

**THE EFFECT OF MACRO ECONOMIC VARIABLES ON THE
LIQUIDITY OF INFRASTRUCTURE BONDS LISTED AT NAIROBI
SECURITIES EXCHANGE**

BY

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DECLARATION

This research project is my original work and has not been presented to any other institution or university.

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This research project has been submitted for examination with my approval as the university supervisor.

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DEDICATION

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LIST OF ABBREVIATIONS

CAPM	Capital Asset Pricing Model
CBK	Central Bank of Kenya
CMA	Capital Markets Authority
GDP	Gross Domestic Production
MM	Modigliani-Miller
NSE	Nairobi Securities Exchange
OTC	Over the Counter
PPP	Public-Private Partnerships
SPV	Special Purpose Vehicle

ABSTRACT

The study sought to examine the effect of macroeconomic variables on the liquidity of infrastructure bonds listed at the Nairobi Securities Exchange. The level of infrastructure bonds is still modest and under developed in breadth and depth in Kenya compared to mature infrastructure bond markets such as the US, Asian and Brazil which necessitated the study. A causal research design was used to find out the effect of macroeconomic variables on liquidity of infrastructure bond listed at the NSE. Secondary data for the period 2009-2014. This data is available at the CBK Library and can also be obtained from the NSE and KBS. To identify the effect of macroeconomic variables on liquidity of infrastructure bonds, the study considered monthly statistics of volumes traded, interest rates, inflation rates, exchange rates, diaspora remittance and GDP. From the findings one can safely conclude that the interest rates and exchange rates have a positive relationship with liquidity of infrastructure bonds, which is in line with expectation theory of term structure of interest rates. While inflation rate variability, real GDP, diaspora remittances have a negative relationship with infrastructure bond liquidity. From the study findings there is need to create awareness of the role of bond market in the economy and there is need to establish sound macroeconomic policy by the policy makers with a keen interest on exchange rate, interest rate and GDP. The level and volatility of interest rate, the volatility of changes in the exchange rate are very important in liquidity of infrastructure bonds. This will spur the development of infrastructure bonds. Additionally, other measurements of liquidity of infrastructure bonds could be tightness as measured by the bid-ask spread. This is so because various developments in infrastructure bonds such as euro denominated infrastructure bond and the number of issues have increased. Further investigation may be done to establish the effect of macroeconomic and microeconomic determinants outside this study on liquidity of infrastructure bonds. Additionally, further investigation may be done into why the macroeconomic variables exhibited the specified relationships and coefficient magnitude against liquidity of infrastructure bonds. Further studies can use market tightness as measured by the bid-ask spread as measure liquidity of infrastructure bonds.

DEFINATION OF TERMS

CHAPTER ONE

INTRODUCTION

1.1 Background of study

An Infrastructure bond is a debt instrument issued by governments or private companies to raise funds from the capital markets for infrastructure projects. Infrastructure bonds have been used around the world as an alternative financing mechanism for projects from such instruments as a bank loan. Infrastructure bonds can be issued by private companies without a need for government assistance. Infrastructure can be divided into two types: economic infrastructure, such as roads or electricity grids; and social infrastructure, such as schools or health care (Ehlers, Packer, and Remolona, 2014).

The global market for infrastructure bonds has grown rapidly since 2008. Since the global financial crisis, the issuance of global infrastructure bonds has risen to be roughly three times its pre-crisis levels. In 2009, annual global issuance topped US\$60 billion, although it has since fallen back modestly to around US\$50 billion. These developments have evidently been strongly influenced both by the financial cycle and a structural shift towards greater issuance in China by state-owned entities (Ehlers, Packer, and Remolona, 2014).

Borio (2000) argues that economies all over the world are increasingly moving to the market to finance their activities and secondly that the central bank is now more inclined to use market based instruments in managing monetary policy. Kapingura and Ikhide (2007) noted that central banks use the bond market to achieve two critical objectives. First, they use bond market to infer interest rates and inflation expectations of market participants. This helps to design efficient and rational financial systems. Secondly, central banks use the bonds market to conduct their regular open market operations. Thus illiquidity can greatly hinder the achievement of these two critical functions, with far reaching implications for the economic growth of a country. The government debt managers also worry about illiquidity because it has cost implications to bond issuance. Investors view illiquid markets as risky and hence demand a premium to hold such securities, however this is at the expense of the government and as long as the

government wishes to minimize risk and borrowing costs it will be keen to foster liquidity.

There is a crucial role for governments in promoting infrastructure project bonds. Governments can play a greater role in supporting stable macro-economic conditions, developing local capital markets and strengthening institutions. These actions will encourage all issuers to come to market, particularly corporations for whom bond issuance has been limited to date. Promoting reform and corporatization of utilities, professional management, political stability and a clear regulatory environment, are an important landmark in the development of local capital markets and the emergence of infrastructure project bonds.

Khalid (2007) the development of a bond market in a country may take three stages. At Stage I, the market does not have a sizeable saving and investment opportunities available, the intermediaries lack the skills and experience, banks are wither weak or so dominant that other market players are not encouraged to enter and the capital market is underdeveloped. Also, common signs of this initial stage are the absence of macroeconomic stability, financial fragility and a well-structured regulatory system. As such, the government and the policy makers need to establish the basic norms for a bond market to function in the most efficient manner. The policies of financial liberalization should be combined with deregulation, market determined pricing mechanism, macroeconomic stability, central bank reforms, incentive mechanism for market participants and banking sector reforms. At the same time, the country should initiate measures needed for the creation of a money and capital market.

At Stage II a country seems to have attractive issuers but limited investor base, developing capital markets and finally good macroeconomic and political environment. At this stage, further measures should be taken to develop a primary market of public and private securities. Country would also need public company, disclosure regulations, credit rating agency, and OTC arrangements to support trading. Finally, the country should have a Benchmark for pricing long maturities.

Finally, at Stage III, a country must have sufficient issuers and investors, skilled intermediaries, favorable macroeconomic and political environment. At this stage, the

country should develop a secondary market for securities. This will help pricing new issues. Credit rating agency must be able to handle a large number of issues. Disclosure rules have to be strengthened. Training of individuals involved is important to clearly understand the market risk, the reward, best practices and other related issues.

1.1.1 Macroeconomic Variables

Pardy (1992) noted that there are two variables which are necessary for faster development of capital market: macroeconomic and fiscal environment and market infrastructure. The macroeconomic factors included inflation, interest rate, foreign exchange rates and government expenditure. It seems to be unrealistic to plan policies for bond market development without establishing certain norms of macroeconomic stability and financial sector reforms. Within these macroeconomic conditions, fiscal discipline takes the first preference. Economic theory suggests that high level of fiscal deficits will increase interest rates. These deficits will also increase the risk of default and the cost of government debt, thus making it difficult to develop a liquid nominal bond market. In order to reduce market uncertainty, the government must ensure a fiscal discipline. Monetary stability is another important pre-requisite. High fiscal deficits financed through central bank leads to high inflation and high inflationary expectations. High inflation and large fiscal deficits discourage the long-term investment projects needed for a sustainable development, (Valle, 2001).

