drive the investment allocation decision which we will discuss in this section.

2.5.1 Asset and Liability match

In their study, Oliver Wyman (2012) state that infrastructure assets are attractive to institutional investors (pension funds) as they can assist with liability driven investments and provide duration hedging. Because infrastructure projects are long-term investments they could match the long duration of pension liabilities.

Standard & Poor's (2014) find that institutional investors are becoming increasingly attracted to infrastructure as a result of their need to match long-term assets and liabilities. However, many non-traditional investors remain wary of such assets.

Infrastructure investment offers an attractive asset-liability match because it allows for substantial investments with steady returns over decades according to Schoenberg (2015). Infrastructure provides "annuity-type" returns over decades that are in general reasonably predictable.

2.5.2 Superior Risk-Adjusted Returns

OECD and Oliver Wyman (2011) found that pension funds are increasingly looking at infrastructure to diversify their portfolios, due to the low correlation of infrastructure with traditional asset classes.

Research by Helmsley (2014) found that infrastructure promises long-term stable cash flows, delivering reliable returns from 8% up to as high as 15%, including an attractive yield component.

In their study, CBRE Clarion (2015) found that between 2010 and 2014 global listed infrastructure outperformed global equities and global bonds whilst maintaining lower levels of volatility than other equity sub-sectors. Global infrastructure five-year annualized total returns were +13.1% versus global equities, which had a +12.7% total return, and global bonds, which returned +2.1%.

Van Nieuwerburgh, Stanton and de Bever (2015) found that between December 2003 and June 2015, the MSCI World Core Infrastructure Index Sharpe Ratio was 0.80, the MSCI World Infrastructure Index 0.61, and the MSCI Emerging Markets Infrastructure Index 0.62. During the same period the NCREIF Property Index Sharpe Ratio was 0.47, equities 0.50, bonds 0.47 and U.S. REITs 0.45. We see that infrastructure as measured by the three indices outperformed all the other asset classes.

2.5.3 Low default rates

Infrastructure debt as an asset class has lower default probabilities and higher recovery rates than equivalently rated corporate bonds.

Standard & Poor's (2013) found that between 1992 and 2012, the annual default rate for all rated project finance debt averaged 1.5% which was slightly lower than the average corporate issuer default rate over the same period

In his study of project finance default rates, Davison (2015) found that the marginal annual default rates for project finance bank loans averaged 1.4% per annum during an initial three year period following financial close, but fall significantly thereafter trending towards marginal default rates consistent with single-A category ratings by year 10 from financial close.

2.6 Project bond issuer objectives

2.6.1 Access to a greater pool of funds

Sheppard (2003) argues that the international capital markets represent the largest and deepest source of financing globally, and in conjunction with local capital markets, which represent an essentially untapped source of funds for infrastructure projects, they can make a meaningful contribution to economic development, if effective transaction structures are developed.

The global capital markets are significantly larger than the banking market. It is through this market that governments and private corporations are able to frequently borrow hundreds of billions of dollars from investors. Capital market investors, the majority of whom are institutional investors, have the capacity and the liquidity to provide a large quantum of long-term funding that the banking sector is no longer able to do.

According to Valahu (2006), government and their private partners are increasingly turning to capital market issues as a way to bring in a vast new array of investors, while reducing the cost of project-related debt. As capital markets in emerging countries develop, sovereign and sub-sovereign public entities will make increased use of these markets to fund major public-private works projects.

Erol & Ozuturk (2014) suggest that capital markets can be used as an effective environment in mobilizing long-term investment funds into infrastructure. Capital market investment motivates the participation of the private sector in infrastructure projects, easing the constraints imposed by the public sector budget on infrastructure development and the burden on taxpayers.

2.6.2 Cheaper source of funding

In his study, Hale (2001) finds that in countries where the liquidity of the country is questionable, banks cannot do much to reduce their risk, even by monitoring individual loans. The additional costs associated with banking then makes it cheaper for the borrowers to borrow on the bond market, resulting in a larger share of bonds.

Russ and Velderrama (2012) argue that given the choice between bank and bond funding, certain firms lean toward bond financing because it is typically cheaper than bank loans, where the bond yield is lower than the bank interest rate for the lowest-risk borrowers.

Croce and Gatti (2014) find that project bonds have some contractual features that make them more attractive to institutional investors rather than banks. Firstly, bonds are more

standardised capital market instruments and show better liquidity if the issue size is sufficiently large to generate enough floating securities. A higher degree of liquidity can trigger a lower cost of funding vis-à-vis syndicated loans.

2.6.3 Flexible covenant package

According to Verde (1999), covenants help align the actions of borrowers with the interests of its lenders throughout the life the debt. Loan covenants provide both explicit and implicit protections. High yield bond investors generally do not have the benefit of financial covenants and the explicit protections afforded to high-yield bondholders are weak in comparison to those provided to leveraged loan lenders.

Although high-yield bonds are well-known for their complex covenant packages, Vita (2011) argues that financiers often find the “incurrence” based nature of high-yield covenants an attractive alternative to the financial maintenance covenants they are accustomed to in the senior bank finance environment.

Looking at the covenant packages of syndicated loans and bonds, Payden and Rygel Reaearch (2013) found that syndicated loans offer stronger credit quality relative to high-yield bonds, given their senior status in the capital structure and more exacting financial covenants. Syndicated loan covenants offer superior credit quality because they must be maintained unlike bond covenants, which are incurrence covenants that are only tested when the issuer wants incur more debt.

2.7 Regulatory and institutional environment

In a country-level study done by Knack & Keefer (1995) they find that institutions that protect property rights are crucial to investment. In fact their study shows the security of property rights not only affects the magnitude of investment but also the efficiency with which inputs are allocated.

According to La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998), the legal environment and the quality of law enforcement are determinants of what rights security holders have and how well these rights are protected. Given that the protection investors receive determines their readiness to finance firms, corporate finance may critically turn on these legal rules and their enforcement.

Cross-country data and firm level regression by Johnson, McMillan and Woodruff, (2002) shows that a firm's investment is affected by the perceived security of property rights. Reinvestment rates were found to be the lowest in Russia and Ukraine, where property rights are least effective, and highest in Poland and Romania, where property rights are most secure.

According to Esty (2002), New York and UK law are most preferred for lenders contracts and agreements. However, the operating contracts and the enforcement of security provisions (e.g. seizure of collateral upon default) depend on the legal system in the country where the project is located. Therefore lenders must understand their rights as creditors and the efficiency of local enforcement before lending in a given country.

Foreign and local investors in South Africa are subject to the same laws and regulations according to Tralac (2004). Foreign investors have equal rights and obligations within South Africa's judicial system. However, foreign investors have the option of settling a dispute through international arbitration, provided there is a Bilateral Investment Treaty (BIT) in existence between the parties and that it makes provision for such arbitration.

In the latest Doing Business report by the World Bank, South Africa is ranked 46th out of 162 countries on the Enforcing Contracts index, with its distance to frontier being 66. The enforcing contract index measures the efficiency of the judicial system in resolving a commercial dispute. Although the country fares better than all African countries and most developing countries, more needs to be done to improve the regulatory and legal framework in order to attract more investment. Policy coordination remains critical in achieving the required improvements.

2.8 Determinants of project bond credit spreads

Elton, Gruber, Agrawal and Mann (2001) found that spreads can almost entirely be explained by three influences, namely: the expected loss from defaults, state and local taxes and the premium required for bearing systematic risk.

In their study of the determinants of at-issue spreads for project bonds, Dailami and Hauswald (2003) found that market risk perception in terms of at-issue spreads over US Treasury Bonds are a function of a project's contractual structure and its ambient institutions. They also find that on average, project bonds are issued at approximately 300 basis points above US Treasury Securities.

In their study of the determinants of emerging market spreads, Rowland and Torres (2004) found that the economic growth rate, debt-to-GDP ratio, reserves-to-GDP ratio, and the debt-to-exports ratio are found to be significant determinants of the spread for emerging market sovereign issues. Additionally, the spread is also determined by the exports-to-GDP ratio, and the debt service to GDP.

Examining the determinants of credit spreads for South African corporate bonds, Grandes and Peter (2007) found that sovereign risk is the single most important determinant of corporate credit spreads. Firm leverage, firm-value volatility, time to maturity and risk-free interest rate volatility are also statistically significant determinants of corporate spreads.

Using information from listed Korean corporate bonds, Shin and Kim (2013) found that credit risk is a more influential determinant of yield spreads than liquidity especially after the recent global financial crisis. Average trading volume and equity volatility of the bond issuers were found to be significantly correlated to yield spreads.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter describes the research methodology used in this study. Both qualitative and quantitative methods will be applied in answering the research objectives provided earlier. This paper will rely on secondary research and data to answer the research hypothesis of whether the South African market should begin to use project bonds to fund its infrastructure development. We will also discuss limitations and potential problems of this research, including any validity and reliability issues faced.

3.2 Research Approach

Thomas (2003) differentiates between two types of research approaches: deductive research and inductive research. The primary purpose of the inductive approach is to allow research findings to emerge from the frequent, dominant or significant themes inherent in raw data, without the restraints imposed by structured methodologies. The purposes underlying the development of the general inductive approach include: to summarise extensive and varied raw data; to establish a relationship between the research objectives and the summary of findings derived from the raw data and to ensure these links are both transparent and defensible; and to create a model or theory about the underlying structure of experiences or processes which are evident in the text (raw data).

According to Standers et.al (2003) the deductive approach is where a researcher makes an observation and collects data in an attempt to build a theory. Neuman (1997) states

that in deductive research, the researcher starts with an abstract, logical relationship among concepts then moves towards concrete empirical evidence. Gill and Johnson (2002) argue that the deductive research method involves the development of a conceptual and theoretical structure prior to its testing through empirical observation. They further argue that logical ordering of induction is the reverse of deduction as it involves moving from the empirical world to the construction of explanations and theories about what has been observed.

In this paper we use the deductive approach by analysing existing literature and data to respond to the research questions. Through the findings of existing literature, the paper will determine whether to reject or fail to reject to the research hypothesis, the use of project bonds to fund South Africa's infrastructure development. Deductive research also allows us to explore broader issues that we would have otherwise not been able to do with inductive research given the insignificant size of the project bond market in South Africa, limited local experience with project bonds and lack of information relating to project bonds that have been issued in South African.

Data on project bonds and their performance is limited and in some cases confidential making it difficult to conduct an inductive study. Banks and institutional investors are often restricted in the information they can share as a significant number of project bonds are issued via private placements. Therefore, deductive research allows us to analyse information that has been published by project finance and project bond experts and participants and form a hypothesis.

3.3 Research Strategy

According to Creswell (2009), the research strategy involves making a decision regarding the data collection method and analysis, which must be suitable to the research study.

Newman and Benz (1998) identify two main types of research methods: qualitative and quantitative research methods, with some studies being a mix of both research methods. Quantitative research takes a deductive approach, where research is used to test the theory and qualitative research takes an inductive approach, where the theory is created from the research.

“Quantitative research can be constructed a research strategy that emphasizes quantification in the collection and analysis of data” and “by contrast, qualitative research can be construed as a research strategy that usually emphasizes words rather than quantification in the collection and analysis of data” (Bryman & Bell, 2007).

Bryman and Bell (2007) state that the quantitative approach collects knowledge from positivist assumptions, where the inquiry has experimental and quasi-experimental design. Quantitative research methods are predetermined and use close-ended questions, performance, attitude, observations and census data. On the other hand, Quantitative approaches are used to test or verify theories, identifying variables to study, using standards of validity and reliability and using unbiased approaches and employing statistical approaches.

In my study I employ both quantitative and qualitative research methods as this provides a better opportunity to answer the research questions. The major advantage with quantitative research is that it enables the researcher to collect and analyse large quantities of data and be able to draw reliable generalisations from the data. The major disadvantage is the inability to find granularity in the information. Qualitative data, on the other hand, allows researchers to dig deeper into issues and to test for certain hypotheses. Using (credible) data and appropriate statistical methods, researchers are able to test and prove their hypothesis.

3.4 Data Collection

There are two data collection methods. Primary data collection is where the researcher gathers new data primarily through questionnaires and surveys. Secondary data is collected and studied from existing literature. It involves using work done by other researchers to address one's research objectives.

This study uses secondary data, which is more appropriate for addressing the research objectives. In order to obtain the data I used different scholar databases such as EBSCO Host, Emerald, Harvard Business Review, IMF eLibrary, Jstor, Science Direct, Wiley Online Library, Social Science Research Network, World Bank Group, South African National Treasury, South African Reserve Bank, United Nations Conference on Trade and Development, and the Organisation for Economic Co-operation and Development.

I also used financial services industry databases such as J.P. Morgan, Citigroup, Deutsche Bank, Brookfield Asset Management, Prudential Investment Managers, Standard and Poor's, Project Finance International, Bloomberg LLP, Moody's Investor

Services, Fitch, Thompson Reuters, Dealogic, European PPP Expertise Centre, Deloitte and Ernest & Young.

3.5 Data Analysis

The data has been presented in the form of an extensive literature review, where I have presented the findings of different studies and researchers. I have also presented the data in the form of excel tables, graphs and charts in order to allow for easier comparison and interpretation.

Furthermore, this study employs statistical analysis using regression tools. The regression analysis is used to study the relationship between two variables, an independent and a dependent variable. We use the results to conclude whether one variable has an effect on another variable and whether the effect is statistically significant.

3.6 Limitations and potential problems

The major limitation faced when conducting this study is the availability of project finance and project bond data. Project bonds and project finance have not received much attention in the academic fraternity resulting in limited academic studies. It is also difficult to obtain quantitative information on project bonds, as many academics and investors have not paid a lot of attention to this asset class. The information available was supplemented with industry information and analysis.

3.6.1 Data reliability and validity

In order to achieve reliability and validity of the data I only used data from recognised and reliable sources as described earlier. Where possible, this data was verified using other sources including databases such as Bloomberg and Thompson Reuters. The chosen methods of analysis, which include descriptive statistics and regression analysis helped ensure increased transparency and non-biasness in the data and results.

CHAPTER 4: ANALYSIS OF THE GLOBAL PROJECT BOND MARKET

4.1 What are project bonds?

According to Hauswald and Dailami (2003), the difference between project and corporate bonds stems from the underlying economics of the borrower. In the case of the project, the issuer (borrower) raises funds to finance a single indivisible large-scale capital investment project whose cash flows are the sole source to meet financial obligations and to provide returns to investors. In the case of a corporate borrower, the security is typically issued against the firm's general credit and the underlying assets consist of multiple sources of cash flow.

Leng, Fong and Sulaiman (2003) argue that project bonds differ from conventional corporate bonds in certain legal and financial characteristics. Project bonds are used to finance a specific capital investment project, which utilises potential cash flows as the source of debt servicing. A typical corporate bond is issued to raise funds for the general business activity and is secured against the firm's general status of credit and underlying assets (which act as an implicit mechanism for diversification of risks for the investor). Risk is mitigated in a project bond issuance through effective allocation of repayment obligation to parties who are best suited to managing this risk.

Research by the World Bank (2015) finds that project bonds were designed to create an asset class for infrastructure investments targeting long-term institutional investors such as pension funds and insurance companies. It aims at encouraging greater risk sharing among domestic and international investors and to increase the role of capital markets in infrastructure financing.

Project bonds are different to corporate bonds. Whereas corporate bonds are issued by companies to fund their business activities, project bonds are issued by a standalone company or project company, usually a Special Purpose Vehicle (SPV), which owns the project's assets, where the proceeds from the operations of the project are used to service the interest and principal obligations and make dividend payments to equity investors.

These bonds are used to finance infrastructure projects through a project finance structure where the lenders (bond investors) have limited recourse or no recourse to the project sponsors. Project finance has become the most common financing structure for infrastructure projects because of two main benefits. Firstly, because of off-balance treatment, it allows governments and state owned enterprises to undertake multiple infrastructure projects simultaneously. Therefore government is able to source large amounts of (debt) funding whilst preserving its balance sheet.

Secondly, project finance debt is structured as limited recourse or no-recourse debt. Therefore, in the event that a project fails, the lenders' recourse would be minimal and limited to the project and its assets and not the project sponsors (government and state owned enterprises).

4.2 Who uses project bonds?

Project bonds were first issued in the early 1990s, and were an important source of capital for infrastructure improvement in North America and Western Europe. However, Voge et.al (2009) finds that when commercial banks became more aggressive on pricing their loans in the late 1990s and early 2000s, project bonds fell out of favour

because borrowers could obtain long-term project loans on terms more favourable than bond market terms.

Project bonds in the U.S. are primarily used in the oil and gas, and renewable power industries, and do not include tax-exempt bonds issued as Private Activity Bonds (PABs) in the municipal market. Yescombe (2014) argues that taxable infrastructure bonds have been largely (but not entirely) 'crowded out' by the tax-exempt market.

According to Freedman, Kassis and Treuhold (2013), the U.S. power sector played an import role in developing and growing project bonds. As the sector was moving away from the utility generation model to an independent power producer model and as bankers became accustomed to analysing, structuring and executing project finance transactions, the project bond market grew, resulting in the first Rule 144A offering for a large power project in the Northeast in the early 1990s.

Traditionally in Europe, capital markets finance for greenfield infrastructure came from bonds guaranteed by monoline insurers. Because of the risk associated with large scale greenfield projects, issuing investment grade project bonds that were sufficiently highly-rated to be attractive to institutional investors required monoline insurers to provide wraps (guarantees).

Freshfields Bruckhaus Deringer. LLP (2012) argue that these wraps enhanced the credit rating of the bonds, taking their credit rating to the highest credit rating of AAA. The wrap essentially guaranteed senior bondholders the full credit risk of the issuer (borrower), thus providing a safe and liquid instrument. Monoline insurers made bonds

competitive with bank pricing by charging roughly half of what the banks charged for taking the credit risk.

The monoline insurers were born in the United States and arrived in Europe in the late 1980s and became significant players in the PPP financing markets from the late 1990s according to the EPEC (2010). Although they played a major role in Europe, their greatest impact was in the United Kingdom because of the combination of government's extensive Private Finance Initiative scheme and the presence of a deep and liquid bond market, which provided a competitive alternative to bank financing for infrastructure projects. The dominance of the wrapped bond market is proven by the fact that, when the first United Kingdom PPP project financed through capital markets was executed in the 1990s, and through to 2009, only two earlier projects were funded with bonds that did not have a monoline wrap.

Today, project bonds are used both in the emerging and developed world by borrowers in both the public and private sector. Latin America is one notable example that has seen a significant growth in the use of project bonds. In her paper, Arca (2013) argues that the increase in project bonds issuances in this region has been driven by three factors: a large unmet infrastructure and energy need; significant capital available among fixed income investors; and constrained bank capital.

In the late 1990s, Latin America also benefited from monoline guarantees that supported its project bond market during its infancy stage. Just like in the rest of the world, the Latin America monoline industry disappeared after the global financial crisis. Today, Latin American project bonds are issued without any insurance and have

proven to be very attractive to global investors. Brazil has a strong track record in project bond financing for oil and gas drilling (using international capital markets) and power and toll roads (using the domestic market). According to PwC (2013), Latin America has the necessary conditions for project bonds to takeoff. There should be an increase in public-private partnerships and the use of project bonds.