1.1.2 Liquidity of Infrastructure Bonds

A deep and liquid long-term infrastructure bond market can insulate the underlying projects from global market fluctuations, as opposed to the more volatile equity market. In the 2008 global financial crisis, for example, the Sharia-compliant sukuk market, which is dominated by government-issued infrastructure bonds, remained resilient. This liquid infrastructure bond market can also attract foreign investors, as Malaysia has shown, adding diversity to the investor base, (Rowter, 2014).

A number of approaches have been taken to measure bond market liquidity in various studies. D'Souza and Gaa (2004) suggest a number of measures for liquidity, including bid-ask spreads, volatility, trading volume and frequency, as well as quote size and

frequency. While trading volume is an intuitive and widely cited measure of market liquidity, one drawback is that it is also associated with price volatility, which tends to be negatively related to market liquidity. Market liquidity has several dimensions and there is no one satisfactory definition that captures all the features of a liquid market. Some of the important characteristics by which a market could be judged liquid are; market tightness as measured by the bid-ask spread, market depth as reflected by the ability of the bond market to handle large transactions without causing sharp changes in prices.

1.1.3 Effect of Macroeconomic Variables on the Liquidity of Infrastructure Bonds

Goyenko and Ukhov (2007) document that increased bond market volatility and return significantly forecast increased stock market liquidity. Further, stock market liquidity respond positively to an increase in liquidity for bonds with short and long time to maturity, while the opposite effect is true for the liquidity for bonds with medium time to maturity. Chordia, Sarkar and Subrahmanyam (2005) find that increased bond market volatility significantly forecast decreased stock market liquidity, stock market liquidity respond positively to an increase in the bond market liquidity.

As pointed out in Chordia, Roll and Subrahmanyam (2001) interest rates are shown to influence liquidity in the inventory paradigm. The inventory paradigm, see for example O'Hara (1995), suggests that liquidity depends on inventory turnover rates and inventory risks. In addition, frictions such as margin requirements and short-selling constraints imply that a change in the interest rates can result in that the liquidity is affected. For example, a decrease in the interest rates could, by reducing the cost of margin trading and decreasing the cost of financing inventory, stimulate trading activity and increase stock market liquidity.

Many variables drives the level of development of the domestic bond market and no single class of variables is wholly responsible for the underdevelopment of the domestic infrastructure bond market. Macroeconomic factors such as interest rates, exchange rates, the presence or absence of capital controls and fiscal balances. Institutional and legal environments for example legal, financial reporting, taxation, corruption ,Financial markets and banking sector for example activity and size of markets and level of

economic development measured by per capita income all matter for domestic bond market development, (Adelegan and Radzewicz, 2009).

Similarly, bond market development must be viewed as a dynamic process in which continued macroeconomic and financial sector stability are essential to building an efficient market and establishing the credibility of the government or corporations as issuers of debt securities. Gross Domestic Production (GDP) per capita which is the developmental stage of the economy is expected to have a positive relationship with bond market development. Underdeveloped countries have a volatile investment environment, domination of government in commercial activities, weak creditors' rights, lack of transparency and poor corporate governance (Adelegan and Radzewicz, 2009). Burger and Warnock, (2007) also argue that there is a strong positive relationship between the level of economic development and depth of financial markets for instance the size of a country's local-currency denominated bond market is related to GDP per capita rather than country size.

1.1.4 Macroeconomic Variables and Infrastructure Bonds listed at NSE

Kenya kicked off the revitalization of the stock market in the late 1980s and it set out to revitalize the bonds market in 2000 by strengthening the government bonds market. However, despite the initiatives, the stock market that has been in existence for over 50 years is still shallow, narrow and thin. The bonds market is also in its infancy stage attracting more of the government bonds compared with corporate bonds. The modern Kenyan bond market has evolved from an East Africa Development Bank (EADB) private placement in 1998. From 2001, the Government has sought to promote the domestic capital market as a more viable source of long-term funding for public and private issuers. A significant feature of this has been pension reform. Several additional market reforms were initiated, including a policy to meet borrowing needs from the local market. As a result, demand for long-term paper has increased and the government has been able to extend the tenor of its local currency debt and reduce average borrowing costs. Its longest dated bond is 30 years issued in 2012 for KES 28.5bn. (CBK)

Infrastructure Bonds have been successfully issued in Kenya since 2009 when the first bond was issued to raise Ksh.18.5bn, to fund specific projects in Roads, Energy, Water

and Irrigation sectors So far, five Infrastructure bonds amounting to Ksh 130.85bn have been issued to fund various projects under these sectors. The First IFB Issue No. IFB1/2009/12, Second IFB: Issue No. IFB 2/2009/12, Third IFB: Issue No. IFB1/2010/8, Fourth IFB: Issue No. IFB2/2010/9, Fifth IFB: Issue No. IFB1/2011/12, Sixth IFB: Issue No. IFB1/2013/12. (CBK)

The implementation of Kenya Electronic Payment and Settlement Systems (KEPSS) facilitated efficient payment and settlement of government securities; paving the way for introduction of products such as ILF that further promotes bonds market in Kenya. The outcome of this policy move boosted trading of bonds in the secondary market, with total turnover rising from Ksh 14.08bn by end of 2001 to Ksh 54.16bn in 2006 and Ksh 523.99bn by end of 2012, (CBK).

The emerging policy issues include long-term credit gap and the limited menu of financial instruments in the capital market. Though Kenya's financial sector has a wide range of products, institutions and markets, there are glaring gaps in long-term credit. While commercial banks have not managed to supply long-term capital, the stock market has remained shallow and thin, limiting long-term resource mobilization by firms. Thus, to boost long-term investment growth, deliberate efforts must be made to adequately develop vehicles for mobilizing long-term capital in Kenya. This is by use of PPP and SPVs (Kenya Economic Review, 2013)

The capital markets play a key role in providing long term funding for large infrastructure projects such as the development of transportation networks, extractive industries, technological connectivity and utilities infrastructure – projects which all form part of the Vision 2030 developmental agenda. The National Treasury has published a National Priority List of 47 public private partnership infrastructure projects. These have a requirement for private sector funding of at least \$27 billion over the next ten years, indicating an infrastructure funding gap of \$2-3 billion per year over this period. The size of the required investments for large infrastructure projects makes the capital markets an ideal channel for mobilising international financing for these projects. The target is that the share of infrastructure investment financed through the private capital markets, by

means of listed equity, private equity or bond issues, should rise to 25 percent by 2023, (CMA, 2014).

Some of the barriers to realizing the infrastructure needs include; shortage of well-prepared projects, regulatory and institutional obstacles as well as the lack of capital and expertise for risky, early-stage project development. The regulatory and institutional obstacles relate to the lack of public-private partnership legal frameworks to ensure the delivery of efficient and cost effective infrastructure. This is because private sector participation ought to be governed by specific regulations or long term concession contracts. Institutional arrangements are also needed to ensure the sustainability of private sector participation. We now have a Public-Private Partnership (PPP) framework in place which is expected to spur activity in the infrastructure finance capital raising sphere going forward, (CMA). Kenya has a youthful bonds market with handful infrastructure bonds listed and yet to evolve long term maturity. With the emphasis on private-sector led growth and the increasing focus on PPP as an alternative to providing public services, it means that developing the capital market is very vital. (Ngugi and Agoti, 2007).

1.2 Research Problem

The primary purpose of a well-developed bond market is to provide cheaper, longer term finance to fund capital investments. Due to its positive influence on the development of an economic and financial system, and numerous advantages that a bond market provides, the development of a bond market remains critical to a country's financial system and economy (Sprcic and Wilson, 2007). From a macroeconomic policy perspective, the lack of bond markets places constraints on the financing of fiscal deficits, while bond markets provide useful market signals for macro-economic policy. Domestic debt is also needed for monetary policy purposes, including for sterilizing inflows of foreign exchange. Bond markets also help to provide interest rates across the maturity spectrum and a more efficient pricing of risk. And by providing an alternative source of financing, they reduce concentration of intermediation in banks. Because lending can be hedged in the bond market, banks have the ability to lend longer, (Kahn, 2005).

Objective of infrastructure bonds is to Support Kenya's Development Agenda: Development Expenditure about 30% of budget deficit component to be funded from domestic borrowing, Issue Infrastructure Bonds (IFBs) to partly finance development budget, Issue bonds to raise funds to fund infrastructure projects in key economic sectors; Transport (Roads), Water & Irrigation and Energy sectors, Government entities and private sector to follow suit and tap from capital markets to fund capital expenditure. IFB Features and Incentive Package includes Tenor – Dependent on projects turnaround time, Coupon rate – Fixed interest rate, Amortization – Redemption of principal in portions, Tax – All earnings/returns from IFBs exempt from taxation, Minimum amount – Kshs 100,000, Issuance Method – Public offer, Multi-price Auctions Secondary trading, Target Investors – Local & foreign, Institutional and retail investors, (Kenya Economic Review, 2013).

Mbeng (2012) states that efficient and liquid government bond markets are vital especially for the correct pricing of all other bond issuances e.g. municipal, infrastructure, corporate bonds etc. because the yields on the government bonds provide the underlying benchmark yield curves to price these other types of bonds; Efficient institutional and legal infrastructure reforms and structures should be introduced. Mohanty (2002) on improving liquidity on government bond markets in emerging market economies noted that a wide investor base, presence of primary dealers and development of benchmark bonds are major contributors to a liquid bond market. Elton and Green (1998) study suggests that liquidity is a significant determinant in the relative pricing of treasury bonds, but its role is much less than previously reported and primarily associated with highly liquid bonds with long maturities.

Despite the fact that bond market liquidity in Kenya is low as established by Ngugi and Agoti, (2007), there is no study that we know of which comprehensively addresses the question of what drives liquidity especially the government bond market which is the largest in the Kenyan capital market. Mwangi (2013) attempted to study the determinants of liquidity in Kenyan government bonds; however his study only discussed the newly introduced benchmark bonds and uses trading volume as a proxy for liquidity. This study

sought to address the following research question; what is the effect of macroeconomic variables on liquidity of infrastructure bonds listed at NSE?

1.3 Research Objectives

To establish the effect of macroeconomic variables on liquidity of infrastructure bonds listed at NSE.

1.3.1 The specific objectives will be as follows:

- i. To determine the influence of the interest rate on liquidity of infrastructure bonds listed at NSE.
- ii. To determine the effect of the inflation on liquidity of infrastructure bonds listed at NSE.
- iii. To determine the volatility of exchange rate on liquidity of infrastructure bond listed at NSE.
- iv. To determine the effect of GDP on the liquidity of infrastructure bonds listed at NSE.
- v. To determine the influence of diaspora remittances on liquidity of infrastructure bonds listed at NSE.

1.4 Value of the Study

Empirical results from this study will be of interest to government debt managers, central bank, capital market authority, portfolio managers and traders and researchers. As agents of the taxpayer, government debt managers have a duty to ensure that the infrastructure bonds functions smoothly generally characterized by efficient and liquid markets. This will enable them to minimize both the costs and risk of borrowing. They would be interested to understand what really drives liquidity and what policy options can be adopted to boost liquidity. This study is a useful addition to the existing rare studies of the bonds market, especially from developing markets.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section provides a theoretical background by reviewing the literature on infrastructure debt securities. Section 2.2 describes the theoretical literature on capital structure taking into account the main findings of the corporate finance literature. Section 2.3 enumerates macroeconomic factors effects on the liquidity of the infrastructure bonds listed at NSE Section 2.4. Focuses on the empirical literature of liquidity infrastructure debt securities and macroeconomic. Section 2.5 provides a summary of key issues emerging from the discussion in the previous sections.

2.2 Theoretical Review

Several theories in finance and economics have tried to explain investor behaviour and preferences in securities markets. The Efficient Markets Hypothesis tries to explain the ability of financial markets to factor in all available information in the prices of various securities. The term structure of interest rates and liquidity preference theories try to explain the rationale behind investor preference and risk appetite with regard to the different maturity ranges of financial instruments.

2.2.1 Tradeoff Theory

The study of capital structure mainly attempts to explain the mix of securities and financing sources used by corporations to finance real investment (Myers, 2001). The tradeoff theory assumes that there are benefits to leverage within a capital structure up until the optimal capital structure is reached. The theory recognizes the tax benefit from interest payments - that is, because interest paid on debt is tax deductible, issuing bonds effectively reduces a company's tax liability. Paying dividends on equity, however, does not. Modigliani and Miller, (1963) earlier assumption of world without tax proposed that firms should use as much debt capital as possible in order to maximize their value. The optimal level is attained where the debt-tax shield trades off with the bankruptcy cost and

maximizes the value of the firm. Therefore, the tax has been thoroughly investigated as a factor that determines the capital structure.

According to the static trade-off theory of capital structure, in choosing a capital structure, a company balances the value of the tax benefit from deductibility of interest with the present value of the costs of financial distress. At the optimal target capital structure, the incremental tax shield benefit is exactly offset by the incremental costs of financial distress.