The Asia-Pacific market remains small compared to other markets. However, the PFI (2014) finds that countries like Malaysia have been very active in using project bonds since its first ringgit-denominated long-term project bond issued in 1993 for YTL's greenfield gas-fired Paka and Passir Gudang IPPs. Many other similar project bonds have been issued for various infrastructure projects across the country, ranging from power plants, terminals to tolls roads. The Employee Provident Fund (EPF) and other pension funds have been the largest subscribers to these projects bonds.

An important factor that ensured the successful development of the project bond market in Malaysia has been the existence of one or more specialist investors who understand the structures, sectors and have expertise to analyse transactions. With the support of local rating agencies, the EPF has taken this role in Malaysia.

The Reserve Bank of Australia (2008) reports that Australia has financed the majority of its PPPs and infrastructure projects using project bonds. It too relied heavily on the credit enhancement of monoline insurers before the market disappeared during the 2008/2009 global financial crisis.

According to Infrastructure Australia (2014), as of March 2008, there were \$27billion worth of credit-wrapped bonds outstanding in Australia and between 2005 and 2007 the bond market had provided \$6.2billion of long-term monoline wrapped project bonds. The project bond market effectively closed due to the global financial crisis and PPPs had to rely on short-term bank loans.

Morris and Ng (2014) found that Australia has returned to the project bond market, financing and refinancing brownfield infrastructure projects with project bonds.

Various governments, especially the American and European governments, have initiatives aimed at growing their project bond markets and increasing capital market investment in infrastructure. In 2012, the European Investment Bank (EIB) and the European Commission launched the Europe Project Bond Initiative (PBI) as a way of stimulating capital markets investment in large infrastructure projects. Under this initiative, the project companies (SPVs) will issue project bonds and the EIB will provide credit enhancement in the form of a subordinated instrument (either a loan or contingent facility) to support the senior debt issued by the project company.

As bank lending for infrastructure projects becomes limited, largely due to Basel III, we should see more of these initiatives globally and an increased focus on project bonds. South Africa has both the experience and expertise with project finance to be able to structure and execute project bond transactions. The country also has a significant capital markets sector, large institutional investors and the institutional capacity, which are all important elements in creating a successful project bond market.

4.3 How do project bonds work?

While there are fundamental differences between project bonds and corporate bonds, the main difference stems from the economics of the borrower or issuer according to Hauswald and Dailami (2003). Corporate Bonds can be used for multiple purposes, including the financing of expansions, capital improvements, acquisitions, and debt refinancing. Bond investors rely on the balance sheet strength of the issuer (company) for coupon and principal payments and security can take the form of any of the company's assets.

Project bonds, on the other hand are issued by a standalone project company, usually an SPV, and the proceeds are used solely for the construction of a single asset owned and operated by the project company. Cash flows generated by the asset are the only source of interest and principal payment for bond investors. Bond investors assume all the risks of the underlying asset, which also serves as their collateral. In the event of default or failure, recourse is limited to the project's assets.

Project bonds are generally rated by the major rating agencies in order to attract capital market investment. They can be issued via private placements or they can be listed on an exchange. Investors can invest directly in the project or they can invest through listed and unlisted infrastructure funds. Given the inherent risks of project finance, many project bond issuers have had their bonds rated by one or more of the major rating agencies.

The rating of this instrument is very important, given the reservations institutional investors have about investing in project bonds and infrastructure assets. The rating

serves two purposes; firstly it sends a signal about the credit quality and riskiness of the project (and associated debt) and secondly it does most of the due diligence work that most institutional investors are not able to perform as they lack the expertise and institutional capacity.

Project bonds can be used to finance the construction period or the operational phase of a project. Traditionally, project bonds have been used to refinance bank debt during the operational phase of a project when construction risk no longer exists. However, we are seeing more project bonds being issued during the construction phase of projects as project finance structures improve and achieve investment grade credit ratings for the construction phase of projects.

A good example is Peru, who according to PFI (2015), recently developed a payment mechanism applicable to PPP infrastructure projects that has increased the bankability of projects by reducing their construction risk effectively down to a level equal to the country's sovereign risk. In 2006 Peru introduced government backed, milestone-linked payment certificates that represent payment obligations of Peru. More importantly, these certificates/obligations are also assignable, and therefore permit concessionaires to tap into foreign capital markets through offerings, typically in bond form, that carry a risk of default closely reflecting Peru's sovereign rating, which as of July 2014 had been upgraded to A3 by Moody's.

Unlike corporate bonds, project bonds have much longer tenors, ranging between 20 – 30 years to match a project's lifecycle. The significantly long-tenor will impact the pricing on these instruments given the risks associated with long-dated investments.

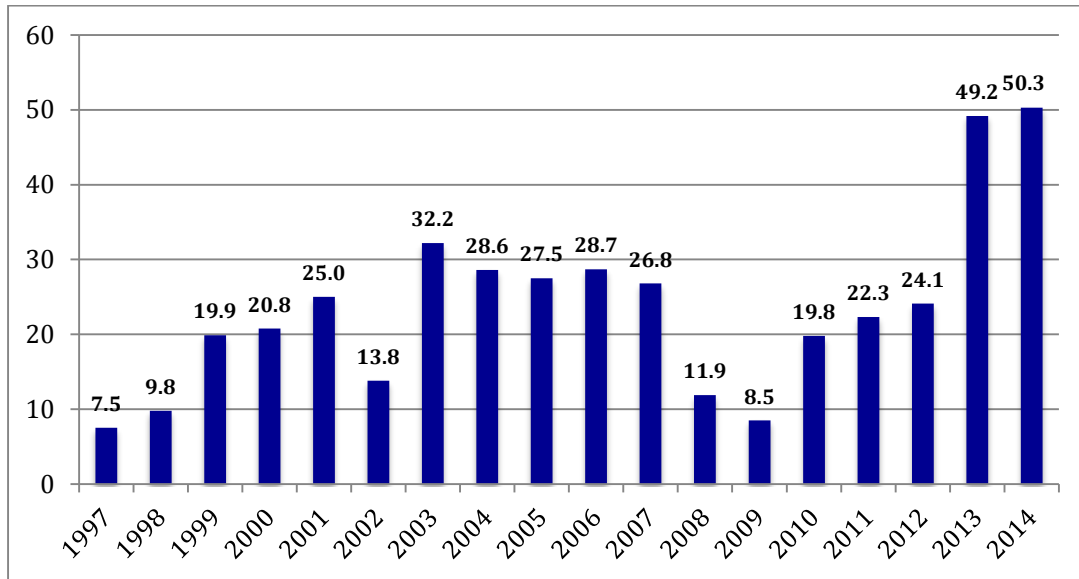
However, the average life of the bond can be much shorter, depending on the structure of the bond. Amortising bonds, where interest and principal is paid periodically, are likely to have a shorter average bond life, and therefore carry a smaller premium than bullet bonds whose principal is only paid on maturity of the bond.

Project bonds are less liquid than corporate and government bonds. The size of the project bond market is very small compared to other debt markets and much of the issuances are done via private placements. This effectively means that investors who invest in this asset class must be prepared to hold these bonds until maturity. Again, this will significantly affect the yield on this instrument, as investors will need to be compensated for investing in an illiquid asset.

4.4 Global project bond market

Project bonds account for a small portion of the project finance debt market. In 2013 they accounted for 20% of total project finance debt before falling to 16.6% in 2014. Although project bond deals remained flat in 2014, the project loan market was buoyant with deals and remains the leading funding source for borrowers. Project bond deals closed reached \$50.3billion in 2014, compared to the global project finance loan market, which reached new highs of \$260.2billion, beyond the previous best year – 2008, when volumes hit US\$250bn. While the project finance loan market grew by 23% from the previous year (\$204 billion – 2013), the project bond market remained flat (\$49bn in 2013).

Figure 1: Project bond deals closed 1997 – 2014 (\$billions)



Source: Author's calculations based on PFI data

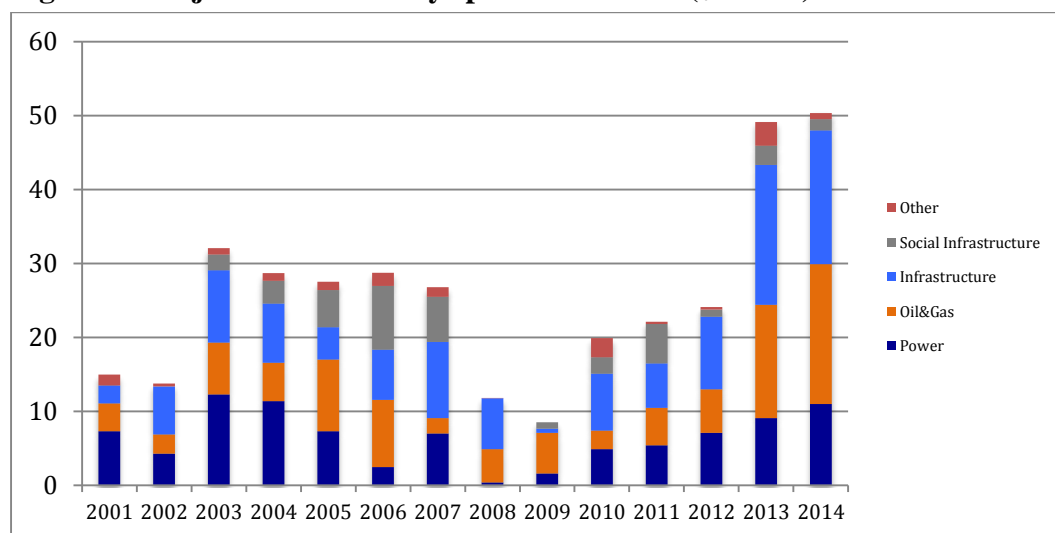
Although project bonds remain small compared to the loan market, there has been significant growth in the project bond market between 2009 and 2014. Project bond deals doubled in size in 2013 reaching \$49.2billion (\$24.1billion – 2012) and remained steady in 2015 with \$50billion in deals. This indicates growing investor appetite for infrastructure assets. Issuances have been rising since steadily since 2009, with the six-year period (2009 – 2014) registering a CAGR of 34%.

The project bond market has done generally well, as shown in figure 1 above. In 1997 project bond deals closed stood at only \$7.5billion (10% of the project finance debt market, which stood at \$75billion). By 2003 the project bond market had grown to \$32.2bn in just 6 years (over 300% growth) representing 17% of project finance debt. In 2002 project finance deals slipped and this was felt in both the project finance loans and bond markets. According to PFI (2003), the boom in the US power financing came to an end as the US energy finance markets hit the post Enron brick wall.

Between 2003 and 2007 the market remained steady although there was a small decline in issuances due to aggressive pricing from banks. During the global financial crisis 2008-2009, project finance bond deals decreased considerably. This is mainly due to the fact that monoline insurers, who had insured many of these bonds lost their investment credit rating and there was no longer a benefit from wrapping the bonds and investors no longer had access to the AAA investment grade security. Given their significant exposure to the sub-prime market, and inability to meet all their insurance claims, by 2009 most of the monoline insurers had gone out of business.

Oil & gas, power, and infrastructure account for a large market share of the project bond market. Until 2002, telecoms also had a sizeable project bond market share; however, from 2002 there was a significant drop in telecom deals such that even project finance loans in the telecom sector fell sharply.

Figure 2: Project bond industry split 1997 – 2014 (\$billion)



Source: Author's calculations based on PFI data
 Other refers to deals episodic deals in the telecom, mining, leisure, industrial, and petrochemicals sectors

The global project bond market plummeted during 2008 and 2009 as a result of the global financial crisis and the downgrading of monoline insurers. Infrastructure project bonds were not spared from the significant decrease in the overall issuance of project bonds during this period. There were very little, if any, single A rated bonds issued that attracted the interest and appetite of institutional investors according to PFI (2010).

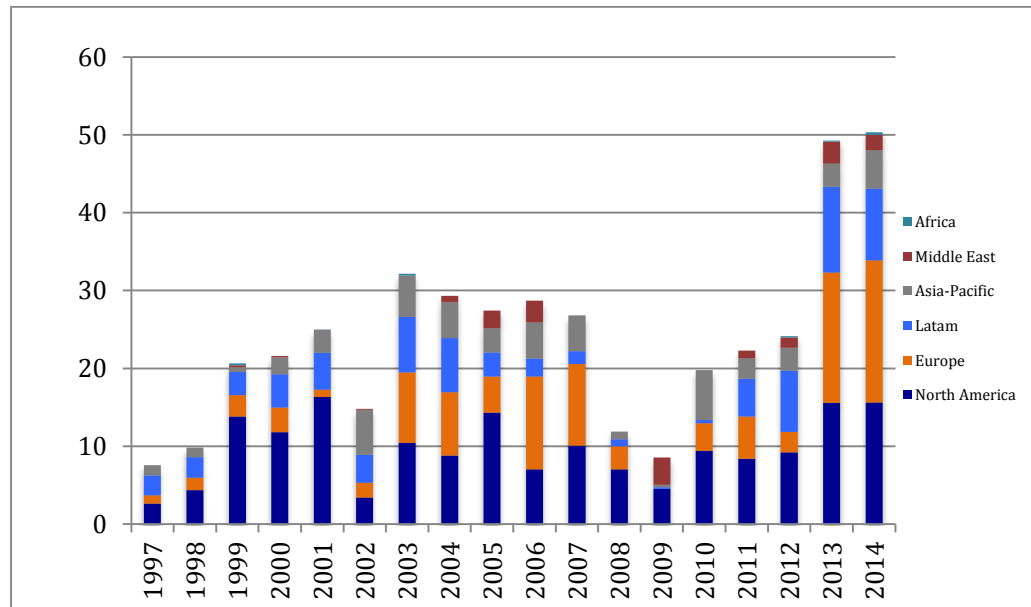
Project finance league tables published by PFI (2014) show that project bonds more than doubled in volume in 2013, driven by energy and infrastructure projects. Infrastructure bond issuances doubled to \$18.8bn, with large PPP deals and refinancing taking place in Asia. We also saw the first credit-enhanced project bonds, under the EIBs Project Bond Initiative, the R1 refinancing in Slovakia being closed in 2013.

From a country and regional perspective, the United States has been the largest driver of project bonds. From the inception of project finance in the US until today, they are the largest project finance market in the world, and rank first in both project finance loans and project finance bonds. Until 2002, the US power market was the primary driver of project finance deals, both the loan and bond side due to the liberalization in the power sector. There was a large sell-off of power plants to independent power generators by the utilities. The energy sector continues to drive project finance in the U.S. and more recently we have seen increased infrastructure deals.

European PPP, PFI and oil and gas transactions have also been major drivers of project finance. Monoline insurers who effectively disappeared from the European market during the global financial crisis in 2008/2009 had wrapped the majority of European

transactions. We are now seeing increased activity in Europe, partly driven by the recently launched Project Bond Credit Enhance initiative by the EIB.

Figure 3: Project bond deals regional split 1997 – 2014 (\$billion)



Source: Author's calculations based on PFI data

Mining and the privatization of the power sector led the way for project finance in Latin America. Since then the region has used project bonds to finance infrastructure, oil & gas, power and mining sector projects. Brazil and Mexico have traditionally led the region in project finance and project bond issuance. However, Peru has completed several big transactions and has contributed significantly to project finance growth in Latin America. Between 2011 and 2014, the region held a reasonable market share on the project bond side driven by issuances in the energy, power and infrastructure sectors.

Although Asia-Pacific has seen some activity in the project finance and project bond deals, it has been disappointing given the size of the region and the large infrastructure development that has taken place in the last 20 years. Australia and Malaysia have been

the largest issuers of project bonds in the region over the last 18 years (1997 – 2014). There have been episodic transactions from other countries such as China, India and New Zealand in the same period but they have been minimal. India recently started using local capital markets to fund its infrastructure through the issuance of local currency denominated project bonds. Given the size of the region and the on-going infrastructure development, the Asia-Pacific project bond market has the potential to grow to one of the largest in the world.

Lack of understanding when it comes to project bonds and scarcity of bankable projects are some of the major obstacles in Asia. It will take some time before the market is comfortable with project bonds. The CEO of the Asian Development Bank (ADB) recently remarked: “For bond investors in this region to acquire expertise and set up internal capacity to monitor project bonds, there must be reasonable certainty or firm expectation that the market will be large enough to justify the cost of acquiring such expertise and taking up internal capacity” (Wee, 2014).

Africa has also been another disappointing region. The market remains insignificant, with only a few episodic transactions recorded in South Africa, Democratic Republic of Congo, Ghana and Kenya in the last 10 years. The continent needs to start looking into project bonds as a means of sourcing infrastructure investment from the capital markets. In the medium-to-long term, project bonds may prove to be an important catalyst in developing and growing the continent's capital markets.

Although they represent a small portion of project finance debt, project bonds are re-emerging as a good source of financing for a variety of sectors across the regions.

Between 2009 and 2014 we have seen their market share in project financing grow and we have seen an increase in the number of listed and unlisted infrastructure funds. We expect this trend to continue given their attractiveness to institutional investors.

4.5 Project Bond Issuer Objectives

4.5.1 Introduction

Project bonds must offer unique benefits not offered by conventional debt instruments such corporate bonds and loans for project sponsors to find them attractive. In South Africa, project finance borrowers have financed most of their projects through the bank market; leaving the capital markets unutilized. While there have been episodic issuances, in 2013 we saw the first listing and investment-grade rated infrastructure project bond, held entirely by institutional investors. To date this remains the only listed project bond on the Johannesburg Stock Exchange.

Although borrowers have several objectives when issuing (project) bonds, we will assess only three objectives that are critical in growing South Africa's project bond market. Firstly, we will look at whether project bonds give project sponsors access to the type and quantum of funding they require in order to execute infrastructure project finance transactions. There are various sources of funding that can be used to fund South Africa's infrastructure development, however, not all of them are suitable for long-term financing of large-scale infrastructure projects.

Secondly, we will assess whether project bonds are a cheaper source of financing when compared to loans. Large-scale projects on average cost hundreds of millions of dollars,

and bank funding for 20-30 year tenors is not cheap and will soon be unavailable. Borrowers also run the risk of not being able to refinance bank debt or refinancing at higher costs. Pricing will be a key success factor in growing the project bond market. If project sponsors are able to secure the investment they require at the right tenor and price, we will should see a shift toward project bonds especially given the tight capital and liquidity requirements under Basel III which will drive up the cost of (long-term) bank loans

Lastly, we look at whether (project) bonds have a more flexible covenant package as compared to loans. In most cases bank loans are accompanied by strict covenants with strict monitoring and reporting requirements. This requires additional reporting and disclosure from the borrower and the banks become very involved in the daily operations including the decision making of the borrower. A breach of these covenants results in an event of default. Bonds on the other hand have a more flexible covenant package given the nature of bond investors. This gives project sponsors more autonomy in the running of the project and more flexibility in times of difficulties.

4.5.2 Access to a greater pool of funds

Infrastructure projects are large-scale projects that can cost billions of dollars with long construction and repayment periods. The current global infrastructure expenditure is nowhere near the global infrastructure need. The McKinsey Global Institute (2013) found that between 1992 and 2011 global infrastructure investment has averaged 3.8% of global GDP, totaling \$36 trillion. That is \$2trillion over the 18-year period. They further estimate that between 2013 and 2030, \$57 trillion in infrastructure investment will be needed to keep up with projected global GDP growth.

PricewaterhouseCoopers (2014) on other hand estimates that global infrastructure spending will grow from \$4 trillion per year in 2012 to more than \$9 trillion per year by 2025. Overall, almost \$78 trillion will be spent globally between 2014 and 2025. According to Foster and Briceño-Garmendia (2010), Africa is currently spending \$43billion per annum on infrastructure, far below the \$93billion (15% of its GDP) it needs to address its infrastructure development. Oxford Economics and PWC (2014) estimate the continent's infrastructure spend to reach \$180billion per annum by 2025. If the PwC estimates are correct, the continent will have twice the amount of infrastructure it requires. The National Treasury (2015) reports that South Africa has a potential pipeline of more than R3 trillion in infrastructure projects planned over 15 years.

Historically, commercial bank lending has provided the majority of infrastructure investment and the current infrastructure investment is nowhere near the global need. Besides limited balance sheet capacity, there have been two major developments in the commercial bank sector that will further restrict their lending to infrastructure projects. Firstly, as a result of the global financial crisis, global banks that have previously financed mega infrastructure projects have had to reorganizing their balance sheets by deleveraging and reducing cross-border exposure. Secondly, there was the adoption of the Basel III regulatory framework, which imposes significant capital, funding and liquidity requirements on banks'. As a result, banks' will no longer be able to offer the long-term financing required for infrastructure projects.

In their study, Croce and Gatti (2015) find that debt in the form of syndicated loans has been the major source of financing for large-scale infrastructure projects. The project

finance market saw a period of rapid expansion until the 2007 – 2008 global financial crisis. Loan funding in project finance transactions peaked to a record USD 247bn in 2008 but declined sharply in 2009. In 2013 project finance loans recovered to an amount of USD 204bn, however, project finance accounted for roughly 5% of syndicated loans worldwide, significantly lower than the 9% peak reached in 2008.

According to the PFI (2015), in 2014 project finance loans hit a new high of US\$260.2bn (above the 2008 peak). The main driver was the US project finance market where volumes doubled from the previous year. Project bond financing although still small is gaining momentum. In 2013, project bond issuances totaled USD 49bn representing 20% of the total debt provided to project finance. In 2014, issuances were flat at USD50bn representing 16% of the total debt provided to project finance.

Project bonds give borrowers access to capital markets, a market that links suppliers of long-term capital such as institutional investors to users of capital such as businesses, governments and financial institutions. Capital markets are important for the efficient allocation of capital and risk in the market. They ensure that capital is used productively and generates maximum returns for its owners.

Mussa and Goldstein (1993) state that international capital markets channel resources from units that are savers to units that are dissavers, thereby loosening the constraints imposed by self-finance and enabling increases in overall productivity of investment and smoothing of consumption. Capital markets also provide liquidity, and allocate and distribute risk.

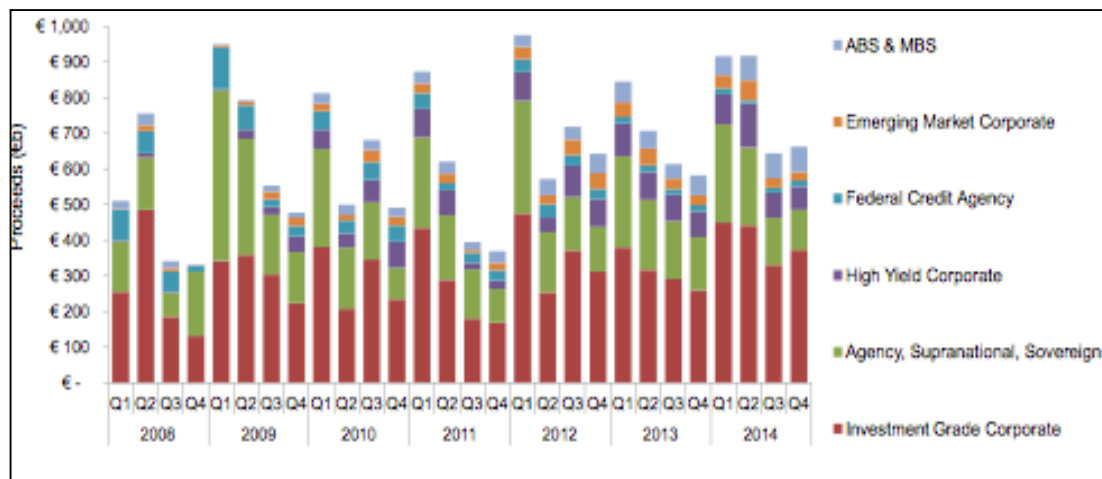
Murinde (2006) describes capital markets as markets for trading long-term financial securities, including ordinary shares, long-term debt securities such as debentures, unsecured loan stocks, and convertible bonds. Capital markets allow companies and governments to raise long-term funds from those with funds to invest, such as financial institutions and private investors.

Obtsfeld and Taylor (2004) argue that, at the global level, the international capital markets channel world savings to their most productive uses, irrespective of location. Emerging countries with little capital can borrow to finance investment, thereby promoting economic growth without sharp increases in saving rates. World capital markets also help countries with imperfectly correlated income risks to trade them, thereby reducing the global cross-sectional variability in per capita consumption levels.

Capital markets are the largest and deepest source capital, with trillions of dollars raised every year in the debt markets according to the Thompson Reuters (2015) debt capital markets report. International bond proceeds for 2014 reached \$4trillion, which was a 15.4% increase from 2013 and a new market record set by the bond markets (exceeding the previous market peak set in 2007)

Thompson Reuters (2015) shows that domicile countries driving the market included the United States (proceeds up 34.1%, with a 30.2 % market share of all international issuance), China (116.2% year-on-year increase), and Switzerland (up 158.2%). From an industry perspective, significant increases in issuance were seen in Healthcare (+117.2% over 2013), Retail (+51.1%), and Media & Entertainment (+32.4%).

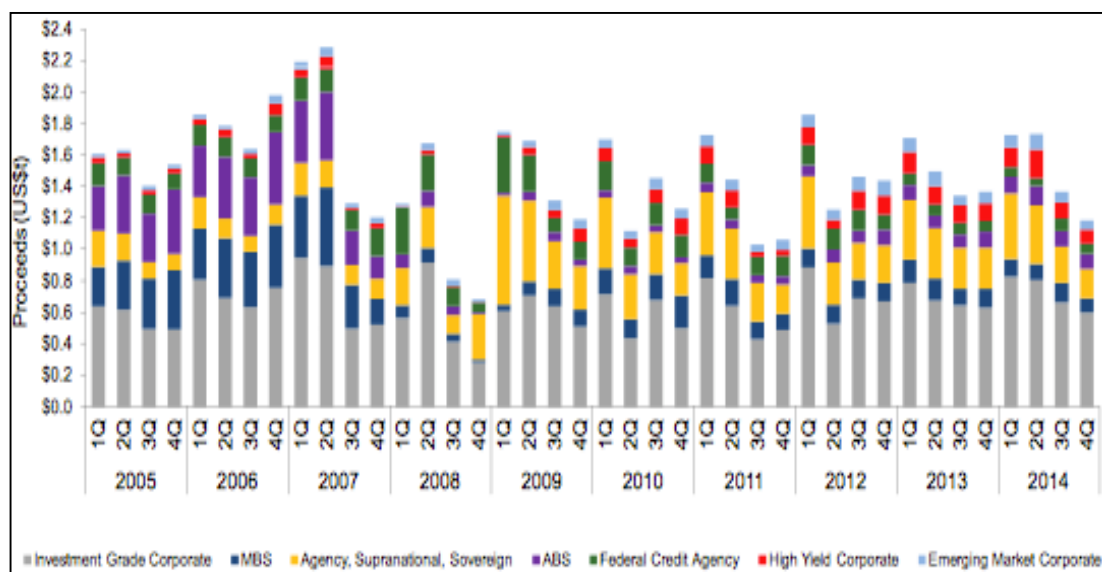
Figure 4: All international Bonds by Issue Type



Source: Thompson Reuters (2015)

Bonds account for a significant market share (70%) in debt capital market issuances, which reached a global total of \$5.7 trillion in 2014, a 2% increase from 2013. The U.S. accounts for the majority of issuances, with High Grade corporate debt offerings targeted to the US marketplace totaling US\$1.1 trillion during 2014. Companies based in the US accounted for 61% of issuance, and issuers based in the United Kingdom, Canada and Japan each accounted for 4% of US marketplace issuance during 2014.

Figure 5: Global debt capital markets by issue type

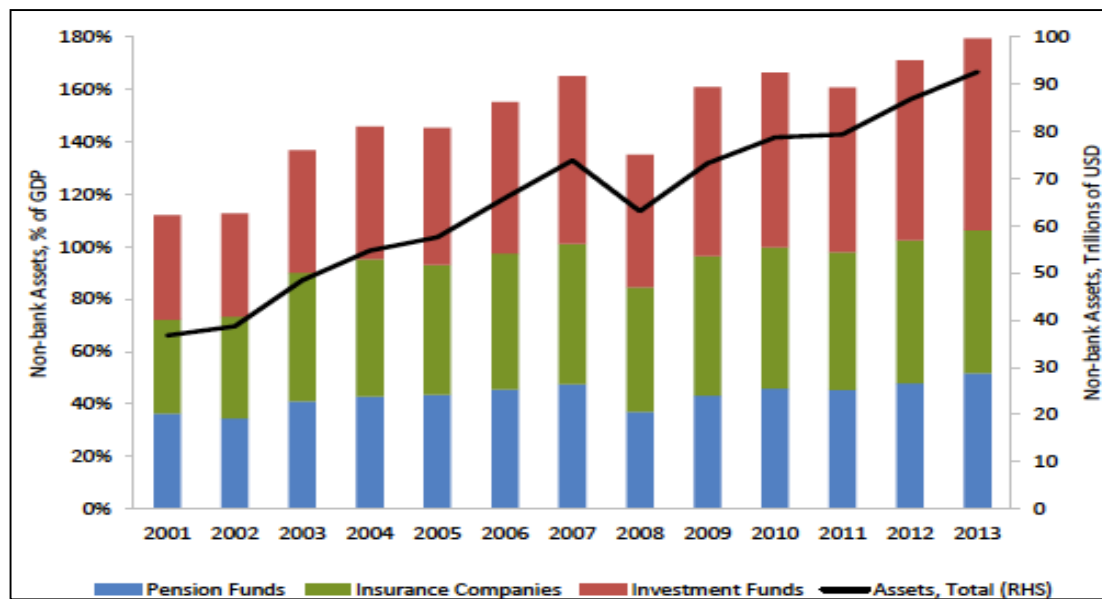


Source: Thompson Reuters (2015)

Emerging markets still represent a very small portion of the global capital markets, with debt issuances reaching \$348.6 billion in 2014, \$297 billion in 2013 and \$305.9 billion in 2012. Russia, India and Brazil, Mexico and Malaysia accounted for over 50% of emerging market issuances in all 3 years. In his study, Masetti (2013) find that the South African bond exchange, the most deep and liquid debt market in Africa, had a market capitalization of \$184bn or 47% of GDP.

As evidenced by the above, the bond markets are significantly large and liquid. They have the capacity to fund infrastructure projects worth billions of dollars.

Institutional investors such as pension funds, sovereign wealth funds, investment funds, and insurance firms are the largest investors in global capital markets. They have large assets under their management and they earn returns on these assets by investing in capital markets. Croce (2014) estimates South Africa's pension fund sector to be equal to 81% of GDP, which would equal R3trillion based on 2014 GDP of R3.8trillion. However, only 4% of these assets are invested in infrastructure assets. Institutional investors belonging to the Organization for Economic Cooperation and Development (OECD) member countries have an estimated \$100 trillion assets under management according to Schmukler (2015).

Figure 6: Institutional investor assets under management (2001 – 2013)


Source: OECD (2015)
 OECD Countries Only

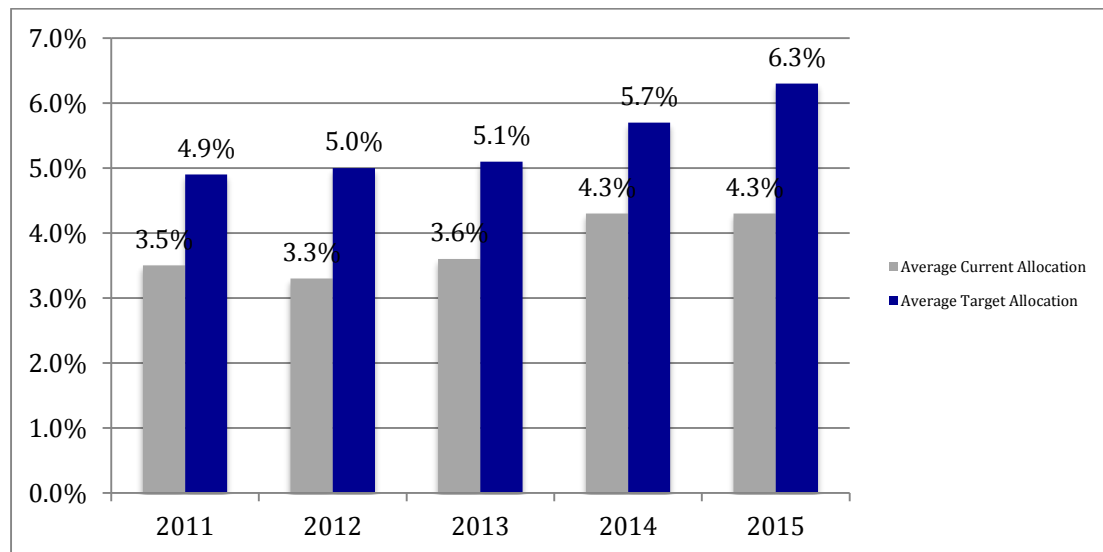
The general average portfolio for pension funds surveyed by the OECD in 2014 shows that as of December 2013, 52.1% of total assets were invested in fixed income and cash, 31.5% in equity, 1.6% in unlisted infrastructure and 14.8% in alternative/other investments.

Although increasing, investment in infrastructure by institutional investors remains minuscule. Currently, average direct investment in infrastructure by pension funds represents around 1% of total assets across the OECD. Large pensions in Canada and Australia are the exception, where they have been actively raising their allocation in infrastructure with allocations as high as 10-15%. Croce and Yermo (2013) found that Sovereign Wealth Funds in countries like Singapore have allocations in excess of 10%.

Prequin (2015) found that the majority of institutional investors they surveyed were generally satisfied with their infrastructure fund investments over the June 2014 to June

2015 period. More than one-fifth felt that infrastructure had fallen short of expectations, and 15% of the respondents felt infrastructure had exceeded their expectations. A good percentage of institutional investors are still looking to increase their allocations in infrastructure assets as shown below.

Figure 7: Average Allocation to Infrastructure (As a % of AUM)



Source: Preqin (2015)

Issuing project bonds would give project sponsors access to global capital markets with trillions of dollars in funds. Capital market investors have more than enough capital available to invest in South African project bonds. From a local capital markets perspective, there is sufficient liquidity to invest in project bonds. The South African government and state owned enterprises such as Transnet and Eskom have successfully tapped the capital markets in the past to finance their infrastructure projects, with all of their issuances being over-subscribed. South Africa has the expertise and experience domestically and internationally to successfully structure and execute project bond issuances.

4.5.3 Cheaper source of funding

The cost of financing will play an important role in the decision of which debt instrument to use for the financing of infrastructure. For project finance, loans have been the major source of financing for many reasons. One of the major reasons is their flexibility as compared to bonds. Given the nature of bank financing, it is easier to restructure bank loans and avoid defaults than it is with bonds. Bank debt is also easier to access at a fraction of the costs incurred when accessing bond financing. Unlike the case with bonds, there is also no negative carry associated with bank loans. These factors make bank loans more attractive than project bonds.

Berlin and Loeys (1988) and Diamond (1991) argue that the choice of debt instrument is, among others, a function of a borrower's creditworthiness. Diamond shows that as the borrower's credit worthiness improves, borrowers are likely to switch from junk bonds to bank loans and as creditworthiness improves even further, borrowers then switch back to the bond market, issuing investment grade bonds, reflecting a lower level of risk.

Hale (2002) suggests that because banks have more monitoring power than bondholders, banks can refuse to rollover the loans, which represents a credible threat to a borrower and therefore makes monitoring efficient. In contrast, after the launch of an international bond, bondholders have little control over the issuer's actions, since a bond issue cannot be reversed before maturity. Therefore banks can limit the risk of their loans and, hence, offer funds at a lower rate. However, these benefits come at a cost. Banks bear costs not borne by bondholders. These costs include reserve and capital requirements, operating and monitoring costs. Banks pass these costs through

to their borrowers. Therefore, borrowers face a trade-off between lower risk premium and additional costs of bank loans as compared to bonds.

Hale and Santos (2008) found that firms pay a lower spreads on their bank loans after they undertake their bond Initial Public Offerings. Everything else being equal, firms that enter the public bond market with an investment grade rated bond benefit from a reduction of between 35 to 50 basis points in the credit spreads they pay on their bank loans. These findings are consistent with the hypothesis that banks do price their informational advantage when they extend loans to borrowers.

Groobey, Pierce, Faber and Broome (2010) argue that a 144A bond offering is generally executed more quickly and inexpensively than a syndicated project loan and bonds can also pay interest at tax-exempt rates (lowering the borrower's borrowing cost), be issued in fairly small amounts (making them ideal for smaller project finance transactions) and carry implied or explicit credit support from government instrumentalities (again reducing borrowing costs).

Basel III is expected to pose significant challenges for banks. In particular, there will be a significant increase in the quantity of capital – particularly common equity capital – that banks will be required to hold. This is likely to lead to increased cost of project loans due to increased capital intensity. According to Chan and Worth (2011), high-rated bonds will require a lower proportion of stable funding under the Net Stable Funding Ratio than similarly rated loans.

In their model Russ and Valderrama (2012) found that although banks are able to monitor borrowers, this comes at a higher marginal cost of lending. While firms find it

harder to access the bond market due to higher fixed costs, these costs are associated with a lower cost of funds. Therefore the marginal cost of financing capital with bond issues is cheaper than with bank loans – that is, the bond yield is lower than the bank interest rate.

Contessi, Li and Russ (2013) state that bonds are commonly referred to as “unmonitored” lending, due to the dispersion of bond investors who choose not to monitor or influence the activities of bond issuers, while banks, on the other hand, specialize and spend resources to monitor borrowers, which typically results in higher cost of lending. Given a choice between the two, some firms prefer bond financing because it is typically cheaper than bank loans.

Grant Thornton (2014) argue that bonds are cheaper to service than loans as bonds can be structured with bullet repayments. As a result, servicing only the interest portion of the loan means that debt service is considerably lower than would be the case for a comparable loan as banks generally require a substantial part, if not all, of the loan to be amortised over the loan life.

Using issuances of corporate bonds by companies operating in comparable infrastructure sectors (water, power, transportation and oil and gas) as a proxy for project bonds (due to the lack of available data on project bonds in Europe), Dhondt, Krawchenko and Traxler (2014) found that on average, across tenors and credit quality, bank loan margins have been higher than bond credit spreads. As of September 2013, average loan credit spreads were 87 basis points higher than those for comparable corporate bonds. Even when corporate bond credit spreads are conservatively adjusted

for credit quality, they have remained on average 47 basis points lower than project loan spreads.