2.2.2 Modern Portfolio Theory

Markowitz (1952) ushered in the modern era of portfolio theory by applying simple mathematical ideas to the problem of formulating optimal investment portfolios. In the Markowitz portfolio selection model, the "return" on a portfolio is measured by the expected value of the random portfolio return, and the associated "risk" is quantified by the variance of the portfolio return. - Capital Asset Pricing Model (CAPM) developed by (Litner, 1965; Mossin, 1966; Sharpe, 1964) this mean-variance model has had a profound impact on the economic modeling of financial markets and the pricing of assets was an immediate logical consequence of the Markowitz theory.

Modern Portfolio Theory (MPT) also called portfolio theory is an investment approach and is the philosophical opposite of traditional stock picking (Shefrin, 2001). It is the creation of economists who try to understand the market as a whole, rather than business analysts who look for what makes each investment opportunity unique. Investments are described statistically in terms of their expected long-term return rate and their expected short-term volatility. The volatility is equated with risk. The goal is to identify the acceptable level of risk tolerance and then to find a portfolio with the maximum expected return for that level of risk.

2.2.3 Efficient Market Hypothesis Theory

Fama (1970) proposed the efficient market hypothesis (EMH) theory which describes the behavior of a perfect market whereby securities are typically in equilibrium, security prices fully reflect all public information available and react swiftly as soon as information has been announced. This is because securities are fully and fairly priced,

investors need not waste time looking for mispriced securities. Fama argued that inefficient markets provide arbitrage opportunities to investors. Abnormal bond returns arising out of inefficient markets imply increased borrowing costs and risks to the government.

Efficient markets not only avail resources to investors but also facilitate the inflow of foreign financial resources into the domestic economy. The credit market has increased activities in financing investments with deposits forming a significant proportion of their financial asset basket this is because the bond and equity markets have not been thriving as they should be (Ngugi, 2009).

2.2.4 Expectation Theory of Term Structure of Interest Rates

Reilly and Brown (2000), expectations theory holds that any longer term interest rates simply represents the geometric mean of current and future 1-year interest rates expected to prevail over the maturity of the issue.

Such that $(1 + R_2)^2 = (1 + R_1)(1 + E(R_1))$

Where: R_2 = the rate on two year securities,

R_1 = the rate on one year securities,

$E(R_1)$ = the rate expected on one year securities one year from now.

The theory postulates that long term interest rates reflect the markets expectations of future short term interest rates; thus a downward sloping yield curve implies that short term rates are expected to fall in future, (Winfield and Curry, 1995). Bonds with short time to maturity tend to have reduced risk of capital loss emanating from movements in interest rates as opposed to long dated bonds thereby prompting investors to demand a risk premium on such bonds resulting in an upward sloping yield curve.

2.2.5 Liquidity Preference Theory

Keynes (1936) considered that the long term rate of interest is a monetary phenomenon which can be control directly and indirectly by the central bank, by supplying liquidity to arbitragers. It is often asserted that bonds are meant to be held long-term. The risk for

long-term bonds and short-term bonds are not the same because investors prefer liquidity. The further into the future the more uncertainty and therefore more risk. Longer-term bonds are subject to a greater amounts of interest rate risk than that of shorter-term bonds. Because of this risk, investors require a premium that compensates them for taking on this risk. This is called the liquidity preference theory of the term structure. This is because short-term bonds are more liquid and can therefore be sold and reinvested. Liquidity would be beneficial if interest rates increased because investors could reinvest their money at a higher rate of return. This would not be the case for someone with a bond that had a longer time to maturity; therefore, they are compensated for this risk with a higher yield to maturity. The yield to maturity compensation happens in the open market where bonds with longer times to their maturity date sell at lower prices than that of shorter term bonds. These lower prices make the yield to maturity higher. The premium added to the yield to maturity of longer term bonds is called the liquidity premium

2.3 Determinants of Liquidity of Infrastructure Bonds

Liquidity is the ability of a market to absorb a large number of transactions without dramatically affecting price. The literature has identified the following factors to be key determinants of liquidity of infrastructure bonds listed at NSE: Economic size, measure by GDP at purchasing power parity (PPP) with the expected relations being weakly positive with larger size; Natural openness, measured by ratio of exports to GDP with the expected relationship being weakly positive with greater openness; Developmental stage of the economy, measured by GDP per capita (Growth pattern of the economy) with the expected relationship being positive with higher development stage; Size of the banking system, measured by the extent of a well-developed and competitive banking systems with the expected relationship being positive with size and development of banking system; Exchange rate variability, measured by variation of monthly exchange rates over the period of study with the expected relationship being negative with greater variability of exchange rates. (Bhattacharyay, 2013; Eichengreen and Luengaruemitchai, 2004).

Chabchitthaodol and Panyanukul, (2005) link volatility and trading volume to market liquidity. They argue that volatility adversely impacts on liquidity since it increases inventory holding uncertainties. Investors therefore demand compensation for taking such risks, which comes in terms of widened bid-ask spreads. Bid-ask spread is widely used as a liquidity measure. They further argue that higher trading volumes should increase liquidity as increased trading lowers inventory risks. Contrary to the positive impact on liquidity increased trading had, adverse selection theory suggests that increased trading will have a negative impact on liquidity. Mohanty, (2002) refers to the European experience, which seems to suggest that bond markets became deeper after the adoption of a common market and currency. McCauley and Remolona (2000) suggest that debt markets require a minimum aggregate threshold size in order to maintain liquidity.

2.4 Empirical Review

This will be based on observed and measured phenomena and derives knowledge from actual experience rather than from theory or belief investigating the effect of macroeconomic variables on liquidity of infrastructure bonds from both an international and local perspective.

2.4.1 International Empirical Review

He and Nasser (2000) analyzed factors affecting bond liquidity in the Thai Secondary bond market, focusing at bond characteristics as well as macroeconomic factors using monthly data. The authors used bond turnover as a proxy for liquidity and used the SPSS programme for analysis. Empirical results revealed that credit rating is the most significant factor to the investors when selecting bond as an investment. Macroeconomic factors were also seen as important factors impacting on bond market liquidity. This result is consistent with the South African experience as bond market liquidity improved after the establishment of rating agency.

Muhammad and Banafe (2002) carried out a study on development of debt markets in emerging economies with a special focus on the Saudi Arabian experience. The study acknowledged the importance of the secondary bond market, established that sufficient volumes of outstanding government bonds spread along certain key maturities stream is a major condition for boosting bond market liquidity.

Panyanukul and Chabchitrchaidol (2005) analysed the determinants of liquidity in the Thai bond market. The study used secondary data from the Bank of Thailand and Thai Bond Dealing Centre and they used both descriptive and inferential statistics to analyze the data. The study revealed that there exist a negative relationship between trading volume and bid-ask spread since when there is a high degree of liquidity, resulting from a high level of demand for trades, the spread between bid and offer prices will narrow.