Furthermore, they find that the 47 bps credit spread reduction presents a cash savings of 9,4% (unadjusted for inflation or the time value of money) for comparable bonds and loan with a tenor of 20 years. This translates to billions of Euros in annual savings.

In examining bond and loan spreads by tenor, Dhond et.al (2014) find that bonds still demonstrate a clear cost advantage across the maturity profile. For bonds issued in 2010 to 2013 within the 10-15 year category, loan spreads are 163 bps above those of comparable bonds. On average, from 2010 to 2013, across all tenors (not weighted by issue size), loan spreads were 97 bps above those of comparable bonds.

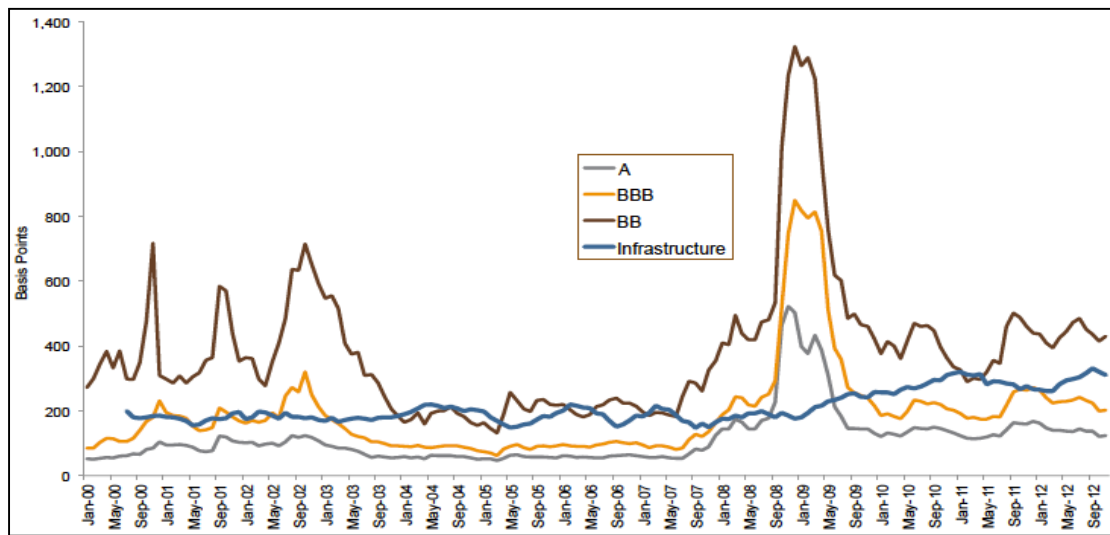
Doyle and Murphy (2012) conclude that pricing has remained a key driver in the popularity of project bond financing in Canada. Canadian bond yields are at historic lows and average credit spreads for issues continued to tighten between May 2011 and May 2012, reducing from 200 basis points to 187 basis points for an A rated issue.

In Canada, there was competition between loans and bonds for long-term debt until end of the 2010 (when long term bank loans were no longer available in any volume) - post the global financial crisis. This led to competitive pricing in the bond markets according to Infrastructure Australia (2014). Pricing for bonds with tenors of 30+ years started at 385 basis points over the benchmark, decreasing to around 300 basis points in 2010 and decreasing further to 200 basis points in 2011. Recent transactions have priced marginally below 200 basis points, with the share of public private partnerships debt

provided by bonds increased from less than 10 percent to greater than 70 percent and finally settling at around 50%. The use of Project Bonds before the global financial crisis was driven by their ability to offer the lowest cost of debt (as well as enabling sponsors to ‘black box’ and control all aspects of transactions).

Yates (2014) argues that alternative debt solutions, such as bond financing, will play a significant role in reducing the margins on wind farm debt. In November 2013, Balfour Beatty, Equitix and AMP Capital used a project bond to acquire the offshore transmission link for the Greater Gabbard wind farm. This bond had a spread of 125 basis points over the Gilt, which compares with margins for bank debt for similar, earlier projects of 210-220 basis points.

Figure 8: Margins over LIBOR for long-term (7+ years) global corporate bonds and new issue infrastructure project finance debt



Source: Barclays Capital; Dealogic; J.P. Morgan Asset Management

The graph above shows the credit spreads for infrastructure project finance debt, global corporate bonds with A, BBB, and B credit ratings. A credit spread is measure of how

much more a corporation pays to borrow money than the government does. It is the yield between two bonds, a treasury bond and a corporate bond of similar maturity but different credit quality. From the above we see that infrastructure project finance spreads lie between BB and BBB quality corporate debt and appear less volatile.

The evidence provided in this section suggests that project bonds can be a cheaper source of funding than loans for infrastructure projects. We have seen evidence from Europe where project bonds offer a clear cost advantage than loans. Project bonds are also cheaper to service than loans as project bonds are generally structured with principal bullet payments on maturity unlike loans where the principal is generally amortised over the life of the loan. Bondholders also have the benefit of being able to trade project bonds in secondary market and pass on the risk to other capital market investors. While project loans can be syndicated to reduce a lender's exposure and risk, lenders will generally need the permission of the borrower should they wish to leave the syndicate team and pass on their exposure to other banks'.

4.5.4 Flexible covenant package

Covenants are important in the bank and bond lending markets. Firstly, they serve to protect the interests of the lenders by restricting the activities a borrower can undertake, therefore ensuring that future obligations are honoured as and when they fall due.

Secondly, they mitigate the principal-agent problem by ensuring that managers (agents) act in the best interests of the shareholders (principals). Lastly, covenants protect lenders against information asymmetry where borrowers have more information

about the firm than lenders do. Lenders monitor adherence to covenants and any breach could have serious implications for the company's ability to borrow in the future.

Bond covenants are generally more flexible given the nature of bond investors. Borrowers prefer this as it affords them more flexibility in the running of their businesses. McLaughlin and Yessios (2011) state that for brownfield projects, covenants tend to be incurrence-based, not maintenance-based as in bank-financed projects. This is important because it allows borrowers to customize their bonds according to their needs. Where banks typically impose a set of covenants on the borrower, bonds are marketed with a pre-determined set of covenants by the issuer.

Bonds are said to have incurrence-based covenants and loans are said to have maintenance-based covenants. Banks prefer maintenance-based covenants because these are monitored and tested frequently which allows them to take action early when the borrower experiences financial distress or shows strong signs of breaching the covenants. Borrowers, on the other hand, prefer incurrence-based covenants because unlike bank covenants, these are only tested in the event of a significant corporate action such as raising new debt, making an acquisition or paying a dividend.

According to Maxwell and Shenkman (2010), with incurrence-based covenants, the borrower (bond issuer) need not worry about failing to comply, based on events beyond its control. Instead, it need only test compliance with the covenant if it proactively intends to take an action, such as to borrow more money, to pay a dividend, or to sell assets. Because there is no close monitoring by bondholders, even if there is a breach

in the covenants, issuers have the advantage of correcting the breach should they wish to approach bondholders for corporate action in the future.

Vita (2011) argues that bond covenants are designed to preserve the bond's relative payment priority, protect against loss of equity cushion (in an insolvency scenario, equity ranks lower than debt) and prevent credit deterioration (through controls over asset and cash leakage), but without limiting a company's ability to grow, because positive growth will enhance the capital value of the bonds which benefits bond trading prices in the secondary market.

According to the Payden & Rygel Research (2013), leveraged loans involve a series of standard covenants that dictate how borrowers can operate and finance themselves. These are known as maintenance covenants, which allow the lender to ensure that the corporate borrower "maintains" these critical measures of financial health. These covenants differ from those associated with high-yield bond issues as they must be met not only upon issuance, but typically quarterly.

O'Sullivan and White (2015) argue that one of the major differences between bank loans and bonds was the inclusion of financial maintenance covenants in syndicated loan agreements. The borrower had to "maintain" a negotiated (and frequently declining) level of leverage, for instance, to avoid default or failure of a condition to further advances. The maintenance covenants included: maximum leverage ratio; minimum interest coverage ratio; and a minimum fixed charged ratio.

In the event of default, O'Sullivan and White (2015) found that bond investors to be more flexible than banks. In the event of a default in interest payment, bondholders generally give borrowers a 30-day grace period and senior bank loans have a 3 to 5 business day grace period. In the case of a covenant default, bondholders have a 60-day grace period other than mergers, asset sales and failure to repurchase upon a change of control.

Banks' on the other hand have no grace period for negative covenants and certain affirmative covenants; and 30-days for others. In the event of default in other material debt, bonds have a cross-acceleration clause whereby the acceleration of a loan with any other lender, following an event of default under another loan agreement, is also an event of default under their (bondholder and bond issuer) agreement. Bank loans on the other hand have a cross-default provision stipulating that if borrower defaults on any outstanding debt obligations, the borrower is considered to be in default on all obligations.

4.6 Project bond investor objectives

4.6.1 Introduction

Institutional investors, who are the largest investors in capital markets, will be central in developing the project bond market in South Africa. Infrastructure continues to gain increased recognition as a unique asset class, and holds considerable appeal for institutional investors as it has the potential to deliver significant yields and match their long-term liabilities. Institutional investors have access to more liquid and deep funding unlike banks and it is their appetite for this asset that will ultimately determine its success.

Prequin (2015) found that as at the end of 2014, there were 144 infrastructure funds globally, with a combined target size of \$93 billion. The gap between current and targeted allocation amongst institutional investors as shown earlier indicates that there is room for more infrastructure investment from institutional investors.

Globally, the demand for private infrastructure capital continues to grow according to Roberts, Patel and Minela (2015). This is driven by governmental budget constraints, the need for investment to facilitate continued economic growth, and a secondary market for existing assets, which continues to increase in importance. As regulatory changes affect bank term lending, investors have also begun looking increasingly at the provision of infrastructure debt.

In this chapter we will assess three critical objectives for bond investors. Using qualitative and quantitative methods we will determine whether or not project bonds are able to satisfy those objectives.

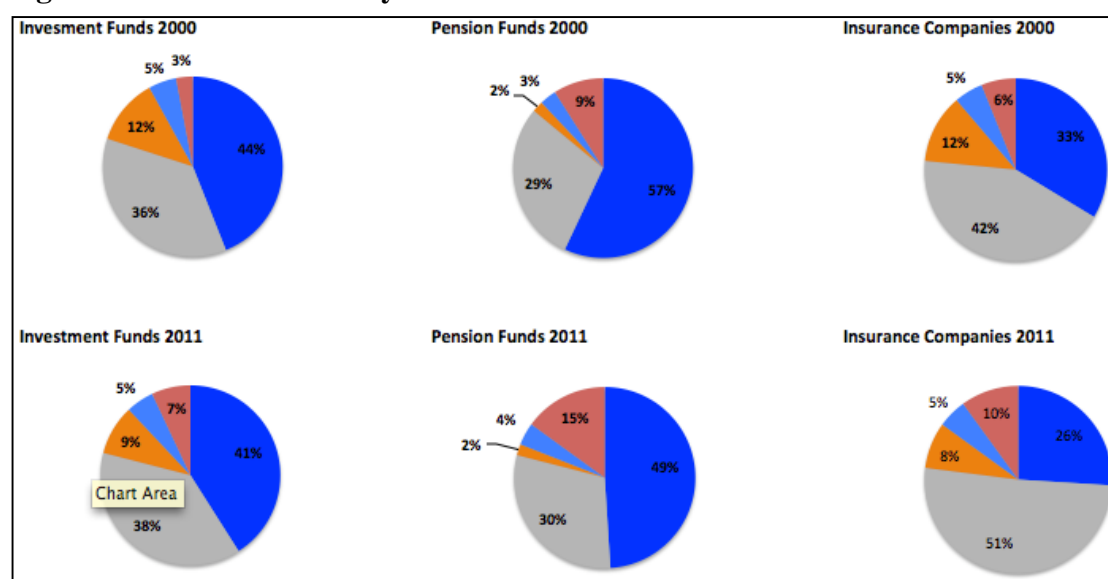
Firstly, we will look at whether project bonds provide an asset and liability match for institutional investors. Pension funds and Sovereign Wealth Funds are institutional investors that sit with long-term liabilities, which need to be matched with long-term assets i.e. assets that provide stable returns over the life of the liability. At present these investors are investing in short-to-medium-term assets and have to reconstitute their portfolios when these assets reach maturity. Due to its long-term nature, infrastructure is able to match the life of a pension plan, which can be up to 40 years.

Secondly, we will assess whether as an asset, infrastructure provides superior risk-adjusted returns as compared to other asset classes. Given its monopolistic nature, high entry barriers and price setting power, we expect infrastructure to deliver stable returns over the long-term unlike traditional asset classes that are sensitive to global macroeconomic conditions and move with the business cycle. We also expect to find infrastructure returns to be less correlated with the other asset classes, which is important for institutional investors and their portfolio diversification strategies.

Lastly, we will assess the default rates for project and infrastructure finance debt. Whilst institutional investors have the liquidity and capital to invest in project bonds, they also have a fiduciary duty to their investors. That is, they need to act in best interests of their investors and not undertake activities that are risky and outside the scope of the investment mandate. Institutional investors must earn a return on their liabilities and make payouts as and when they fall due. Therefore, they will be looking to invest in liquid assets and assets with low probabilities of default to ensure they are able to meet future obligations.

4.6.2 Asset-liability match

Institutional investors are the majority investors in capital markets. They hold trillions of dollars in long-term savings (liabilities) and seek to earn a return on these savings by investing them in capital market assets and other financial instruments. Pension funds have long-term commitments such as pension payouts that need to be matched with long-term investments and infrastructure is one such asset that provides this match. However, average global investment in infrastructure remains low at 1%.

Figure 9: Asset allocation by traditional institutional investors in the OECD


Source: OECD

Public “equity” and “securities other than equities”, which consists mainly of bonds, represents the largest share in the asset allocation decision for institutional investors. However, we see growth in the “other” category, which includes investments in private equity funds, venture capital, hedge funds, real estate, commercial loans and financial derivatives. Çelik and Isaksson (2014) state that the major institutional investors have increased asset allocation into these asset classes as they have come to understand them more and seek to diversify their portfolios.

Using a vector error correction model (VECM) that explicitly distinguishes between short-term and long-term dynamics in the joint distribution of asset returns and inflation, Amenc, Martellini and Zieman (2009) found that real estate and commodities have particularly attractive inflation hedging properties over long-horizons, which justifies their introduction in pension funds’ liability-matching portfolios. Their results

suggest that alternatives are very useful ingredients for institutional investors facing inflation-related liability constraints.

Inderset (2014) found that while institutional investors in the UK and Australia have been investing in infrastructure assets since the 1980s when many of the utility industries were being privatized, today, their investment in infrastructure is driven by low yields, volatile markets, portfolio diversification and enhancing long-term asset-liability match. They are increasingly attracted to infrastructure assets with (potentially) favourable characteristics such as long-term, stable, and often inflation-linked cash flows.

According to Standard & Poor's (2014), a large number of institutional investors are found to be seeking greater exposure to Asian infrastructure. Investing in such projects seems to be a good match, particularly for insurers and pension funds, because of the predictable, stable cash flows and potential for asset and liability matching. However, the low credit quality of sovereign borrowers and issuers in the region, combined with currency-fluctuation risks and too-low yields, may hold many investors back.

The Institute and Faculty of Actuaries (2015) argues that appropriate infrastructure can provide pension funds with attractive risk/return profiles, liability matching cash flows and diversification benefits.

According to Schoenberg (2015), infrastructure assets offer an attractive asset-liability match because they allow for substantial investments with steady annuity-type returns over decades that are generally predictable. However cost and ease of exit, given their

illiquidity remains a major challenge. Liquidity would further enhance their attractiveness and open the projects to a wider pool of investment capital.

Infrastructure bonds have the potential to solve the asset-liability mismatch that characterizes institutional investors. Project bonds have significantly larger tenors as compared to other bonds, such as corporate and sovereign bonds that have been used to mitigate the asset-liability mismatch. Given their monopolistic nature and ability to absorb macroeconomic shocks, infrastructure assets are able to provide stable returns for the life of the bond.

Given the global infrastructure need and the stricter regulatory environment in the banking sector, we will see institutional investors increase their asset allocation to infrastructure assets. A significant portion of the institutional investor market has indicated that they are willing to increase allocation to this asset; however, there is a lack of well-structured projects.

Over time we expect to see more collaboration and less competition between institutional investors and banks, where institutional investors will bring their large quantum of capital and banks will bring their structuring, executing and monitoring capabilities.

4.6.3 Superior risk-adjusted returns

As an asset class infrastructure has been found to deliver superior risk-adjusted returns as compared to other asset classes. Given its monopolistic nature, its low correlation

with other asset classes and its resilience to economic down turns, infrastructure assets are able to provide stable cash flows and superior risk-adjusted returns.

To measure risk-adjusted returns we will use the Sharpe Ratio, which is the most commonly used measure of risk-adjusted returns. Developed by William Sharpe in 1966, the Sharpe ratio is defined as the excess return or risk premium per unit of additional standard deviation. It is the excess return per additional unit of risk that is earned by an investor for the risk he or she takes.

According to Simons (1998), the Sharpe Ratio measures a fund's excess return per unit of its risk. It is based on the trade-off between risk and return. A high Sharpe ratio means the fund delivers high returns for its level of volatility. If investors are able to borrow and lend, they can invest in the portfolio with the highest Sharpe ratio and mix it with the risk-free asset in different proportions.

Best and Hodges (2007) define the Sharpe Ratio as the ratio of a portfolio's expected return in excess of the risk-free to its expected standard deviation. Higher ratios indicate portfolios that are expected to yield higher risk-adjusted returns.

Engels (2004) states that the Sharpe ratio plays an important role in the asset allocation decision and modern portfolio theory. The capital asset pricing model (CAPM) theory tells us that the portfolio with the highest Sharpe Ratio on the efficient frontier is the market portfolio. This is the point where the capital market line is tangent to the efficient frontier, and represents the highest expected return per unit of risk.

In their study that assesses the significance of the infrastructure sectors in investment portfolios in Australia, as well as the added value of the infrastructure sectors using risk-adjusted performance analysis, Peng and Newell (2007) found that infrastructure sectors contributed the highest returns to investment portfolio between 1995 (2nd quarter) and 2006.

They found that the average annual return of unlisted infrastructure funds of 14.1% was higher than the returns of bonds (7.2%), stocks (12.9%) and direct property (10.9%). Direct property had a significantly high Sharpe ratio of 3.67, while unlisted infrastructure came second (1.47), followed by stocks (0.67) and bonds (0.39) ranked at the bottom. Volatility of unlisted infrastructure (5.8%) is lower than that of the listed asset classes but higher than for bonds (4.3%) and direct property (1.5%). Listed infrastructure shows both higher returns and risk than unlisted infrastructure.

According to Swiss Re (2014), infrastructure bonds and loans meet several needs of institutional investors, such as regular cash flows and attractive risk-adjusted yields. They offer a significant premium over Treasury rates and coupons have remained stable despite the decline in US Treasury yields in recent years. During the financial crisis in 2008/2009, infrastructure debt remained resilient in terms of spreads, and did not suffer a jump in default rates.