Walsh (2011) analyzed whether phases of fast infrastructure investment are considerably different from episodes of slower investment. They look at four key factors: association between infrastructure booms and rapid GDP growth, link with increases in savings and their origin, foreign or domestic, link with fiscal deterioration; and link with deepening financial markets. Using annual data for macroeconomic performance and infrastructure construction with observations from 1980 to 2009 for 105 advanced and emerging economies, they find that rapid economic growth has a tendency to go hand in hand with growth in infrastructure investment. Specifically, it appears that increases in energy capacity tend to be funded domestically, while investment in roads is less likely to be undertaken without the contribution of foreign capital. They find evidence that private capital markets tend to expand during periods of infrastructure investment, showing that environments

Packer and Remolona (2012) identified factors conducive to the participation of private finance in the financing of infrastructure which tend to improve together with the need for supplementary financing. As revenues from infrastructure projects mostly come in local currency, the potential for infrastructure bonds is greatly increased by deep and liquid local bond markets. Hence, factors related to local bond market development are likely to be of particular importance to emerging markets.

2.4.2 Local Empirical Review

Mbugua (2003) sought to assess the effects of macroeconomic variables on the corporate bond market which are seen to impede the development of a market that is required to boost economic growth. The study period spanned 1997-2004. The study identified and examined the relationship between macroeconomic variables notably exchange rate. The study adopted a short run time series linear econometric model to estimate effects and contribution of these variables as determinants of domestic bond market development. The study found that exchange rate, interest rate and bank credit variables negatively affected the development of the corporate bond market.

Ngugi and Agoti (2007) analysed the microstructure characteristics of the bonds market in Kenya and the factors that influence these characteristics. The study used traded values and trading activity measured by the number of deals to capture liquidity. The study showed that a higher number of deals have a positive relationship with the traded value of the bonds hence the higher the number of deals the higher the liquidity.

Mwangi (2013) studied the effect of benchmark bonds on the liquidity of bond market in Kenya. Secondary data of government bonds issued between 2001 and 2012 was used. The study sought to establish whether trade frequency bid-ask spread, tenor structure and volume of issuance influences the liquidity in bond market in Kenya. The study indicates that benchmark bonds which are characterized by large issue sizes at primary market and standard tenor structures have a positive relationship with bond market liquidity which is in line with theory as reflecting liquidity preference.

Muthama, Mbaluka and Kalunda (2013) analyzed the influence of the macro economic factors on the capital structure of selected listed companies in Kenya. An econometric model of multiple linear regressions was used. The study revealed that indeed macro-economic factors have pronounced influence on the capital structure of the listed companies. GDP growth rate was found to have a positive influence on long term debt ratio and a negative influence on total debt ratio and short term debt ratio. Inflation on the other hand had a negative influence on the short term debts while interest rates as measured by the treasury bills have a positive influence on the long term debt ratio and total debt ratio and a negative influence on the short term debt ratio.

Githinji (2013) sought to investigate the effect of selected macroeconomic variables on bond market development in Kenya. Secondary data for the period 2008-2012 was used, data was analyzed using descriptive and regression analysis. The study found out three macroeconomic (bank size, exports and fiscal policy) had no effect on bond market development. Three macroeconomic variables (exchange rate, interest rate and gross domestic product per capita had a positive effect on bond market development. However, economic size measured as gross domestic product at purchasing power parity had a negative effect on bond market development. It can therefore be concluded that exchange rate, interest rate, gross domestic product per capita and gross domestic product at purchasing power parity do affect bond market development.

2.5 Summary of Literature Review

The available literature shows that there exist a strong relationship between macroeconomic factors and infrastructure bonds liquidity. Brunnermeier and Pedersen (2006), and Chordia, Roll, and Subrahmanyam (2005) suggests that macroeconomic variables and price volatility may impact bond market liquidity by affecting market-making costs. Muthama, Mbaluka and Kalunda (2013) revealed that indeed macroeconomic factors have pronounced influence on the capital structure of the listed companies. GDP growth rate was found to have a positive influence on long term debt ratio and a negative influence on total debt ratio and short term debt ratio. Inflation on the other hand had a negative influence on the short term debts while interest rates as measured by the treasury bills have a positive influence on the long term debt ratio and total debt ratio and a negative influence on the short term debt ratio.

Ngugi and Agoti (2007) the study used traded values and trading activity measured by the number of deals to capture liquidity. The study showed that a higher number of deals have a positive relationship with the traded value of the bonds hence the higher the number of deals the higher the liquidity. Walsh (2011) They look at four key factors: association between infrastructure booms and rapid GDP growth, link with increases in savings and their origin, foreign or domestic, link with fiscal deterioration; and link with deepening financial markets.

Githinji (2013) economic size measured as gross domestic product at purchasing power parity had a negative effect on bond market development. It can therefore be concluded that exchange rate, interest rate, gross domestic product per capita and gross domestic product at purchasing power parity do affect bond market development. There was need to investigate the effects of macroeconomic variables on the liquidity of infrastructure bonds listed at NSE. The research gap that exists as no study has been done to investigate the effects of macroeconomic variables on liquidity of infrastructure bonds listed at the NSE.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The focus of this chapter was the methodology used to conduct the research. The chapter tackled: research design; study population; data collection and data analysis respectively.

3.2 Research design

This study employed a descriptive research design to assist the researcher identify the effects of macroeconomic variables on the liquidity of infrastructure bonds listed at the NSE. Mugenda and Mugenda (2003) descriptive research portrays the fact as it really is; if another researcher goes to the field now, they will find the situation as described. Chandran (2004) states that descriptive research design is one of the best methods for conducting research in human context because of portraying accurate, current facts through data collection for testing hypothesis or answering to conclude the study.

3.3 Population of study

The population in this study constituted of 8 issues of infrastructure bonds listed at NSE for the period February 2009 to September 2014. (Appendix 1).

3.4 Data Collection

The study collected secondary data for the purpose of investigating the effect to which macroeconomic variables influence liquidity of infrastructure bonds listed at NSE. Secondary data was obtained from time series of monthly reports of the Central Bank, Capital Markets Authority (CMA), Kenya National Bureau of Statistics (KNBS) and Nairobi Stock Exchange (NSE). The data spanned through the years 2009 to 2014.

3.5 Data Analysis

This study used the quantitative data which was analyzed by use of descriptive statistics, percentages and mean scores. Percentage scores and standard deviation where used. Data was analyzed using statistical package for social sciences (SPSS) and presented using figures. Multiple regression analysis was used to determine extent to which

macroeconomic variables have contributed to the liquidity of infrastructure bonds listed at NSE.

3.5.1 Analytical Model

The following analytical regression model was used in the analysis. It undertook the empirical analysis on the relationship between the macroeconomic indicators and the liquidity of infrastructure bonds listed at NSE, the below macro-econometric model was used:

$$Y = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + e$$

Where Y = Liquidity of infrastructure bonds; Where Y is measured by total traded volume in Kshs.

α_0 = Constant to be estimated by the model

β_i = Coefficient indicating influence of independent variables i on the dependent variable Y.

X_1 = Monthly Interest rates

X_2 = Monthly Inflation rates

X_3 = Monthly Exchange rates (Kshs/USD)

X_4 = Monthly Gross Domestic Product

X_5 = Monthly Diaspora remittances

e = error term

3.5.2 Test of Significance

The research applied the following hypothesis to test the relationship between macroeconomic variables and liquidity of infrastructure bond listed at NSE at 5% level of significance: The coefficient of determination, R squared, measure was used to test the significance of the regression model in explaining the relationship between macroeconomic variables and liquidity of infrastructure bond listed at NSE. The correlation coefficient, R squared, was a number ranging from 1 (a perfectly positive correlation)

through Zero (no correlation) to -1 (a perfectly negative correlation). The higher the R squared the better the model. ANOVA from the regression models was used to test the level of significance of the predictor variables that were used in the study.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter discussed the data analysis, findings, interpretations and presentation. The objective of this study was to study effect of macroeconomic variables on the liquidity of infrastructure bonds listed at the NSE. The chapter starts with data analyzed using descriptive statistics, then regression analysis.

4.2 Descriptive Statistics

Table 4.1 below gives a summary of the descriptive statistics of regression data.

Table 4.1: Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Varian ce	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Liquidity KSH '000000'	69	31831.40	.00	31831.40	8211.8746	7593.41957	57660020.831	1.862	.570
Interest Rates	69	6.49	13.85	20.34	16.3155	2.09851	4.404	-.889	.570
Inflation Rates	69	16.54	3.18	19.72	8.3526	4.70109	22.100	-.211	.570
exchange rates	69	26.531	74.739	101.270	83.74281	5.120654	26.221	1.141	.570
Real GDP	69	8.3	.0	8.3	1.477	2.3595	5.567	.200	.570
Diaspora Remmitances USD '000'	69	89291.0	39535.0	128826.0	81950.841	26002.9608	676153971.518	-1.536	.570
Valid N (listwise)	69								

Source: Research Findings

The result in table 4.2 shows the correlation matrix of the study variables. According to the table, there exists a positive and statistically significant relationship between liquidity and interest rates (Pearson Correlation Coefficient=0.507, p-value=0.000), exchange rate (Pearson Correlation Coefficient=0.340, p-value=0.002) and diaspora remittances (Pearson Correlation Coefficient=0.525, p-value=0.000) at 5% level of significance.

Table 4.2: Correlations Matrix

		Liquidity KSH '000000'	Interest Rates	Inflation Rates	exchange rates	Real GDP	Diaspora Remittances USD '000'
Liquidity KSH '000000'	Pearson Correlation	1	.507**	-.174	.340**	.045	.525**
	Sig. (1-tailed)		.000	.076	.002	.357	.000
	N	69	69	69	69	69	69
Interest Rates	Pearson Correlation	.507**	1	.159	.325**	.018	.681**
	Sig. (1-tailed)	.000		.096	.003	.442	.000
	N	69	69	69	69	69	69
Inflation Rates	Pearson Correlation	-.174	.159	1	.434**	-.030	.010
	Sig. (1-tailed)	.076	.096		.000	.404	.467
	N	69	69	69	69	69	69
exchange rates	Pearson Correlation	.340**	.325**	.434**	1	.095	.655**
	Sig. (1-tailed)	.002	.003	.000		.219	.000
	N	69	69	69	69	69	69
Real GDP	Pearson Correlation	.045	.018	-.030	.095	1	.084
	Sig. (1-tailed)	.357	.442	.404	.219		.246
	N	69	69	69	69	69	69
Diaspora Remittances USD '000'	Pearson Correlation	.525**	.681**	.010	.655**	.084	1
	Sig. (1-tailed)	.000	.000	.467	.000	.246	
	N	69	69	69	69	69	69

** . Correlation is significant at the 0.01 level (1-tailed).

Source: Research Findings

Table 4.3 below shows the coefficients of the regression model with the interest rate and exchange rates, indicating positive coefficients while the inflation rate, real GDP and diaspora remittances shows a negative coefficient indicating negative relationship with the dependent variables.

Table 4.3: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics		
	B	Std. Error				Beta	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	66022.361	20717.263		-3.187	.002	-107422.508	24622.213						
Interest Rates	1799.816	530.193	.497	3.395	.001	740.309	2859.323	.507	.393	.324	.424	2.359	
Inflation Rates	-706.790	205.454	-.438	-3.440	.001	-1117.358	296.223	-.174	.398	.328	.562	1.778	
exchange rates	631.818	250.223	.426	2.525	.014	131.787	1131.849	.340	.303	.241	.320	3.129	
Real GDP	-33.373	309.413	-.010	-.108	.914	-651.685	584.940	.045	-.014	-.010	.985	1.016	
Diaspora Remittances USD '000'	-.025	.058	-.087	-.436	.664	-.142	.091	.525	-.055	-.042	.227	4.403	

a. Dependent Variable: Liquidity KSH '000000'

Tables 4.4 and 4.5 below are a summary of the model indicating the regression statistics R-squared and Analysis of variance (ANOVA) values to explain the model.

Table 4.4 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.653 ^a	.427	.381	5973.34135	.427	9.378	5	63	.000

Source: Research Findings

- a. Predictors: (Constant), Diaspora Remittances USD '000', Inflation Rates, Real GDP, Interest Rates, exchange rates

Table 4.5 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1672990585.351	5	334598117.070	9.378	.000 ^b
	Residual	2247890831.172	63	35680806.844		
	Total	3920881416.523	68			

Source: Research Findings

- a. Dependent Variable: Liquidity KSH '000000'
 b. Predictors: (Constant), Diaspora remittances USD '000', Inflation Rates, Real GDP, Interest Rates, exchange rates

As indicated in the regression statistics R - squared was 0.427. This means that 43% variations from the expected and actual output (dependent variable: liquidity of infrastructure bonds) are explained by the independent variable. This indicates good fit of the regression equation used. Further Analysis of variance shows that f - calculated is greater than f – critical (9.378>0.01). This implies that the regression equation was well specified. Thus, this is a good reflection of the true position that liquidity can be explained by interest rate and exchange rates.

Estimated Equation:

$$LIQ = -66022.36 + 1799.816X_1 - 706.790X_2 + 631.818X_3 - 33.373X_4 - 0.025X_5$$

Where:

LIQ = Liquidity measured in Trading Volume

X₁ = Monthly Interest rates

X₂ = Monthly Inflation rates

X₃ = Monthly Exchange rates (Kshs/USD)

X₄ = Monthly Gross Domestic Product

X₅ = Monthly Diaspora remittances

The above shows that inflation rates and exchange rate have a positive relationship with the liquidity of infrastructure bonds listed at NSE.