Wiesdorf (2007) found Australian infrastructure to be less correlated with traditional asset class returns offering attractive inflation protection characteristics. Its correlation with Australian equities was 0.32, bonds 0.04, listed property 0.16 and international

equities 0.00. Other asset classes were found to be highly correlated such as Australian bonds and listed property who had a correlation coefficient of 0.52.

Russ, Thambiah, and Foscar (2010) show that infrastructure correlations stayed relatively low against most analyzed asset classes in the period between July 2000 and March 2010, with the exception of non-US equities. They also find that adding infrastructure to an institutional portfolio improves return per unit of risk (Sharpe Ratio). When they compare a portfolio with no infrastructure to a portfolio with 5% infrastructure and 5% customized infrastructure, they find that the Sharpe ratio increases from 0.75 to 0.8 and the overall risk of the portfolio decreases.

J.P. Morgan (2011) studied changes in the cash flows of unlisted American and European infrastructure assets between 1986 and 2010 and found the cash flows to demonstrate low volatility over time. Their study also found very low correlation between the cash flows of infrastructure assets and similar indicators for other asset classes (EBITDA for equity and net operating income for real estate). Their study further shows that increasing a portfolio's allocation to infrastructure from 0% to 20% increases a portfolio's Sharpe Ratio from 0.45% to 0.54%.

Roberts, Patel and Minella (2015) argue that the quasi-monopolistic nature of infrastructure assets, high barriers to entry, as well regulation can protect returns from market risk and volatility, limiting exposure to the economic cycle. Their results show that unlisted infrastructure exhibits low, negative correlation with global bonds (-0.25); equity markets (-0.20) and listed infrastructure (-0.12). These results suggest that there are diversification benefits with unlisted infrastructure. Their study also shows that

unlisted infrastructure exposes investors to lower volatility and hence produces more attractive risk-adjusted returns. Using quarterly data over a period of 5 years to December 2014, they find unlisted infrastructure to have a significantly high Sharpe ratio (3.6) compared to listed equities (0.9); global bonds (0.5) and listed infrastructure (1.3).

Prudential Investments (2015) found that adding infrastructure to a diversified portfolio of traditional stocks and bonds has improved returns while reducing volatility. Analysing two portfolio returns between December 2001 and September 2015, their results show that the portfolio with 40% equities, 40% in bonds and 20% infrastructure had a Sharpe Ratio of 0.68 whilst the portfolio with 60% equities and 40% bonds has a Sharpe ratio of 0.53

4.6.3.1 Analysis of infrastructure returns

In this section of the paper we test whether infrastructure has higher returns than traditional asset classes that continue to dominate portfolios; we assess if it is indeed less correlated with the other asset classes using a correlation matrix; and finally we will test whether infrastructure offers superior risk-adjusted returns than other assets using the Sharpe Ratio.

We will be using the Dow Jones Brookfield Global Infrastructure Broad Market Corporate Bond index as a proxy for infrastructure debt. For equities we will use the S&P Global Broad Market Index; the S&P Global Real Estate Investment Trust for global property; the S&P GSCI for commodities; the S&P International Corporate Bond Index for corporate bonds; and the Citigroup World Government Bond Index for

government bonds. We used the United States 3-month Treasury-Bill rate as our risk-free rate. We will use monthly Total Returns (TR) over a 10-year period, January 2005 – December 2014.

Table 1: Annualized Returns

Asset Class	1 year ('14)	3 year ('12-'14)	5 year ('10-'14)	10 year ('05-'14)
Dow Jones				
Infrastructure Index	6,51%	6,25%	5,95%	5,61%
S&P Global REIT	22,81%	16,03%	14,42%	6,97%
S&P Global BMI	4,36%	14,91%	10,02%	6,97%
S&P GSCI	-33,06%	-12,86%	-6,54%	-4,79%
Citi World Gov Bond				
Index	-0,48%	-0,97%	1,67%	3,08%
S&P Inter Corp				
Bond Index	-0,71%	5,87%	4,93%	6,08%

Source: Author's calculations based on data from Standard & Poor's and Citigroup

Our results show that in 2014, infrastructure had the second highest returns after Real Estate. We also see that Commodities had a dismal performance with -33.06% in annualized returns, which is consistent with trend of plummeting global commodity prices. Looking at the 3 and 5 year annualized returns, we see that Infrastructure provided the third highest returns after Real Estate and Equities. Infrastructure returns appear to be more stable over the 10 years compared to the asset classes.

Table 2: Correlation Matrix

Asset Class	Dow Jones Infrastructure Index	S&P Global REIT	S&P Global BMI	S&P GSCI	Citi WGBI	S&P Int Corp Bond Index
Dow Jones Infrastructure Index	1					
S&P Global REIT	-0,0005	1				
S&P Global BMI	0,0790	0,8362	1			
S&P GSCI	0,0277	0,3658	0,5811	1		
Citi WGBI	0,1411	0,3082	0,2604	0,2083	1	
S&P Int Corp Bond Index	0,1725	0,5521	0,6428	0,4719	0,7623	1

Source: Author's calculations based on data from Standard & Poor's and Citigroup

The results from the correlation matrix are consistent with the findings of previous research. Compared to all the other asset classes, infrastructure investment returns have low a correlation with all the other asset classes.

There are several reasons why infrastructure is less correlated with the other asset classes. Firstly, infrastructure is highly regulated, normally by the government or a government related entity allowing for prices to be set above inflation. Secondly, infrastructure is associated with high barriers to entry; therefore limiting competition and creating an asset that is effectively a monopoly with price setting powers. Lastly, infrastructure assets are usually necessities such as electricity, water, transport, and utilities that consumers (households, businesses and government) cannot function without. They are essentially defensive assets that provide stable cash flows even during challenging macroeconomic conditions.

From an institutional investor's perspective, infrastructure assets would be able to provide stable returns over the long-term while remaining less correlated with the other asset classes.

Table 3: Risk-Adjusted Returns (Sharpe Ratio)

Asset Class	1 year ('14)	3 year ('12-'14)	5 year ('10 - '14)	10 year ('05 - '14)
Dow Jones Infrastructure Index	2,47	0,96	0,70	0,34
S&P Global REIT	2,01	0,74	0,41	0,08
S&P Global BMI	0,49	0,80	0,30	0,11
S&P GSCI	-1,78	-0,44	-0,16	-0,08
Citi WGBI	-0,11	-0,14	0,14	0,09
S&P Int Corp Bond Index	-0,13	0,45	0,22	0,16

Source: Author's calculations based on Standard & Poor's and Citigroup Data

As we see from the table above, infrastructure had the highest risk-adjusted returns as compared to all the other asset classes across all the periods. This further illustrates that there are diversification benefits to including infrastructure in a portfolio. We also see that infrastructure risk adjusted returns appear to be less volatile than the other asset classes. We see negative risk-adjusted returns for global commodities, which is consistent with the commodities cycle since the early 2000s.

To further test the attractiveness of infrastructure as an asset class, we conduct a mean-variance spanning test developed by Huberman and Kendal (1987) to determine whether infrastructure provides diversification benefits when added to a portfolio of other assets. This is a multivariate test of the hypothesis that the minimum-variance frontier of a set of K benchmark assets is identical to the minimum-variance frontier of a set of K assets plus a set of N test assets.

Applying the mean-variance test into our portfolio optimization problem gives us the following equation:

$$\begin{aligned}
 R_{Infrastructure} &= \alpha + \beta_1 R_{Equities} + \beta_2 R_{REIT} + \beta_3 R_{GSCI} + \beta_4 R_{WGBI} \\
 &+ \beta_5 R_{Corp_Bonds} + \varepsilon_i
 \end{aligned}
 \tag{1}$$

The test asset is infrastructure and our benchmark assets are equities, real estate, commodities, government bonds and corporate bonds.

The null hypothesis is that the efficient frontier of our benchmark assets is the same as the efficient frontier of our benchmark assets plus infrastructure:

$$H_0: \alpha = 0 \text{ and } B_1 + B_2 + B_3 + B_4 + B_5 = 1
 \tag{2}$$

Once we have performed our multiple linear regression (Figure 11 in the Appendix), we then perform a Wald test, a test of joint significance, to determine whether infrastructure provides diversification benefits. Rejecting the null hypothesis at the 5% significance level will confirm that infrastructure improves the minimum-variance frontier and provides diversification benefits to investors. If we fail to reject the null hypothesis then the two efficient frontiers are the same and infrastructure provides no diversification benefits. Our Wald test (Figure 12 in the appendix) gives us $F(2, 114) = 114.9938$ and $p\text{-value} = 0.0000$. We therefore reject the null hypothesis at the 5% significance level and conclude that infrastructure does provide diversification benefits and leads to an improved efficient frontier.

To verify the robustness of our results, we check the data for heteroskedasticity. One of the key assumptions in regression analysis is that the variance of the errors is constant across observations (Wooldridge, 2009). Using the Durbin-Watson test to check for heteroskedasticity, we get Durbin-Watson stat = 1.905484 which is close 2 (Figure 12 in Appendix). If there is no heteroskedasticity, the Durbin-Watson statistic will be close to 2. Given a Durbin-Watson statistic of 1.905, we can conclude that there is no heteroskedasticity.

We therefore see that there are huge diversification benefits from including infrastructure in a portfolio. Firstly, it provides high and stable returns; it is less correlated with all the asset classes; and it delivers superior-risk adjusted returns compared to all the other asset classes. Our Wald test also shows that when added to a portfolio, infrastructure improves the efficient frontier, which means investors earn a higher return for the same level of risk.

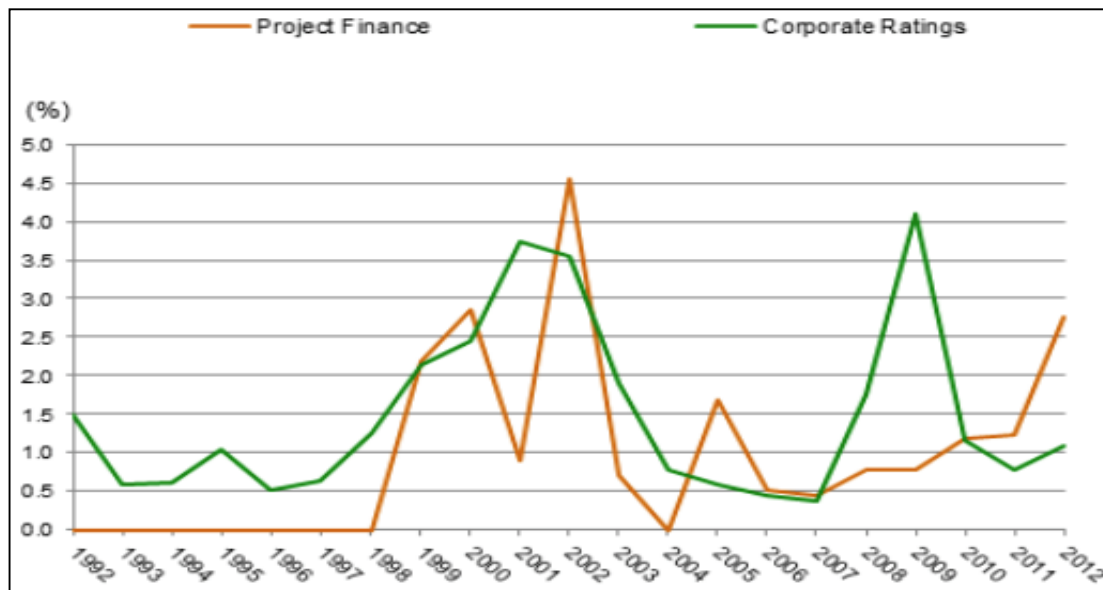
4.6.4 Low default rates

Institutional Investors have a fiduciary duty to their beneficiaries or clients. A duty to act and make investment decisions that is in their best interests. Part of that duty includes investing in liquid, and high quality assets that provide stable returns over the long-term and have low probabilities of default. Although infrastructure is considered to be relatively illiquid compared to the other asset classes, we have shown it provides superior returns. In this section we will also show that historically it has had low default rates.

Many countries enforce the fiduciary duty principle by regulating their institutional investors and by setting limits on the different types of asset classes institutional investors can invest in. High investment grade rated assets, which have low probabilities of default and are preferred to alternative investments that generally have low credit ratings and higher probabilities of default.

Standard & Poor's (2013) found that between 1992 and 2012, the annual default rate for all rated project finance debt averaged 1.5% which was slightly lower than the average corporate issuer default rate over the same period. On average projects are found to be no more risky than corporate entities at comparable rating levels.

Figure 7: Project Finance Default Rates versus Corporate Debt Default Rates



Source: Standard & Poor's 2013

Their study also finds a clear correlation between ratings assigned and the observed frequency of default. In other words, the higher the initial rating, the lower the observed default frequency. Rated project finance issues generally had low default rates

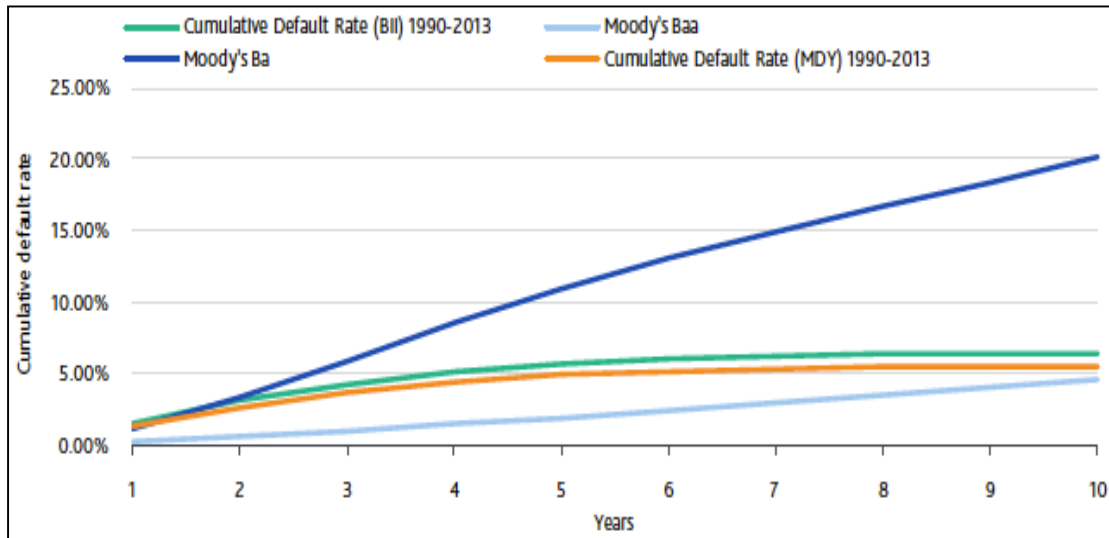
equivalent to low investment-grade corporate entities, and higher prospects of recovery. The Gini coefficients for project finance were found to be lower than those for corporate defaults over the one-year, three-year, and five-year time horizons. This coefficient measures the correlation between ratings and default - a lower score indicates a higher percentage of defaults of higher rated entities

Even though the average recovery rate for project finance is high at 75%, recovery rates form a barbell distribution, with some lenders receiving recoveries close to 100%, while others received minimal amounts, with few projects achieving recoveries close to the mean. It must be noted that the sample of defaulted rated projects (19 projects from six countries.) is not large enough to be a statistically sufficient sample set, but it provides insight into recovery patterns of defaulted projects.

Research by Moody's (2015) found that the 10-year cumulative default rate for project finance bank loans is consistent with 10-year cumulative default rates for corporate issuers of low investment-grade credit quality. The results show continued improvement in default rates for project finance loans. Their results show that the 10-year cumulative default rate (as per the Basel II definition) (BII) for the study data set is 6.4% and the 10-year cumulative default rate (as per Moody's definition) (MDY) is 5.5%. The simple average default rate (BII) stood at 7.0% in the power sector; 5.2% in the infrastructure industry sector and 6.1% in the oil & gas sectors.

The cumulative default rates for corporate issuers with a Baa rating was 4.50% and 20.10% for issuers with a Ba rating according to both the Basel II and Moody's definitions.

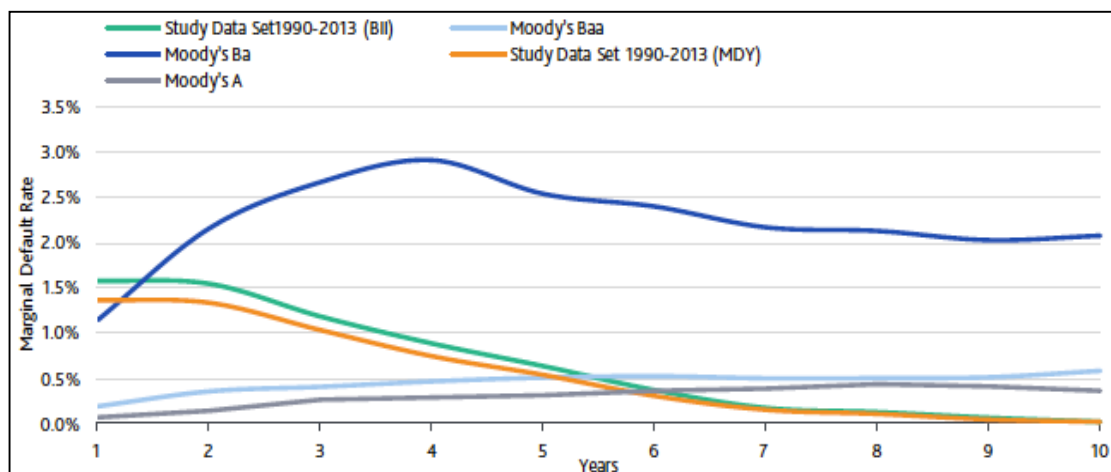
Figure 8: Cumulative Default Rates 1990 – 2013



Moody's Investor Services 2015

However, marginal default rates, which are the likelihood that a performing obligor at the start of a year will default in the same year, are initially consistent with marginal default rates shown by high speculative-grade credits, but trend towards marginal default rates consistent with single-A category ratings by year 10 from financial close.

Figure 9: Marginal Annual Default Rates 1990 – 2013



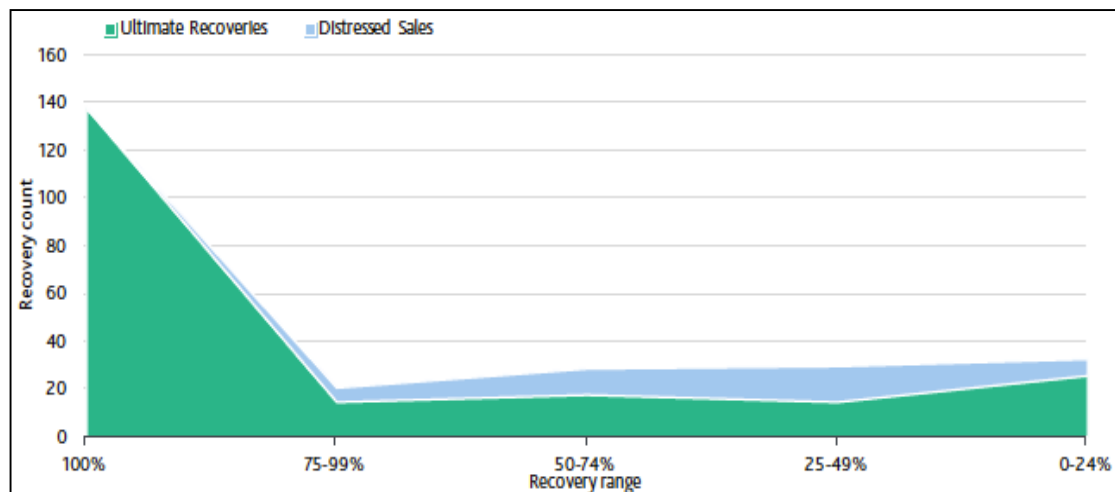
Source: Moody's Investor Services 2015

The marginal annual default rates (BII) for project finance bank loans averaged 1.4% per annum during an initial three year period following financial close, but fall significantly thereafter trending towards marginal default rates consistent with single-A category ratings by year 10 from financial close. Moody's argues that the initial three-year period of higher marginal default rates is strongly associated with construction-phase risk and/or the commencement and ramp-up of operations, while the improvement in marginal default rates is associated with the maturity of project operations.

It is interesting to note that Middle East had the lowest cumulative default rate at 1.05% followed by Africa at 2.18%. Using both the Basel II (BII) Moody's (MDY) definitions, Africa has the lowest cumulative default rate at 0.79% followed by Middle East at 1.05%. However, it can be argued that these two regions represent a small share of the study data set, accounting for 4.7% and 3.5% respectively.

Looking at the recovery rates, we see that the average recovery rate for Ultimate Recoveries of 80.3% (BII) and 77.3% (MDY) exceeds the average recovery rate for Distressed Sales of 50.3% (BII) and 47.4% (MDY). The majority of Ultimate Recoveries, 65.1% (BII) and 62.3% (MDY), were fully restructured or repaid with no economic loss calculated on a Net Present Value basis.

Figure 10: Distribution of Recovery Rates (BII)



Source: Moody's Investor Services 2015

The Study Data Set also includes a substantial number of Ultimate Recoveries within the 0%-24% range which points to a bimodal distribution of recovery rates which has also been observed as a feature of corporate loan ultimate recoveries.

One can draw three conclusions from the above. Firstly, project finance debt is just as risky as corporate debt. Secondly, although the cumulative default rates for project finance debt is higher than for investment grade rated corporate debt (Baa), the marginal annual default rates trend towards marginal default rates consistent with single-A category ratings in the long-term. Lastly, the ultimate recovery rates for project finance bank loans are similar to ultimate recovery rates for senior secured corporate bank loans. This is despite the distinct characteristics such as high leverage and long-tenor found in project finance loans, but generally associated with higher risk corporate loans.

CHAPTER 5: OVERVIEW OF THE LEGAL AND REGULATORY ENVIRONMENT IN SOUTH AFRICA REGARDING PROJECT BONDS

5.1 Introduction

The protection of property rights is one of the most important factors that investors and lenders consider when investing and lending abroad. The risk of governments expropriating assets or choosing to default on loan obligations plays a crucial role in project finance and infrastructure finance. Unlike other investments, infrastructure assets are physical and immobile and because they are complicated assets, they are also illiquid. Because lenders have limited or no recourse to the project's shareholders, they prefer to lend to projects located in countries where property rights are clearly defined, respected and well protected. Investors also consider a country's legal institutions, law enforcement agencies, their government's ability to pay and its credit rating (provided by the credit rating agencies) when making investment decisions.

Infrastructure is highly regulated by the government which results in them interfering with its returns. In a survey conducted by Allen & Overy (2009) amongst different investors, 95% of the respondents believed that a robust rule of law was very important when deciding which country to invest in and 92% of the respondents believed that the attractiveness of the regulatory environment was very important.

The findings by Allen & Overy (2009) are consistent with the findings of the MIGA-EIU Political Risk Survey conducted amongst global investors. In the MIGA (2013) survey it was found that breach of contract and regulatory issues remain the most important for investors.

The OECD (2014) argues that governments need to provide mechanisms to assist with more favourable regulatory conditions for investment in order to catalyse institutional investment in infrastructure.

Mezui and Hundal (2013) found that many of the variables required for infrastructure project bond issuances are present in Sub-Saharan Africa, but more needs to be done to make it attractive for sponsors to tap into local markets. A crucial barrier in African markets is the enabling environment for infrastructure. The regulatory and tariff framework in many sectors is incomplete. Many countries have established PPP laws and institutions, but they lack the resources and capabilities to prepare bankable projects for the market.

In this chapter we assess South Africa's legal and regulatory environment to determine whether it provides enough protection to foreign investors who are needed to support the country's infrastructure investment needs and project bond market. We will analyse the South African Constitution and the protection of property rights; we will look at Bilateral Investment Treaties (BITs) the country signed with major investment partners and the protection they provided to foreign investors; we will analyse the Promotion and Protection of Investment Bill, which looks to replace Bilateral Investment Treaties; and we will conclude the section by analysing the Infrastructure Development Act.

5.2 Protection of Property Rights

In South Africa, the protection of property rights is enshrined in the country's Constitution, which is the supreme law of the land and cannot be superseded by any other law of government. Section 25 of the Constitution states: "No one may be

deprived of property except in terms of law of general application, and no law may permit arbitrary deprivation of property. Property may be expropriated only in terms of law of general application – (a) for a public purpose of public interest; and subject to compensation, the amount of which and the time and manner of payment of which have either been agreed to by those affected or decided or approved by a court”. Section 25 further states that “the amount of compensation and the time and manner of payment must be just and equitable” (The Constitution Of The Republic Of South Africa, 1996).

The South African Constitution therefore makes it difficult for the state to expropriate any private property unless it is in the public’s interest and most importantly, the owners of the property must be justly compensated for their property. This is very important, as investment in infrastructure assets often reaches billions of dollars and investors and lenders look to the project to as the only source of cash flows used to service borrowings. If there is any risk that a government may expropriate assets, then countries will struggle to attract the required investment into their infrastructure projects. Under the South African constitution, property rights are well protected.

South Africa has an independent judiciary whose primary objective is to protect the Constitution of the country. Section 165 (1) – (3), (5) of the South African Constitution states: “The judicial authority of the Republic is vested in the courts. The courts are independent and subject only to the Constitution and the law, which they must apply impartially and without fear, favour or prejudice. No person or organ of state may interfere with the functioning of the courts. An order or decision issued by a court binds all persons to whom and organs of state to which it applies” (The Constitution Of The Republic Of South Africa, 1996).

South African common law, local legislation and the South African Constitution provide equal protection to local and foreign investors. They have access to the same law enforcement agencies and legal institutions. Most importantly, investors are able to take the South African government and government owned corporations to court and any decision of the court is binding on them as well. Government does not receive any special treatment and is bound by the decisions of the court.

The World Economic Forum's Global Competitiveness Report 2014 – 2015 ranks South Africa 56th out of 144 countries in terms of competitiveness. Although the rating appears to be average, the country does well on measures of the quality of its institutions (36th), including intellectual property protection (22nd), property rights (20th), the efficiency of its legal framework in challenging and settling disputes (9th and 15th, respectively), and its top-notch accountability of private institutions (2nd). Furthermore, South Africa's financial market development remains impressive in 7th place. The country remains very strong in the protection of property rights, ranking well above developed countries such as Australia (20th); France (21st); Belgium (24th); and the United States (25th).

Investors are well protected under the South African Constitution and they enjoy the same rights and protection as local investors. To date South Africa has not been involved in any expropriation of assets and foreign investor confidence remains high as the country remains the largest beneficiary of Foreign Direct Investment (FDI) in the African continent. As reported by UNCTAD (2015), between 2009 and 2014, South Africa continued to receive the largest share of FDI inflows into Africa. This evidences

the strength of our institutions compared to rest of Africa and reinforces the confidence that investors have on the quality of our institutions and protection of their rights.

5.3 Bilateral Investment Treaties

South Africa's Bilateral Investment Treaties (BITs), as is common with other countries, seek to give foreign investors certain well-established protections and assurances in order to promote foreign investment in the economy including assurances as to expropriation (and compensation where it does occur), security, repatriation of capital and income from investments, equality of treatment with domestic investors and international arbitration of disputes.

Immediately into the post-apartheid period (1994-1998), South Africa entered into 15 BITs, mostly with European countries. In total South has entered into 47 BITs, although not all of them are in effect. In respect of the top 10 foreign investor countries in South Africa, seven BITs have been entered into.

In 2010 the South African government conducted a review of its BIT obligations. According to Lang (2013) the review found that the BITs were allegedly skewed towards investors and that certain aspects of its BITs were incompatible with the Constitution and other South African laws.

This led to a decision by the South African cabinet in July 2010 to develop a new investment act to codify typical BIT provisions into domestic law, and strengthen investor protection; terminate first-generation BITs and offer partners the possibility of renegotiating; and refrain from entering into BITs in the future, unless there are

compelling economic and political reasons for doing so. At the beginning of October 2012, South Africa cancelled its BITs with Belgium–Luxembourg, Spain, Germany, Switzerland, the Netherlands and Denmark. Kron and Clark (2015) state that South Africa will soon be cancelling its remaining European BITs.

According to the Financial Times (2012), the BITs were signed in haste, as the country was trying to stimulate foreign investment post-apartheid and BITs were a quick way of doing this. However, when government implemented policies such as BEE, they were found to be in conflict with some conditions contained in the BITs. In 2007, Italian and Luxembourg investors filed a claim arguing that South Africa's 2002 Minerals and Petroleum Resources Development Act (MPRDA) contained provisions that amounted to expropriation of their mineral rights, violating the BITs South Africa had signed with both countries.

South Africa is looking to replace the BITs with the Promotion and Protection of Investment Bill which seeks to promote investments and clarify the level of protection that an investor may expect in South Africa and ensure that the country remains open to foreign investment. The intention is that foreign investments will in future be protected through domestic legislation.

The obvious advantage with BITs is that they directly address investors' concerns on risk and provide a binding agreement for South Africa to protect foreign investors. BITs are signed between two countries and they address key issues such taxes, expropriation, and settlement of disputes. The Promotion and Protection of Investment Bill will not achieve the same objectives, as it will be a general legislation that protects foreign

investors. It is likely to offer less protection than BITs, as it will not be “tailor” designed to the needs of the investor and investee country. Project bonds would have benefited from BITs as it would have eliminated the need to reassure investors that their investments are safe in South Africa and they would continue to receive preferential treatment. BITs were custom designed and addressed specific needs of both the parties. With the removal of BITs, extra work will now go into signaling to investors that foreign investment is safe in South Africa.

According to Woolfrey (2012), a large body of literature has failed to demonstrate a consistent and positive relationship between BITs and inward FDI, with the results ambiguous at best. Brazil provides further evidence of this ambiguity, as it has become a major recipient of global FDI flows, while refraining from the use of BITs.

While BITs are more preferred from an investor perspective, they need to be aligned to South Africa's regulations(s) and developmental goals. It is also important that country urgently addresses any conflicts in their policies and regulations. This will aid in avoiding arbitrations such as those caused by the MRDA. It is important that the country has clear and coherent policies and legislation that are in line with global standards and ensure the protection of investors both local and foreign.

5.4 Promotion and Protection of Investment Bill

The Bill is intended to replace Bilateral Investment Treaties (BITs) resulting in one domestic legislation that defines the protection that is offered to foreign investors in South Africa. Historically, South Africa has had BITs in place with an estimated 45

countries, which served as an agreement between South Africa and investor countries on the protection and rights they would be afforded as foreign investors in South Africa.

Among other things, the purpose of the Bill is to: “promote and protect investment in line with and subject to the Constitution, in a manner which balances the public interest and the rights and obligations of investors; confirm the protection of an investment in respect of national treatment and the security of an investment; and affirm the Republic’s sovereign right to regulate investments” (Ministry of Trade and Industry, 2015).

The Bill has received a lot of criticism from local and foreign market participants who believe that it does not provide sufficient protection to foreign investors, and foreign investors, by virtue of being non-citizens of South Africa, do not enjoy the same privileges as South African citizens. This is expected to have a negative effect on foreign investment in the country.

Feris (2014) states that the major concerns that have been raised by the local and foreign business community include: the expropriation provisions in the Bill are not similar to traditional BITs; there is concern regarding whether the regulation of national treatment as an investment protection principle for foreign investors goes far enough in the revised Bill; and the dispute resolutions provisions determine that local remedies in local courts must first be exhausted before the government may consent to international arbitration, which was not a requirement in the BITs.

There are several uncertainties that stand out when one analyses the Bill. Firstly, Section 6 states foreign investors will not be treated less favourably than local investors “in their business operations that are in like circumstances”. Essentially this means that foreign investors may be discriminated against if there are no “like circumstances”. Like circumstances have been vaguely defined as a “requirement for an overall examination on a case-by-case basis of all the terms of a foreign investment” - including the effect of the investment on South Africa, the sector and the “aim of any measure relating to foreign investments”. This is likely to cause a lot of uncertainty, as the case-by-case basis will be subject a lot of interpretation and it is unlikely that there is precedent case law.

Secondly, BITs allowed for foreign investors to refer an investment dispute with a government to international arbitration. However, as per Section 11 of the Bill, there is no provision allowing foreign (and local) investors to refer disputes to international arbitration. The Bill does not prohibit this but the government’s consent will now be required and we do not expect government to freely grant such permission as it may be viewed as undermining the sovereignty of South Africa and its legal system. The critical difference between the Bill and BITs means that disputes will now be determined under South African law, rather than international law. This may pose a major challenge for project and infrastructure finance as many legal agreements are typically signed under English and New York Law, due to the majority of the lenders and contractors being domiciled in those regions and having a strong preference for English and New York law. It may prove difficult to enforce English and New York Law in South African courts.

While this may have serious implications for investment in South Africa, the country has competent law enforcement agencies, a strong and independent judiciary and courts are freely accessible, although it can be a very expensive process. Private participants are free to take the South African government and its institutions to court without any prejudice, and many of them have in the past. South Africa is also signatory to many international treaties and is a member of international bodies such as BRICS, G20, United Nations Security Council, World Trade Organization, World Bank Group and the International Monetary Fund. Therefore the country has an obligation to maintain world-class institutions (legal) and protect local and international economic participants given its role in the global community.

Lastly, Section 8 of the Bill stipulates that an investment may be expropriated in accordance with the South African Constitution as described earlier. However the major change that comes with the Bill is that in the BITs and under international customary law, compensation is equal to the market value of the investment. The Bill states that the market value of the investment is just one factor to be taken into account; other factors include the current use of the investment, the history of its acquisition and the use and purpose of the expropriation. This definition of compensation is narrow and will cause further upset with investors, as they are no longer guaranteed the market value of their investments in the event of expropriation. The definition is not clear as to how investors will be compensated leaving it open to the courts to decide which compensation method is appropriate which will lead to many inconsistencies, especially in the absence of precedent case law.

Many argue that the Bill will scare away foreign investment in the country as it does not provide adequate protect to foreign investors. This could be a serious blow to attracting foreign investment in South Africa and launching project bonds to drive investment in South Africa's infrastructure.

The European Chamber of Commerce and Industry (2015) submitted several concerns to South Africa's Portfolio Committee on Trade and Industry on the Bill. Firstly, the recent withdrawal of South Africa's BITs has sent a negative message to the EU business community regarding the long-term standard of protection of investment in the country. As a result, this has increased the cost of doing business in South Africa where an increased (risk insurance) premium is associated with investing in countries where no BITs are in place.

Secondly, they are concerned that security provided to investments is insufficient. They argue that the obligations of the government are vague and it is not clear what protections investors will be entitled to. Lastly, they remain very concerned about the exclusion of international investor-state dispute settlement as the bill favoured local remedies, and they argue that because the dispute will be with the state, the mediator should be an independent structure and/or independent and neutral individual. While independence is important in arbitration matters, there is clear evidence that the South Africa judiciary is independent and free from government influence. We have seen many cases involving the South African government and private enterprises where the government has lost and has had to obey the rulings of the court.

The American Chamber of Commerce (2015) highlighted three concerns regarding the bill: firstly, under the Bill investors cannot expect compensation that is “fair”; secondly, fair and equitable treatment is not evident in the bill; and lastly, the promotion of investment is not evidenced anywhere in the bill.

The concerns are valid; the Bill does not offer the same investor protection that BITs have historically offered to foreign investors. There are also uncertainties regarding the definition of compensation in the event of expropriation, making it unclear as to whether investors will receive the market value of their investment or an amount determined by the courts and exactly what mechanism they will use.

South Africa is home to many multinational companies who employ many South Africans and have made significant investments in the country. The government has also entered into many Public-Private Partnerships including the Gautrain, N3 Toll Road, SANParks Concessions and the Chapman's Peak Toll Road, with local and international investors. It is also seeking private investment for its power sector through its Renewable Energy Independent Power Producer Programme (REIPP). The government is dedicated to attracting and retaining foreign investment in the country. With the introduction of the Bill, more work from government will be required to show that it does promote investment and investor protection.

In order to continue attracting FDI, it is important that investors are certain that their assets are safe and that they will receive a return on their investment. In a time when the country is going through many challenges and requires external funding for its infrastructure projects, it is important that government sends a strong signal to show

that foreign investments are safe in the country. There is a need for clear legislation that provides comfort to foreign investors. If project bonds are to be successful in South Africa, the assets they are used to finance must be secure as they are the only source of repayment.

5.5 Infrastructure Development Act

The Infrastructure Development Act introduced by the Ministry of Economic Development (2014) aims to ensure that infrastructure development in the South Africa is given priority in planning, approval and implementation and to improve the management of such infrastructure during all life-cycle phases.

The act is intended to reduce bureaucracy associated with infrastructure development, so as to prioritise and speed up infrastructure rollout in South Africa. Eighteen Special Integrated Projects (SIPs) were identified in the country's Infrastructure Development Plan. The SIPs include infrastructure projects aimed at fast tracking growth and development in South Africa. The identified projects will provide new infrastructure, assist in rehabilitating and upgrading existing infrastructure and will play a critical role in facilitating the regional integration for African co-operation and economic development on the African continent.

The Act provides for the Presidential Infrastructure Coordination Committee to expropriate land, in terms of the Expropriation Act, for the purposes of implementing a SIP, and it provides compulsory timelines for the implementation of the SIPs according to the Ministry of Economic Development (2014). The Act will also set timeframes for the approval of regulatory decisions affecting the implementation of

infrastructure projects. Instead of sequential approval processes, it provides for processes to run concurrently wherever possible.

The Department of Environmental Affairs recently established a special unit to facilitate the speedy processing of environmental authorisation for the SIPs. Environmental Affairs, Water Affairs and the Department of Mineral Resources have developed an integrated licensing regime for mining, which will also affect all other development applications.

Accountability is a prominent feature in the Act. The Act also establishes a Secretariat, which is primarily tasked with coordinating the implementation of any SIP by appointing members to a Steering Committee established for each SIP. The committee will report on a monthly basis to the Secretariat, providing progress on all phases of the planning, development and implementation of a strategic integrated project. The committees will also be responsible for identifying requirements for swift and effective implementation of their individual SIPs; identify challenges presented by the strategic integrated project that will impede or delay the implementation of the project, and identify associated remedial actions required. In addition, the committees must, without delay, report to the Secretariat the outcomes of all applications for approvals, authorisations, licences, permissions and exemptions.