4.3 Interpretation of the Findings

The result reveals that the coefficient number of inflation rates and exchange rate have a positive relationship with the liquidity of infrastructure bonds. This indicates that inflation rates and exchange rate have a positive relationship with infrastructure bond liquidity at 1% level. An increase in inflation by 1 transaction will lead to the increase in liquidity by Ksh 1799.816 million, volatility of exchange rate by 1 dollar will lead to increased liquidity by Ksh 631.818 million. An increase in the GDP by 1 basis point will lead to a decrease in liquidity by Ksh 33.373 million.

Table 4.2 the correlation matrix of the study variables. According to the table, there exists a positive and statistically significant relationship between liquidity and interest rates (Pearson Correlation Coefficient=0.507, p-value=0.000), exchange rate (Pearson Correlation Coefficient=0.340, p-value=0.002) and diaspora remittances (Pearson Correlation Coefficient=0.525, p-value=0.000) at 5% level of significance. Table 4.3 the coefficients of the regression model with the interest rate and exchange rates, indicating

positive coefficients while the inflation rate, real GDP and diaspora remittances shows a negative coefficient indicating negative relationship with the dependent variables.

Table 4.4 the regression statistics R - squared was 0.427. This means that 43% variations from the expected and actual output (dependent variable: liquidity of infrastructure bonds) are explained by the independent variable. This indicates good fit of the regression equation used. Table 4.5 analysis of variance shows that f - calculated is greater than f – critical ($9.378 > 0.01$). This implies that the regression equation was well specified. Thus, this is a good reflection of the true position that liquidity can be explained by interest rate and exchange rates.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter is a synthesis of the entire study. It presents a summary of the research findings, conclusions and recommendations. The chapter is organized as follows: first it presents a summary of the findings presented according to the research objectives. This is followed by conclusions, limitation of study and recommendations.

5.2 Summary

The result reveals that interest rates and exchange rates have a positive relationship with liquidity of infrastructure bonds, which is in line with expectation theory of term structure of interest rates. The theory postulates that long term interest rates reflect the markets expectations of future short term interest rates; thus a downward sloping yield curve implies that short term rates are expected to fall in future, bonds with short time to maturity tend to have reduced risk of capital loss emanating from movements in interest rates as opposed to long dated bonds thereby prompting investors to demand a risk premium on such bonds resulting in an upward sloping yield curve. . An increase in inflation by 1 transaction will lead to the increase in liquidity by Ksh 1799.816 million, volatility of exchange rate by 1 dollar will lead to increased liquidity by Ksh 631.818 million. An increase in the GDP by 1 basis point will lead to a decrease in liquidity by Ksh 33.373 million. While inflation rate variability, real GDP, diaspora remittances have a negative relationship with infrastructure bond liquidity.

5.3 Conclusion

The study was guided by the objective; to investigate the effect of macroeconomic variables on the liquidity of infrastructure bonds listed at the NSE. The results indicated that some macroeconomic variables have a positive effect on liquidity of infrastructure bonds. The following conclusions are drawn: the adoption of infrastructure bonds by the Central Bank of Kenya has led to increased liquidity in the Treasury bonds market. In addition through introduction of infrastructure bonds, the CBK has greatly reduced the

problem of debt which results in increased interest rates, exchange rates and generally has an effect on monetary and fiscal policies.

5.4 Limitations of the Study

This study used five macroeconomic variables as determinants of liquidity of infrastructure bonds. whereas other possible macroeconomic variables that have an effect on liquidity of infrastructure bonds may not have been used. In addition, this study is based on 2009-2014 interest rate, exchange rate variability, inflation rates, real GDP and diaspora remittances as the macroeconomic variables data for the Kenyan economy and thus interpretations deviating from the findings of this research may occur if period is outside the study period or if regression variables are not study variables. First missing data on some variables was not wholly available as a result of migration from manual to automated systems.

5.5 Recommendations for Policy

From the study findings there is need to create awareness of the role of bond market in the economy and there is need to establish sound macroeconomic policy by the policy makers with a keen interest on exchange rate, interest rate and GDP. The level and volatility of interest rate, the volatility of changes in the exchange rate are very important in liquidity of infrastructure bonds. This will spur the development of infrastructure bonds. Additionally, other measurements of liquidity of infrastructure bonds could be tightness as measured by the bid-ask spread. This is so because various developments in infrastructure bonds such as euro denominated infrastructure bond and the number of issues have increased.

5.6 Recommendations for Further Research

Further investigation may be done to establish the effect of macroeconomic and microeconomic determinants outside this study on liquidity of infrastructure bonds. Additionally, further investigation may be done into why the macroeconomic variables exhibited the specified relationships and coefficient magnitude against liquidity of infrastructure bonds. Further studies can use market tightness as measured by the bid-ask spread as measure liquidity of infrastructure bonds.

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APPENDICES

APPENDIX I: INFRASTRUCTURE BONDS LISTED AT NSE AS AT 22ND SEPTEMBER 2014

Serial No.	Issuer	Issue No.	Issue date	Maturity date	Clean Price(%)	Dirty Price(%)	Prev Price(%)
1	Republic of Kenya	IFB 1/2009/12 Yr	2009-02-24	2021-02-09	104.1370	104.5840	99.9741
2	Republic of Kenya	IFB 1/2010/8Yr	2010-03-02	2018-02-20	98.2812	98.4419	97.8866
3	Republic of Kenya	IFB 1/2011/12 Yr	2011-10-04	2023-09-19	104.0320	109.8010	103.8820
4	Republic of Kenya	IFB 1/2011/12 Yr	2011-10-04	2023-09-19	104.0180	109.0620	103.8820
5	Republic of Kenya	IFB 1/2013/12 Yr	2013-10-01	2025-09-16	101.6750	106.2990	101.6780
6	Republic of Kenya (reopened)	IFB 2/2009/12 Yr	2009-12-08	2021-11-23	103.5610	106.5280	99.9564
7	Republic of Kenya (reopened)	IFB 2/2010/9Yr	2010-09-01	2019-09-20	87.9887	88.0876	87.9485
8	KENGEN	FXIB 1/2009/10 Yr	2009-11-02	2019-10-31	0.0000	0.0000	97.3673

Source: Nairobi Securities Exchange.