It is evident that the South African government is dedicated to the development of its infrastructure and much work has been done on the regulatory side to speed up the pace of infrastructure development. However, regulation alone will have little effect if the

institutions and political will are not there to support the country's infrastructure development.

Although the South African legal system and its institutions are credible and highly regarded, it is evident that more work will be required to reassure foreign investors that they will be treated the same as local investors and that government is committed to protecting their investments. A lot of work has gone into developing this country, and it is important to recognise that if government began to expropriate assets, this would take the country many steps backwards. Foreign and local investors remain confident, hence their continued commitment to continue investing in South Africa. In February 2015 BP announced a R4.7bn investment; in August 2015 VW announced a R4.5bn investment in a new plant (Allix, 20); and in September 2015 Sasol announced CAPEX of ZAR34bn between 2016 and 2017.

CHAPTER 6:

METHODOLOGY FOR THE REGRESSION ANALYSIS OF THE DETERMINANTS OF AT-ISSUE SPREADS FOR PROJECT BONDS

6.1 Introduction

In this chapter we conduct an econometric analysis to determine the drivers of at-issue spreads for project bonds. The cost of international bond financing for infrastructure projects in developing countries is a key determinant of their tariff structure and, hence, economic viability according to Hauswald and Dailami (2003). While certain factors such as tenor, amount, credit rating, coupon and security would ordinarily determine the spread, there are other factors that are strongly considered by investors which include, the quality of the host country's legal framework, the quality of their institutions and the macroeconomic environment.

Hauswald and Dailami (2003) find that for infrastructure projects located in developing countries looking to source financing from off-shore markets, the ability to design and enforce solid bond covenants to protect the interest of bondholders is a critical success factor. However, given the complexity of infrastructure project finance transactions, which involve multiple contracting stakeholders and complicated legal agreements, compounded by institutional voids and a weak rule of law, this is rendered a difficult task.

The results of our econometric analysis show that there is a clear relationship between at-issue spreads and the legal and institutional environment; the perception of corruption in the country; and the protection of property rights in the host country. Our results also show that investors strongly consider the macroeconomic environment of

the host country when pricing project bonds. When analysing our sample of project bonds, we find that developing country project bonds tend to have a lower credit rating, stricter covenants, and significantly higher at-issue spreads.

Our results also show that the inflation rate, GDP rate and country risk measured using the sovereign 5-year credit default spread at the time of issuance (month when the bond is issued) are all significant factors in the pricing of project bonds.

6.2 The model specification

6.2.1 Variables

To analyse at-issue spreads, we used project bonds issued between January 2009 and June 2015, which we obtained from Dealogic. There was missing data on certain variables due to the fact that some bonds are issued via private placements where disclosure is limited, unlike listed bonds where most information relating to the bond is public. Many of the bonds were also local currency bonds, which are rarely rated by the rating agencies. We then used Bloomberg and Thompson Reuters to obtain the missing data and to source additional information such as the structure of the bonds (secured or unsecured). We dropped all bonds where we could not find additional information. Furthermore, we only selected US dollar denominated bonds.

For the Inflation and GDP rates, we used World Bank data. The World Bank provides annual data, which we assumed to be the prevailing average inflation and GDP rates when the bonds were issued.

To measure country risk, we used the prevailing 5-year sovereign credit default spread (CDS) on the month of issuance, instead of the sovereign credit rating. Most researchers use the sovereign credit ratings (provided by Standard & Poor's, Moody's and Fitch) when measuring sovereign risk. The challenge with credit ratings is that they do not reflect the most recent information regarding sovereign risk and they do not reflect the market's perception on sovereign risk at a particular point in time. Sovereign credit default spreads, on the other hand, are traded instruments and they update immediately when new information regarding an economy becomes available. They reflect the changing market perception of sovereign risk as new information becomes available. The credit default spread information was obtained using the Bloomberg CDS Explorer available from the Bloomberg terminal.

For project bond credit ratings we used Standard & Poor's (S&P) credit rating assigned to each individual project bond. This was obtained from Dealogic and Bloomberg. In cases where there was no S&P rating but a Moody's rating, we converted the Moody's rating to the S&P (see Table 6 in Appendix). Standard & Poor's assigns a value corresponding to each credit rating. The highest credit rating, AAA, is assigned a value of 21 and the lowest credit rating, SD/D, is assigned the value 1. We then converted the credit ratings to their corresponding values.

We used the International Country Risk Guide compiled by the Political Risk Services Group (PRS) to obtain country scores for legal and regulatory indicators. These include: Voice and Accountability; Political Stability and Absence of Violence; Government Effectiveness; Regulatory Quality; Rule of Law; and Control of Corruption. These scores range between 0-1, where 1 is the highest score a country can receive.

6.2.2 The model

To analyse the determinants of at-issue spreads for project bonds, we relate the spreads charged over the US Treasuries to the underlying bond information (amount, tenor, credit rating); host country economic indicators (inflation rate, GDP rate, exchange rate, sovereign risk); structure variable (secured or unsecured); and a set of variables measuring the quality of the host country's legal, regulatory and political environment.

We estimate the following linear cross-sectional model of project bond at-issue spreads using Ordinary Least Squares (OLS) regression:

$$\begin{aligned} Spread = \beta_0 + \sum \beta_k Issue_{ki} + \sum \beta_k Structure_{ki} + \sum \beta_k Econ_{ki} \\ + \sum \beta_k Inst_{ki} + \epsilon_i + \mu_i \end{aligned} \quad (3)$$

Where *Spread* is the at-issue spread over US Treasuries, *Issue* captures the relevant bond issue information, *Structure* refers to whether the bond is secured or unsecured, *Econ* measures the host country's key economic indicators and *Inst* provides scores for several institutional and regulatory variables.

Wooldridge (2009) provides five assumptions that are necessary to derive and use the OLS estimators from our regression. If these assumptions are satisfied, the alphas and betas of our OLS estimators are referred to as being BLUE – best linear unbiased estimators. Best linear unbiased estimators means: best – the variance of the OLS estimators is minimal, smaller than the variance of any other estimator; linear – if the relations is not linear – OLS is not applicable; and unbiased – the expected values of

the estimated beta and alpha equals the true values describing the relationship between x and y.

The five OLS assumptions can be described as follows:

1. Linear in parameters – The dependent variable y is a linear function of a set of independent variables and a random error term.
2. Random sample of n Observations – The sample comprises of n -paired observations that have been randomly drawn from the population $\{y_i: x_{2i}, x_{3i}, \dots x_{ki}\}$; the number of observations is greater than the number of parameters to be, $n > k$; the independent variables are non-stochastic, whose values are fixed.
3. Zero conditional mean – the mean of the error terms has an expected value of zero, given values for the independent variables $E(U|X) = 0$
4. No perfect collinearity – there exists no linear relationship between the independent variables. None of the independent variables, other than the variable associated with the intercept term, can be a constant.
5. Homoskedasticity – The error terms all have the same variance and are not correlated with each other. In other words, the error terms are independent and identically distributed $var(\mu_i|X) = \sigma^2$ and $cov(u_i u_j | X) = 0$ for $i \neq j$

Combining the Gauss-Markov theorem with the unbiased property produces two desirable properties of the OLS estimator: unbiasedness and efficiency. The Gauss-Markov theorem provides a very strong motivation to use OLS – it is unbiased and has a minimum variance within the class of unbiased and linear in Y estimators. OLS

estimators have the minimum mean squared error among unbiased linear in Y estimators.

With cross-sectional data we can use OLS to study the relationship between the at-issue spreads and our independent variables. Cross-sectional analysis is different to panel data analysis or time series data. According to Wooldridge (2009), a cross-sectional data set consists of a sample of individuals, households, firms, cities, states, countries, or a variety of other units taken at a given point. An important feature of cross-sectional data is that we can often assume that they have been obtained by random sampling from the underlying population.

Time series data consists of observations on a variable or several variables over time, while panel data consists of a time series for each cross-sectional member in the data set. With cross-sectional data, the same cross-sectional units are followed over a given time period.

In our study, we are not observing our sample of project bonds over time, hence the reason we have used cross-sectional data. We are interested in the once-off at-issue price that is demanded by investors at the time the bonds are issued. The aim is to understand the factors that investors take into consideration when pricing the project bonds at the moment they are issued to the market. This will enable us to understand the critical factors that project sponsors need to consider before approaching the capital markets with project bonds so as to attract a good price for their bonds.

6.3 A priori expectations

A priori			
Variable	expectation	Justification	Research Support
Economic Indicators			
GDP	- (negative)	We expect project bonds issued by countries with high GDP growth rates to have lower issuance spreads as the project is expected to generate high cash flows due to high economic activity	Mayberger (2014); Tang and Yan(2006); Rowland and Torres (2004)
Inflation	+ (positive)	High inflation reduces the purchasing power of the bond's interest income and principal. Therefore higher inflation leads to a higher spread	Kang and Pfluenger (2012); Deliandis and Geske (2001)
Sovereign risk	+ (positive)	High sovereign risk indicates increased probability of default which collapses a country's entire economy. Therefore higher sovereign risk commands a higher spread to compensate investors for taking additional risk	Alonso, Arghyrou and Kontonikas (2015); Mayberger (2014); Nieto, Novales, and Rubio (2013); Dailami and Hauswald (2003)
Exchange Rate	+ (positive)	A rising exchange increases a country's exposure foreign debt debt. The country may not be able to service the foreign (dollar) debt in future which increases the risk for investors and leads to a higher spread.	Alonso, Arghyrou, and Kontonikas (2015); Delikouras, Dittmar and Li (2014)

Institutional Indicators			
Voice and Accountability	- (negative)	Increased democracy and accountability will lead to lower spreads. It tells investors that leaders cannot do as they please and they can be held accountable for their actions	Yue and Jahjah (2004); AFDB (2013)
Political Stability	- (negative)	Political instability leads to economic instability and can collapse a countries political and economic systems. Therefore the more politically stable a country is, the lower the spread demanded by investors	Dailami and Hauswald (2003); AFDB (2013)
Government Effectiveness	- (negative)	The less bureaucracy a country has, the likelier that projects will be completed on time and will not experience any government approval delays. Therefore the lower the spread.	Dailami and Hauswald (2003)
Regulatory Quality	- (negative)	High regulatory quality means that investments are safe and investors are able to realise a return on the appropriate return on their investments. If a country's regulatory environment is sound, then investors will demand a lower spread	Dailami and Hauswald (2003)
Rule of Law	- (negative)	The protection of investor rights and well-functioning legal institutions are important for attracting investment. Projects situated in countries with well-defined property rights and functioning legal institutions will attract a lower spread.	Dailami and Hauswald (2003)

Control of Corruption	- (negative)	Investors need to be certain that their investment will go towards specific projects and will not be misused by the borrowers. The tougher a host country is on corruption, the lower the spread demanded by lenders.	Dailami and Hauswald (2003)
Bond Characteristics			
Amount	- (negative)	The higher the amount, the more liquid the issuance	Fenn (2000); Helwege, Diaz and Navarro (2002); Huang and Wang (2013)
Tenor	+ (positive)	A longer tenor exposes investors to increased default and rate interest risk. They will demand a higher spread for taking on that risk	Mayberger (2014); Dailami and Hauswald (2003); Eichengreen and Mody (1998); Amihud and Mendleson (1991)
Coupon	+(positive)	The higher the coupon (the more interest bondholders have to pay on the coupon payments. Higher coupons are also associated with premium bonds, where coupon > yield and investors would demand a higher spread	Wang, Wu and Zhang (2008); Edelberg (2014)
Credit Rating	- (negative)	Investment grade rated bonds will have a lower spread than non-investment grade rated bonds. As the rating increases, the spread decreases because the (default) risk falls	Dailami and Hauswald (2003); Gabbi and Sironi (2002); Eichengreen and Mody (1998)
Security	- (negative)	Secured bonds should have a lower spread than unsecured bonds as the security gives investors a second way out. Unsecured bonds have a higher default rate than secured bonds	Bonfim and Santos (2004); Gabbi and Sironi (2002)

6.4 Variable definitions

The table below provides definitions for the variables we used in our econometric analysis and data source for each of our variables.

Table 4: Variable definitions and labels

Label	Variable	Definitions	Source
Economic Indicators			
GDP Rate	gdp	Annual % GDP, observed in a bond's year of issuance	The World Bank
Inflation Rate	inflation	Annual % change in inflation observed in a bond's year of issuance	The World Bank
Sovereign risk	cds_5year	5-year Sovereign Credit Default Spread observed in a bond's month of issuance	Bloomberg
Exchange Rate	exchange_rate	Official exchange rate (LCU per US\$, period average) observed in a bond's year of issuance	The World Bank
Institutional Indicators			
Voice and Accountability	accountability	Military in politics; and Democratic accountability observed in a bond's year of issuance	Political Risk Services
Political Stability	atability	Government stability; Internal conflict; Internal conflict; Ethnic tensions observed in a bonds year of issuance	Political Risk Services
Government Effectiveness	effectiveness	Bureaucratic quality observed in a bond's year of issuance	Political Risk Services
Regulatory Quality	eegulation	Investment profile observed in a bond's year of issuance	Political Risk Services
Rule of Law	law	Law and order observed in a bond's year of issuance	Political Risk Services
Control of Corruption	Corruption	Corruption observed in a bond's year of issuance	Political Risk Services
Bond Characteristics			
Amount	amount	Size of the bond, observed on each individual bond	Dealogic/Bloomberg
Tenor	tenor	Length of time until maturity which is the difference between issue date and maturity date, observed on each individual bond	Dealogic/Bloomberg
Coupon	Coupon	Interest payment that investors receive on the bond, observed on each individual bond	Dealogic/Bloomberg

Credit Rating	sp_rating	Standard & Poor's assigned rating, observed on each individual bond	Dealogic/Bloomberg
At-issue Spread	Spread	Issuance spread on each individual bond	Dealogic/Bloomberg
Structure	Secured	Dummy variable differentiating between Secured and senior unsecured bonds	Dealogic/Bloomberg

6.5 Results

The below table presents the results of our regression. The confidence interval has been excluded but is available in Figure 13 in the Appendix. We have used the 95% confidence level in our regression. Therefore, in interpreting our results, variables with $p < 0.05$ will be considered as significant and have an influence on at-issue spreads for project bonds. While some variables may not be significant from this regression, they can still be considered as important, based on previous empirical studies.

Table 5: Regression results

At-Issue Spread	Coef.	Std. Err	t	P> t
Constant	-7.696	4.345	0.49	0.093
Amount	0.000	0.000	-2.37	0.633
Tenor	-0.080	0.033	-2.37	0.028
Coupon	0.565	0.160	3.52	0.002
S&P Rating	-0.152	0.067	-2.27	0.035
CDS_5year	2.079	0.578	3.60	0.002
Exchange Rate	0.000	0.000	0.60	0.553
Inflation Rate	0.233	0.186	1.25	0.226
GDP Rate	-0.122	0.072	-1.69	0.108
Accountability	1.112	0.875	1.28	0.217
Stability	0.784	3.807	0.21	0.839
Effectiveness	-1.479	4.236	-0.35	0.731
Regulation	14.469	4.739	3.05	0.007
Law	-2.984	1.008	-2.96	0,008
Corruption	-3.380	1.528	-2.21	0,004
Secured	1,442	4.345	2.29	0,033

From the above we are able to draw several conclusions. Firstly, we see that the prevailing host country's institutional environment is a very important consideration for investors when it comes to determining a project bond's price. These variables have the largest and statistically most significant effect. An increase or improvement in Corruption Control and the Rule of Law has a significant decrease on at issue margins. An increase of 1 percent in Corruption Control and the Rule of Law decreases the bond margin by 3.38% and 2.98% respectively. These results reiterate the importance of the legal environment and institutions in order to access international financing, first pointed by La Porta et al. (1997 and 1998).

Using a country's character of legal rules and quality of law enforcement, La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997) found that countries with poorer investor protections also have smaller and narrower debt and equity capital markets.

Modigliani and Perotti (1998) also find correlation between investor protection and the development of security markets. They argue that the legal environment will influence the firm's choice between financing using debt capital markets or equity capital markets.

Our results also show that the influence of the host country's sovereign risk, as measured by the 5-year credit default spread (CDS) on the month of issuance of the bond, is large and statistically significant. A 1% increase in the CDS increases at-issue spreads by 2.07%. Credit default spreads are an indicator of the market's current perception of sovereign risk, taking into consideration not only the sovereign credit rating but key economic indicators such as GDP growth, inflation, interest rates, fiscal

and monetary policy. Unlike credit ratings, which can be considered as lagged variables, the CDS variable reflects the market's current view on sovereign risk.

In South Africa, sovereign risk appears to be the single most important determinant of corporate default premia according to research by Peter and Grandes (2005). Dailami (2010) found that sovereign risk measured using sovereign credit default spreads is positive and statistically significant in determining private corporate bond at-issue spreads in emerging market economies. Bocola (2014) found that an increase in the widening of credit default spreads (i.e. an increase) promotes the required premia demanded by banks for lending to the productive sector because this activity has become riskier.

We also find the credit rating of the bond to be statistically significant where a point increase in the credit rating (as per the S&P rating scale in Table 7 in the Appendix) decreases the at-issue spread by 0.15%. This implies that the higher the credit rating of the bond, the lower the at-issue spread demanded by investors. Higher rated bonds have a lower probability of default and are therefore less risky than bonds with a lower rating. Our results are similar to those of Sorge and Gadanez (2004) who find that bond ratings corresponding to higher credit quality are significantly associated with lower spreads, with the magnitude of the discount diminishing as one goes down the rating scale. Bonds with below investment grade ratings, CCC and D, were found to be characterized by wider spreads.

Our results also show that the coupon is a significant determinant of project bond at-issue spreads, where a 1% increase in the coupon increases the spread by 0.533% (53.3

basis points). While a higher coupon should be associated with a lower spread, it can be argued that since we have used only fixed-rate bonds, investors demand a higher margin since they will lose out in the event of high interest rates, where only floating-rate bond investors benefit since the coupon rate adjusts with changes in the interest rate.

We also find tenor to be statistically significant, but the relationship is negative, where an increase in the tenor of the bond by 1 year, decreases the spread by 0,088%. Our results differ from Hauswald and Dailami (2003) who find a positive but statistically insignificant relationship ($p = 0.0535$). One possible reason for our results could be that our sample of bonds, the spreads on comparable US Treasuries were rising more than the spreads on project bonds resulting in narrower spreads.

Lastly, we find that there is a positive and statistically significant relationship between our dummy variable, Secured, which tests for the difference in effect between unsecured and secured bonds on the at-issue spread. Our results indicate that Secured bonds have at-issue spreads that are 1.5% larger than at-issue spreads for unsecured bonds. This result differs with our a priori expectation, since unsecured lenders ultimately have no security should the project fail or be unable to repay bond investors. Secured investors have a second way out (the security) in the event of default and therefore should charge a lower spread. One reason for this result could be that secured bonds are a signal of the riskiness associated with a project and investors demand security as a second way out. If investors do not request security, it could mean they are comfortable with the project, which also feeds into the pricing of the bonds.

Our results highlight two important implications for project bonds. Firstly, one cannot rely solely on the characteristics and structure of the bond to obtain attractive pricing from investors. As our results show, fixed income investors not only price in the characteristics of the bond, but also the economic and institutional environment of the host country. The economic and institutional environment are important for the success of the project and its ability to generate sufficient cash flows to repay bond investors. A deterioration in either of these environments affects the financing of future projects and the country's ability to access capital markets funding in both the public and private sector.

Secondly, if countries invest in creating sound and independent economic and regulatory economic, legal and regulatory institutions, they will be able to accelerate their infrastructure development through the capital markets and at reasonable cost. In our sample for example, we see emerging market borrowers issuing bonds for as much as \$1.5bn at spreads of only 3.703% for non-investment grade projects. If we analyse the country's economic and institutional environment for this particular issuer, we see a healthy economic (GDP growth rate is 7.57%, 5-year CDS is 110 basis points) and a strong institutional environment (Voice and Accountability is 0.75, Regulatory Quality is 0.64 and Government Effectiveness is 0.50).

6.6. Regression Diagnostics

We run several diagnostics to assess the validity of our model. If our model satisfies the assumptions, then we have OLS estimators that are BLUE - best linear unbiased estimators.

6.6.1 R-squared (R^2) and adjusted R-squared (\bar{R}^2)

Firstly we look at the R^2 of our model we see that $R^2 = 0.9231$ (Figure 13 in Appendix). This tells us that 92.31% of the variation in our independent variable (at-issue spreads) can be explained by our independent variables. Wooldridge (2009) states that R^2 is the proportion of the explained variation compared to the total variation; thus, it is interpreted as the fraction of the sample variation in y (dependent variable) that is explained x (independent variables). The R^2 summarises how well the OLS regression line fits the data, where $R^2 = 1$ means that OLS provides a perfect fit to the data. A value of R^2 that is close to zero indicates a poor fit of the OLS line – very little of the variation in y_i is captured by the variation in the \hat{y}_i (Wooldridge, 2009). Our R^2 is close to one, which indicates that our independent variables do a good job in explaining the variation in our dependent variable.

One can also look at the adjusted R-squared (\bar{R}^2), known as the corrected R-squared. The primary attractiveness of \bar{R}^2 is that it imposes a penalty for adding additional independent variables to a model. As we are aware, R^2 can never fall when a new independent variable is added to a regression equation because the Sum of Squared Residuals (SSR) never goes up as more independent variables are added. On the other hand, if we add a new independent variable to a regression equation, R-squared increases if, and only if, the t statistic on the new variable is greater than one in absolute value (Wooldridge, 2009). Our regression produces a $\bar{R}^2 = 0.8624$, which is close to 1 indicated that 86.24% of the variation in our independent variable is explained by our dependent variables.

6.6.2 Heteroskedasticity

Wooldridge (2009) states that Heteroskedasticity violates the assumption that all the errors have the same variance. If it occurs this means that different observations' errors have different variances. If we have heteroskedasticity, our OLS estimators are no longer BLUE. In other words, among all the unbiased estimators, OLS does not provide the estimate with the smallest variance.

OLS is no longer optimal in the presence of Heteroskedasticity because it gives equal weight to all observations when, in fact, observations with larger disturbance variance contain less information than observations with smaller disturbance variance. Additionally, the standard errors are biased in the presence of Heteroskedasticity, which leads to bias in test statistics and confidence intervals according to Williams (2015).

We use the Durbin-Watson test to test for the presence of Heteroskedasticity. The Durbin-Watson test assumes that all the error terms are stationary and normally distributed. It tests the null hypothesis H_0 , that the errors are uncorrelated against the alternative hypothesis H_1 , that the errors follow an AR1 process according to Wooldridge (2009). The null and alternate hypothesis can be stated as follows:

$$H_0: \rho_s = 0$$

$$H_1: \rho_s > 0$$

Running the Durbin-Watson test, we get d-statistic of 1.94 (Figure 14 in the Appendix). From our Durbin-Watson table, the critical values corresponding to $n = 35$ and $k = 15$ are $d_L = 0.547$ and $d_U = 2.716$. Since $d = 1.94 > d_L = 0.547$, we fail to reject our null hypothesis and conclude there is no evidence of heteroskedasticity. We also know that if d statistic is close to 2 it indicates no correlation between the errors and, given a

d statistic of 1.94, which is very close to 2, we can conclude that the error terms are uncorrelated

6.6.3 Normality of error terms

According to Wooldridge (2009), the normality assumption assumes that the unobserved error is normally distributed in the population. The normality assumption is very important for hypothesis testing as it assures us that the p-values for the t-tests and F-tests are valid.

Osborne and Waters (2002) state that variables that are not normally distributed variables can distort relationships and significance tests. Outliers can influence both Type I and Type II errors and the overall accuracy of results.

However, we should note that the normality assumption is of primary importance when we have small samples of data. According to Efron and Tibshirani (1986), non-normality of the errors may be addressed by increasing the sample size. Given that our data set is small, it is important that we test for normality. Secondly, normality is not required in order to obtain unbiased estimates of the regression coefficients. OLS regression merely requires that the residuals (errors) be identically and independently distributed.

To test for the normality of the error terms we will use the Shapiro-Wilk Normality test formulated by Shapiro and Wilk (1965). This tests the hypothesis that the data are independent and identically distributed and normal, i.e. $N(\mu, \sigma^2)$ for some unknown real μ and some $\sigma > 0$.

The null hypothesis states that the data are normally distributed and the alternate hypothesis states that the data do not follow a normal distribution. A Shapiro-Wilk statistic (W) close to 1 indicates that the data are perfectly normal.

The results from our Shapiro-Wilk test produce $W = 0.96631$ and $p = 0.35009$ (Figure 15 in the Appendix). We there fail to reject the null hypothesis at the 5% significance level and conclude that there is insufficient evidence against the null hypothesis that the data are normally distributed.

6.6.4 Multicollinearity

Keith (2006) defines multicollinearity as the assumption that the independent variables are uncorrelated. Multicollinearity arises when several independent variables correlate at high levels with each other, or when one independent variable is a near linear combination of other independent variables.

Wooldridge (2009) states that multicollinearity makes it impossible to separate the effects on different independent variables on the dependent variable. Correlation among regressors can lead to large standard errors for the OLS estimates.

Having low collinearity is important because it allows the researcher to correctly interpret regression coefficients as the effects of the independent variables on the dependent variables. This means that we can make inferences about the causes and effects of variables reliably.

We use the Variance Inflation Factor (VIF) test to test for Multicollinearity. As a rule of thumb, if a variable has a VIF greater than 10 and tolerance level less than 0.1, this indicates a high degree of correlation, which is of course problematic.

From our results we see that six out of fifteen variables have a VIF greater than 10 and a tolerance level less than 0.1 (Figure 16 in the Appendix). From the six, three of the variables, namely: Government Effectiveness, Regulatory Quality and Political Stability are closely related and it could be argued that they measure the same thing which could be causing much of the multicollinearity. If we drop Government Effect from the regression equation, this improves the VIF of our other variables and improves the mean VIF from 22 to 7.65, which is reasonable (Figure 17 in the Appendix). We can therefore conclude that majority of the variables are collinear.

6.6.5 Functional form misspecification

In the case where the omitted variable is a function of an explanatory variable in the model, the model suffers from functional form misspecification according to Wooldridge (2009). A multiple regression model suffers from functional form misspecification when it does not correctly account for the relationship between the dependent variable and the observed independent variables.

Wooldridge (2009) argues that, for example, if hourly wage is determined by $\log(wage) = \beta_0 + \beta_1 educ + \beta_2 exper + \beta_3 exper^2 + u$, but we omit the squared experience term, $exper^2$, then we are committing functional form misspecification. This leads to biased estimators of β_0 , β_1 , and β_2 . Therefore, misspecifying how *exper*

affects $\log(wage)$ will generally result in a biased of the return to education, β_1 . The extent of this bias depends on the size of β_3 and the correlation among $educ$, $exper$, and $exper^2$.

It is important to note that although misspecifying the functional form of a model can have serious consequences, in one important respect, the problem is minor. By definition, we have the data on all the important variables for obtaining a functional form relationship that fits the data well. This can be contrasted with the problem where a key variable is omitted, on which we cannot collect data.

We use the linktest developed by Pregibon (1980) to test for model misspecification. The test performs a model specification link test for single-equation models. The linktest is based on the notion that if a regression is properly specified, we should not be able to find any additional independent variables that are significant, except by chance. The linktest creates two new variables, the variable of prediction, $_hat$, and the variable of squared prediction, $_hatsq$.

The model is then refit, using these two variables as predictors; $_hat$ should be significant since it is the predicted value. On the other hand, $_hatsq$ shouldn't be significant because, if our model is specified correctly, the squared predictions should not have much explanatory power. That is, we wouldn't expect $_hatsq$ to be a significant predictor if our model is specified correctly. So we will be paying attention to the p-value for $_hatsq$.

From the linktest we find $\hat{\rho}$ to be significant ($p = 0.004 < p = 0.05$) and more importantly, $\hat{\rho}^2$ is insignificant since $p = 0.130 > p = 0.05$ (Figure 18 in Appendix). In other words, using the linktest, we fail to reject the assumption that our model is correctly specified. Therefore, it appears that we don't have a specification error.

CHAPTER 7:

CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

In this paper we have examined whether South Africa should begin to use project bonds to fund its infrastructure development ambitions. We have shown that the project bond market is a growing market and will become increasingly important in the future as commercial bank lending dries up and becomes increasingly expensive for long-term infrastructure finance.

The paper has also shown that the capital markets are by far the largest source of funding, with bonds dominating debt capital markets lending, accounting for 70% in 2014. Capital markets are therefore able to provide the quantum of funding at the required tenors for infrastructure projects and project sponsors and lead advisors will need to structure projects that are attractive to capital market investors. We also see that on average institutional investors have allocated only 1% of their assets to infrastructure assets; however, there is evidence that indicates that there is much greater appetite for infrastructure assets. Institutional investors are willing to increase their investment in infrastructure but face a shortage of well structure projects.

Project bonds are a viable alternative source of funding, as they are able to meet both the objectives of issuers and investors. They provide access to capital markets, which are deep and liquid; they contain flexible covenants allowing project sponsors more control in the running of the project company and they can be a cheaper source of funding compared to bank loans. We expect bank financing to be even more expensive

in the future as banks implement Basel III with the 2019 deadline fast approaching. Institutional investors benefit from low correlation with other assets, stable and superior risk-adjusted returns, and low default rates.

From a legal and regulatory perspective, more needs to be done by the South African government to reassure investors that their investments are safe. Although the South African Constitution offers equal protection to both local and foreign investors, there are concerns regarding the new Promotion and Protection of Investment Bill, which replaces the Bilateral Investment Treaties, which are preferred by local and foreign investors and stakeholders. Nonetheless, as per the World Economic Forum's Global Competitiveness Report 2014 – 2015, South Africa still does well in the ranking of the quality of its institutions (36th), legal framework (9th) and protection of property rights (20th).

When looking at the determinants of at-issue spreads for project bonds, we see that the host country's institutional, regulatory, and economic environment variables are statistically significant. Unsurprisingly, institutional investors take into consideration those variables when pricing project bonds. Although the project's characteristics (tenor, amount, credit rating etc.) are important determinants of pricing, the performance of a country is equally important to ensure the success of a project.

From a regulatory, institutional, economic and market perspective, South Africa should start using project bonds to fund its infrastructure development. Emerging markets such as Brazil, Peru, Malaysia and Mexico have been successful in using project bonds, even though they face similar challenges as South Africa. The country has the right

ingredients needed to issue project bonds and the benefits to both issuers and investors are clear.

7.2 Recommendations

The study provides an opportunity to conduct future in-depth research on how project bonds can be used to fund infrastructure locally and globally. Future studies should consider the following:

1. Little empirical work has been done in analysing infrastructure as an asset class and its returns compared to the traditional asset classes. Infrastructure could be very attractive to institutional investors if found to provide stable risk-adjusted returns.
2. More work should be done in analysing the role that could be played by both banks and institutional investors in infrastructure financing. Banks have the experience and expertise; institutional investors have the capital required. More cooperation between these institutions could create a large and coordinated project bond market.
3. The determinants of project bond (at issue) spreads remain under analysed. This is an opportunity for future studies to focus solely in studying the determinants of project bond spreads.
4. Future studies could also look at risks associated with project bonds and how these can be mitigated contractually and through financial instruments.
5. It would also be important to look at whether projects bonds are cheaper than bank loans. Ultimately, pricing will be a major factor in driving the growth of the project bond market.

APPENDICES

Table 6: Standard & Poor's and Moody's Risk Ratings

<i>S&P</i>	<i>Moody's</i>
AAA	Aaa
AA+	Aa1
AA	Aa2
AA-	Aa3
A+	A1
A	A2
A-	A3
BBB+	Baa1
BBB	Baa2
BBB-	Baa3
BB+	Ba1
BB	Ba2
BB-	Ba3
B+	B1
B	B2
B-	B3
CCC+	Caa1
CCC	Caa2
CCC-	Caa3
CC+	a1
CC	Ca2

Table 7: Scale of Standard and Poor's foreign currency debt rating

Interpretations	Rating	Assigned Value
<i>Investment-grade ratings</i>		
Highest quality	AAA	21
High quality	AA+	20
	AA	19
	AA-	18
Strong payment capacity	A+	17
	A	16
	A-	15
Adequate Capacity	BBB+	14
	BBB	13
	BBB-	12
<i>Noninvestment-grade ratings</i>		
Likely to fulfill obligations, ongoing uncertainty	BB+	11
	BB	10
	BB-	9
High-risk obligation	B+	8
	B	7
	B-	6
Currently vulnerable nonpayment obligation	CCC+	5
	CCC	4
	CCC-	3
Highly vulnerable to nonpayment	CC/C	2
Default	SD/D	1

Figure 11: Multiple regression results

Dependent Variable: INFRASTRUCTURE

Method: Least Squares

Date: 12/20/15 Time: 15:10

Sample: 2005M01 2014M12

Included observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004093	0.001097	3.731290	0.0003
BMI	0.060474	0.054215	1.115447	0.2670
CORP_BOND	0.082335	0.088787	0.927337	0.3557
GSCI	-0.018944	0.020024	-0.946032	0.3461
REIT	-0.053886	0.033197	-1.623208	0.1073
WGBI	0.026387	0.100501	0.262557	0.7934
R-squared	0.055719	Mean dependent var		0.004630
Adjusted R-squared	0.014304	S.D. dependent var		0.011734
S.E. of regression	0.011649	Akaike info criterion		-6.018433
Sum squared resid	0.015471	Schwarz criterion		-5.879058
Log likelihood	367.1060	Hannan-Quinn criter.		-5.961832
F-statistic	1.345367	Durbin-Watson stat		1.905484
Prob(F-statistic)	0.250387			

Figure 12: Wald Test

Wald Test:

Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	114.9938	(2, 114)	0.0000
Chi-square	229.9876	2	0.0000

Null Hypothesis: C(1)=0, C(2)+C(3)+C(4)+C(5)+C(6)=1

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1)	0.004093	0.001097
-1 + C(2) + C(3) + C(4) + C(5) + C(6)	-0.903633	0.060039

Restrictions are linear in coefficients.

Figure 13: Multiple Regression results for determinants of at-issue spreads

Source	SS	df	MS	Number of obs = 35		
Model	44.0586662	15	2.93724441	F(15, 19) =	15.21	
Residual	3.66876284	19	.193092781	Prob > F =	0.0000	
				R-squared =	0.9231	
				Adj R-squared =	0.8624	
Total	47.727429	34	1.40374791	Root MSE =	.43942	

spread	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
amount	.0001158	.0002384	0.49	0.633	-.0003832	.0006147
tenor	-.0795043	.0335101	-2.37	0.028	-.1496417	-.0093668
coupon	.5652647	.1603631	3.52	0.002	.2296208	.9009086
sp_rating	-.1519069	.0668455	-2.27	0.035	-.2918163	-.0119976
cds_5year	2.07933	.5783382	3.60	0.002	.8688543	3.289806
inflation	.2331856	.1864755	1.25	0.226	-.1571122	.6234834
gdp	-.1218969	.0723173	-1.69	0.108	-.2732588	.0294651
exchange_rate	.0003068	.0005083	0.60	0.553	-.0007572	.0013708
accountability	1.117328	.8751973	1.28	0.217	-.7144813	2.949137
stability	.7839342	3.807743	0.21	0.839	-7.185765	8.753633
effectiveness	-1.478719	4.23601	-0.35	0.731	-10.34479	7.387352
regulation	14.46875	4.738518	3.05	0.007	4.550923	24.38659
law	-2.984291	1.008066	-2.96	0.008	-5.094197	-.8743839
corruption	-3.380005	1.52786	-2.21	0.039	-6.577852	-.1821572
Secured	1.442078	.6285724	2.29	0.033	.1264611	2.757695
_cons	-7.696322	4.345469	-1.77	0.093	-16.79149	1.398849

Figure 14: Durbin-Watson Test

```
. dwstat
Durbin-Watson d-statistic( 16, 35) = 1.942099
```

Figure 15: Shapiro-Wilk Test

Shapiro-Wilk W test for normal data					
Variable	Obs	W	V	z	Prob>z
r	35	0.96631	1.203	0.385	0.35009

Figure 16: Variance Inflation Test

Variable	VIF	1/VIF
effectiveness	109.07	0.009169
regulation	98.15	0.010188
stability	28.06	0.035632
inflation	24.84	0.040260
cds_5year	13.03	0.076751
Secured	11.46	0.087270
accountability	9.66	0.103519
law	8.04	0.124324
corruption	7.46	0.134000
tenor	6.81	0.146949
exchange_rate	5.84	0.171311
coupon	5.76	0.173709
gdp	3.97	0.252071
sp_rating	2.84	0.352231
amount	2.17	0.461070
Mean VIF	22.48	

Figure 17: Variance Inflation Test (after removing government effectiveness as an independent variable)

Variable	VIF	1/VIF
regulation	17.26	0.057947
inflation	13.99	0.071481
stability	12.64	0.079108
cds_5year	12.49	0.080037
Secured	10.39	0.096218
law	7.92	0.126329
corruption	6.95	0.143825
tenor	6.29	0.158980
coupon	5.04	0.198393
gdp	3.88	0.257913
sp_rating	2.83	0.353530
accountability	2.70	0.370817
exchange_rate	2.50	0.399246
amount	2.17	0.461089
Mean VIF	7.65	

Figure 18: Linktest

Source	SS	df	MS			
Model	44.315754	2	22.157877	Number of obs =	35	
Residual	3.41167501	32	.106614844	F(2, 32) =	207.83	
Total	47.727429	34	1.40374791	Prob > F =	0.0000	
				R-squared =	0.9285	
				Adj R-squared =	0.9240	
				Root MSE =	.32652	

spread	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
_hat	.6745278	.2152908	3.13	0.004	.2359948	1.113061
_hatsq	.048765	.0314034	1.55	0.130	-.0152016	.1127317
_cons	.4816843	.3550712	1.36	0.184	-.241572	1.204941

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