Appendix II: Infrastructure Bonds Trading Volume at NSE 2009-2014

	Year	Liquidity KSH '000000'	Interest Rates	Inflation Rates	exchange rates	Real GDP	Diaspora Remmitances USD '000'
1	JAN-2009	.00	14.78	13.22	78.950	.0	39535.0
2	FEB-2009	.00	14.67	14.69	79.533	.0	53353.0
3	MAR-2009	.00	14.87	14.60	80.261	6.2	55361.0
4	APR-2009	.00	14.71	12.42	79.626	.0	48117.0
5	MAY-2009	.00	14.85	9.61	77.861	.0	49180.0
6	JUN-2009	.00	15.09	8.60	77.851	1.9	46347.0
7	JUL-2009	.00	14.79	8.44	76.751	.0	50372.0
8	AUG-2009	.00	14.76	7.36	76.372	.0	55947.0
9	SEP-2009	.00	14.74	6.74	75.605	1.9	53347.0
10	OCT-2009	.00	14.78	6.62	75.244	.0	53037.0
11	NOV-2009	.00	14.85	5.00	74.739	.0	48231.0
12	DEC-2009	2260.10	14.76	5.32	75.431	1.2	56329.0
13	JAN-2010	1991.05	14.98	5.95	75.786	.0	45117.0
14	FEB-2010	3932.70	14.98	5.18	76.730	.0	46423.0
15	MAR-2010	13086.90	14.80	3.97	76.947	1.4	52309.0
16	APR-2010	2902.70	14.58	3.66	77.254	.0	52679.0
17	MAY-2010	4362.90	14.46	3.88	78.541	.0	51172.0
18	JUN-2010	9440.20	14.39	3.49	81.018	6.1	52541.0
19	JUL-2010	9959.25	14.29	3.57	81.426	.0	50652.0
20	AUG-2010	2262.90	14.18	3.22	80.440	.0	51993.0
21	SEP-2010	10238.00	13.98	3.21	80.912	7.2	58557.0
22	OCT-2010	5248.35	13.85	3.18	80.714	.0	58503.0
23	NOV-2010	6051.15	13.95	3.84	80.460	.0	56380.0
24	DEC-2010	3518.65	13.87	4.51	80.568	8.3	65617.0
25	JAN-2011	2468.55	14.03	5.42	81.029	.0	64139.0
26	FEB-2011	3818.35	13.92	6.54	81.473	.0	60759.0
27	MAR-2011	6107.75	13.92	9.19	84.206	4.8	71577.0
28	APR-2011	3418.45	13.92	12.05	83.890	.0	70071.0
29	MAY-2011	3272.70	13.88	12.95	85.433	.0	68124.0
30	JUN-2011	11004.90	13.91	14.48	89.049	3.5	71888.0
31	JUL-2011	8090.65	14.14	15.53	89.898	.0	72797.0
32	AUG-2011	8924.55	14.32	16.67	92.786	.0	79563.0
33	SEP-2011	5880.00	14.79	17.32	96.357	4.0	84854.0
34	OCT-2011	9399.80	15.21	18.91	101.270	.0	81311.0

35	NOV-2011	3134.50	18.51	19.72	93.676	.0	80802.0
36	DEC-2011	4974.20	20.04	18.93	86.663	5.2	85244.0
37	JAN-2012	4877.25	19.54	18.31	86.343	.0	89755.0
38	FEB-2012	5314.80	20.28	16.69	83.176	.0	103970.0
39	MAR-2012	11386.55	20.34	15.61	82.897	4.0	106198.0
40	APR-2012	9410.60	20.22	13.06	83.188	.0	95625.0
41	MAY-2012	21215.90	20.12	12.22	84.384	.0	100995.0
42	JUN-2012	9746.80	20.30	10.05	84.789	4.4	99488.0
43	JUL-2012	13458.70	20.15	7.74	84.140	.0	92736.0
44	AUG-2012	31831.40	20.13	6.09	84.075	.0	94819.0
45	SEP-2012	28878.60	19.73	5.32	84.613	4.5	92519.0
46	OCT-2012	23508.00	19.04	4.14	85.112	.0	91627.0
47	NOV-2012	9645.40	17.78	3.25	85.629	.0	97504.0
48	DEC-2012	11248.65	18.15	3.20	85.994	5.3	105656.0
49	JAN-2013	8956.35	18.13	3.67	86.900	.0	102970.0
50	FEB-2013	6546.30	17.84	4.45	87.446	.0	102372.0
51	MAR-2013	14078.35	17.73	4.11	85.818	5.2	103393.0
52	APR-2013	15216.95	17.87	4.14	84.189	.0	104993.0
53	MAY-2013	6452.60	17.45	4.05	84.146	.0	110150.0
54	JUN-2013	23321.05	16.97	4.91	85.488	4.3	99809.0
55	JUL-2013	6722.95	17.02	6.03	86.859	.0	112834.0
56	AUG-2013	4944.35	16.96	6.67	87.493	.0	107049.0
57	SEP-2013	2714.05	16.86	8.29	87.413	4.4	107452.0
58	OCT-2013	31478.80	17.00	7.76	85.310	.0	112919.0
59	NOV-2013	11795.75	16.89	7.36	86.103	.0	113420.0
60	DEC-2013	5040.20	16.99	7.15	86.309	4.7	113216.0
61	JAN-2014	21012.30	17.03	7.21	86.214	.0	110969.0
62	FEB-2014	6388.05	17.06	6.86	86.278	.0	110421.0
63	MAR-2014	4342.35	16.91	6.27	86.489	1.5	119585.0
64	APR-2014	18969.80	16.70	6.41	86.716	.0	113409.0
65	MAY-2014	16903.90	16.97	7.30	87.412	.0	119657.0
66	JUN-2014	11351.00	16.36	7.39	87.612	5.8	116064.0
67	JUL-2014	10984.35	16.91	7.67	87.773	.0	117101.0
68	AUG-2014	7703.95	16.78	8.36	88.106	.0	128826.0
69	SEP-2014	5424.05	17.01	6.60	89.090	6.1	114879.0
Total	69	69	69	69	69	69	69

Source: Computation from raw data obtained from CMA, CBK, KNBS and NSE

APPENDIX III: INFRASTRUCTURE BONDS TRADING VOLUMES 2009-2014
 IN BILLIONS

MONTH	YEAR 2009	YEAR 2010	YEAR 2011	YEAR 2012	YEAR 2013	YEAR 2014
JAN	0	1.9911	2.46855	4.87725	8.95635	21.0123
FEB	0	3.9327	3.81835	5.3148	6.5463	6.38805
MARCH	0	13.0869	6.10775	11.38655	14.07835	4.34235
APRIL	0	2.9027	3.41845	9.4106	15.21695	18.9698
MAY	0	4.3629	3.2727	21.2159	6.4526	16.9039
JUNE	0	9.4402	11.0049	9.7468	23.32105	11.351
JULY	0	9.95925	8.09065	13.4587	6.72295	10.98435
AUG	0	2.2629	8.92455	31.8314	4.94435	7.70395
SEPT	0	10.238	5.88	28.8786	2.71405	5.42405
OCT	0	5.24835	9.3998	23.508	31.4788	
NOV	0	6.05115	3.1345	9.6454	11.79575	
DEC	2.2601	3.51865	4.9742	11.24865	5.0402	

Source: Raw Data from NSE